Le dernier rapport du GIEC et les éléments de solutions qu'il propose au défi climatique

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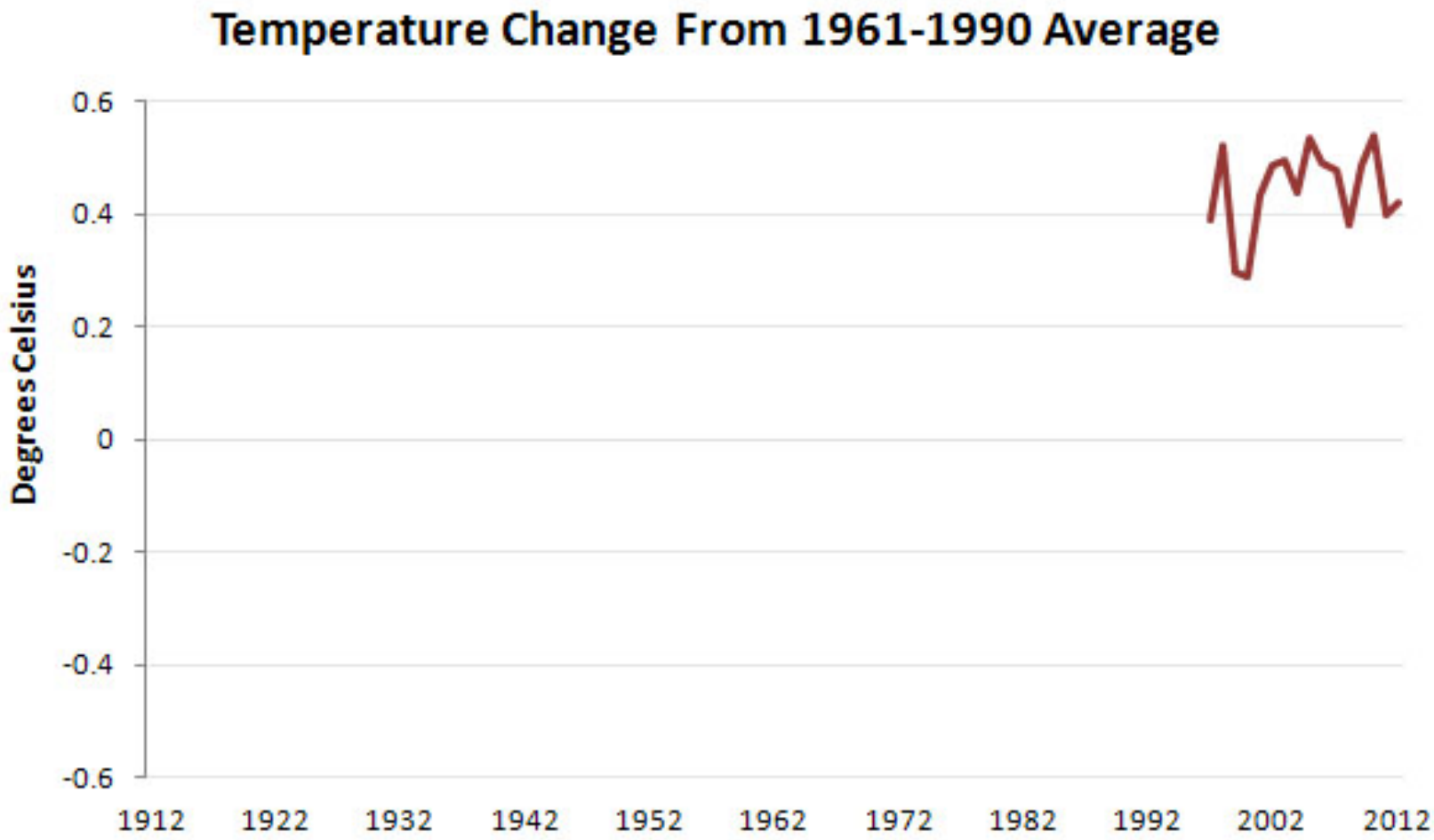
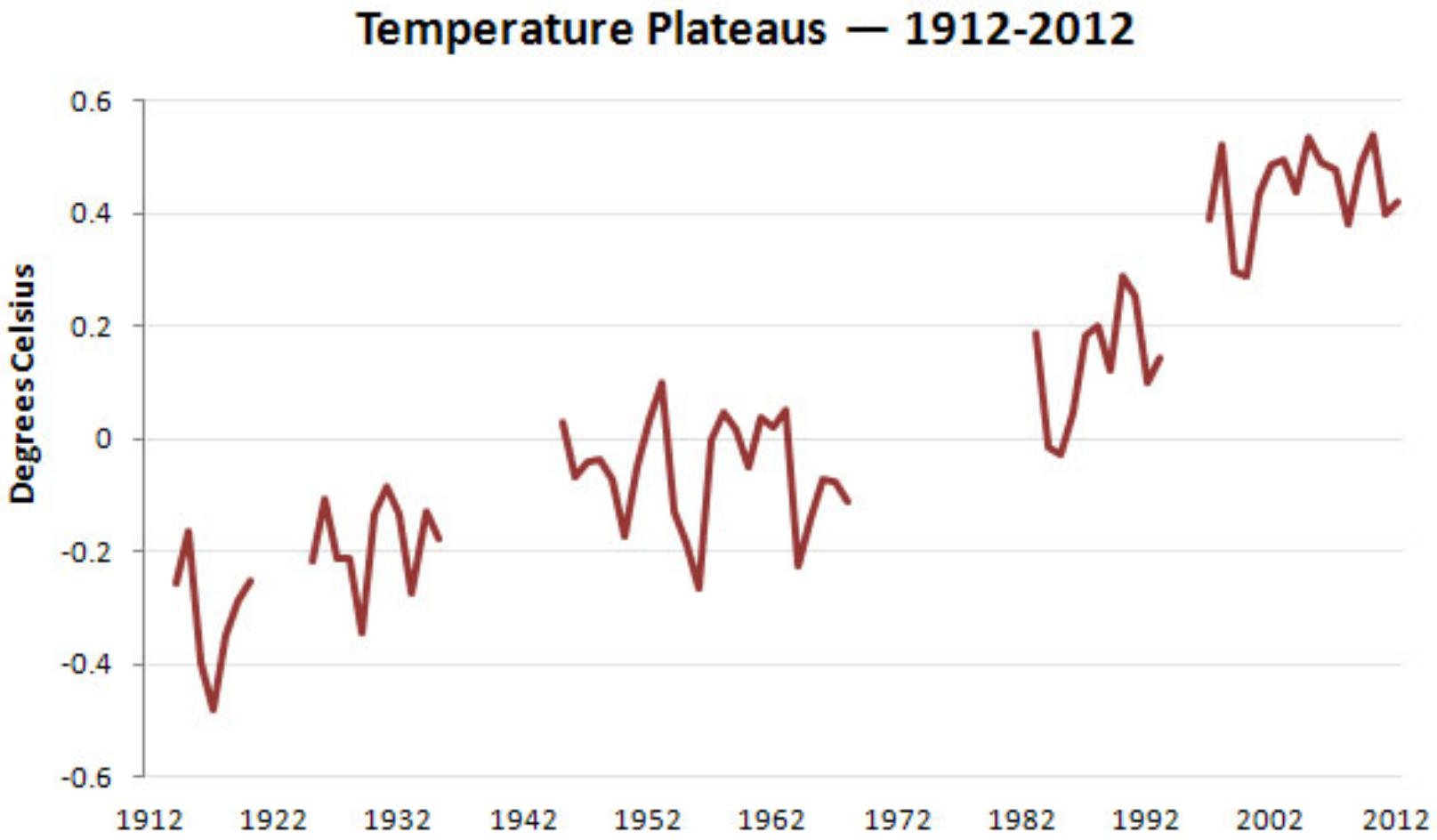
Klima-Bündnis Lëtzebuerg, Luxembourg, 7 mai 2014

Merci aux Services fédéraux de la Politique scientifique belge (BELSPO) pour leur soutien



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

Lying With Statistics, Global Warming Edition



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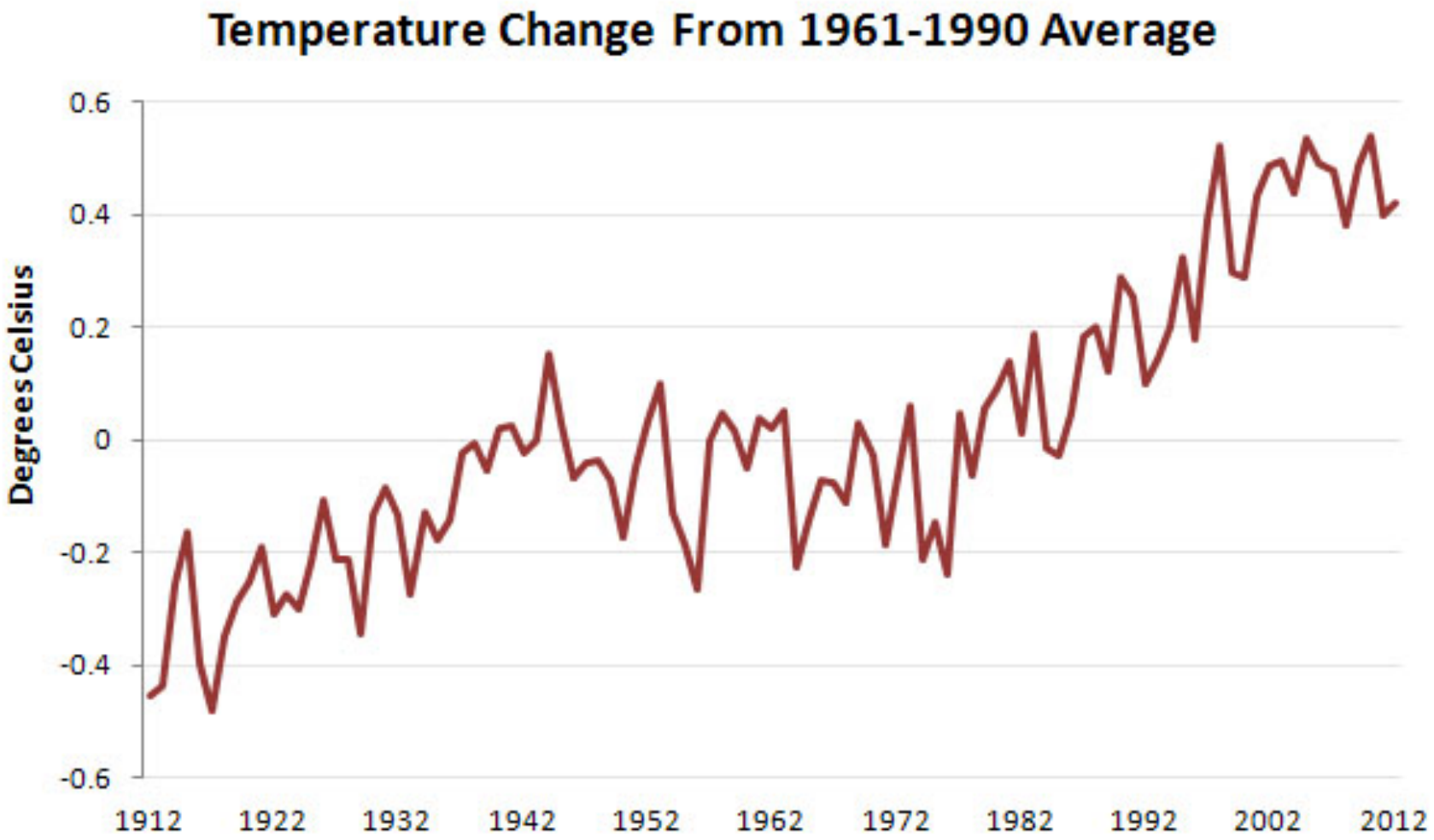


http://www.motherjones.com/kevin-drum/2012/10/lying-statistics-global-warming-edition

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 Organizatior

UNEP= United Nations Environment Programme

Completed IPCC Reports

5 Assessment Reports *(1990, 1995, 2001, 2007, 2013-14)*

1992 Supplementary Report and 1994 Special Report

8 Special Reports *(1997,1999, 2000, 2005, 2011)*

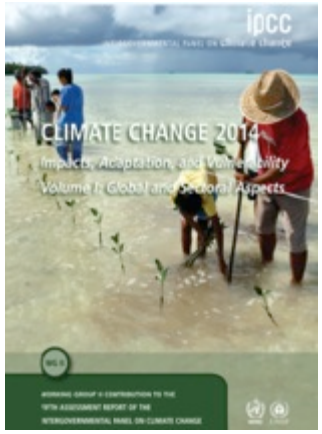
Guidelines for National GHG Inventories, Good Practice Guidanc

(1995-2006)

6 Technical Papers *(1996-2008)*

The IPCC assessments have influenced global action on an unprecedented scale

1. The First Assessment Report (FAR, 1990) had a major impact in defining the content of the UNFCCC
2. The Second Assessment Report (SAR, 1996) was largely influential in defining the provisions of the Kyoto Protocol
3. The Third Assessment Report (TAR, 2001) focused attention on the impacts of climate change and the need for adaptation
4. The Fourth Assessment Report (AR4, 2007) informed the decision on the ultimate objective (2°C) and is creating a strong basis for a post Kyoto Protocol agreement
5. The Fifth Assessment Report (AR5, 2013-14) will inform the review of the 2°C objective, and be the context for preparing the post-Durban 2015 agreement



What is happening in the climate system?

What are the risks?

What can be done?

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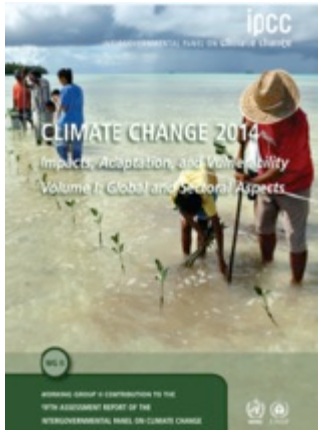
WMO UNEP

WG I (Physical science basis): 209 lead authors, 2014 pages, 54.677 review comments



WG II (Impacts, Adaptation, and Vulnerability): 243 lead authors, 2500 pages, 50.492 review comments

WG III (Mitigation of Climate Change): 235 coordinating and lead authors, 2000 pages, 38.315 review comments

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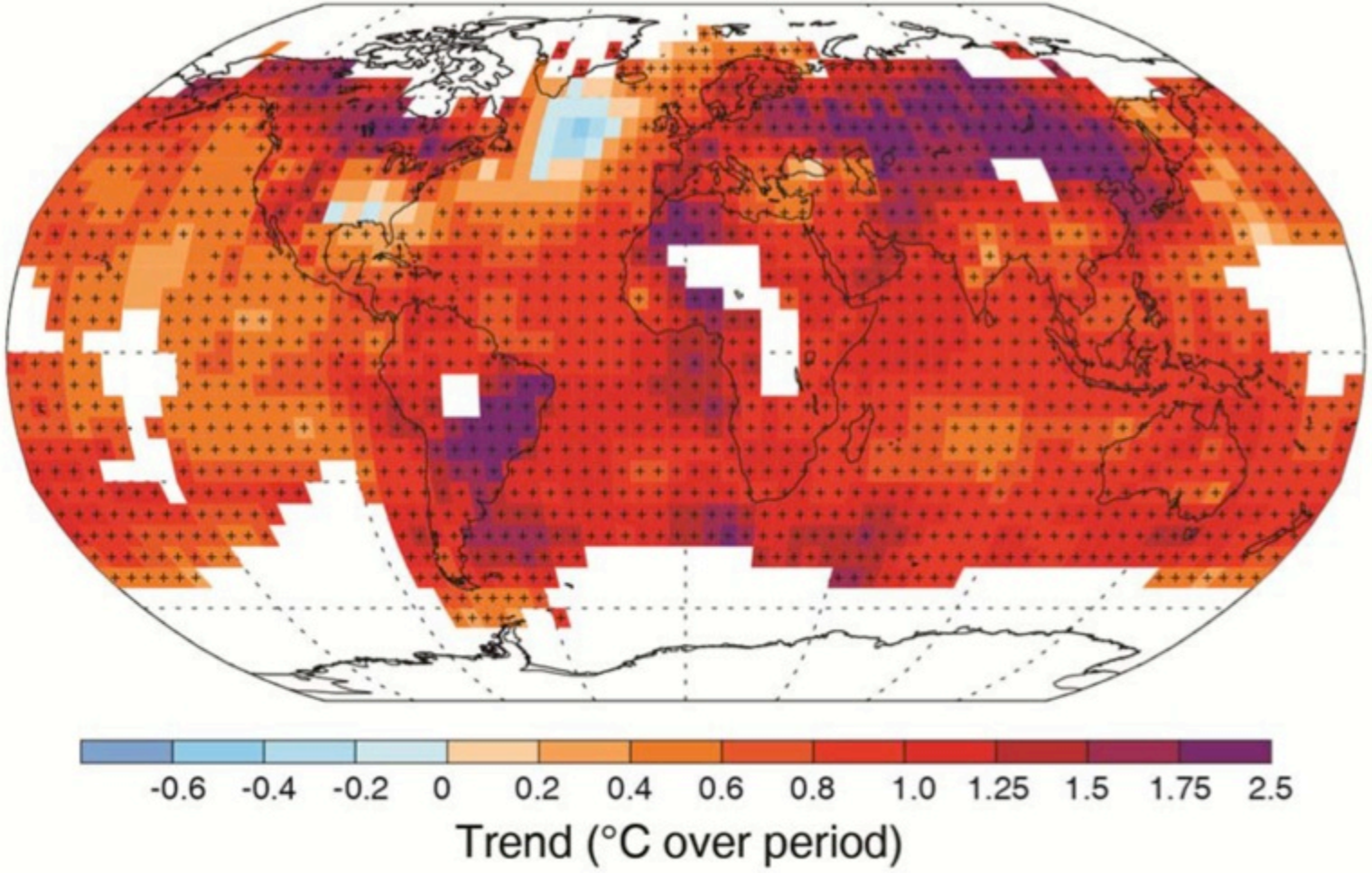
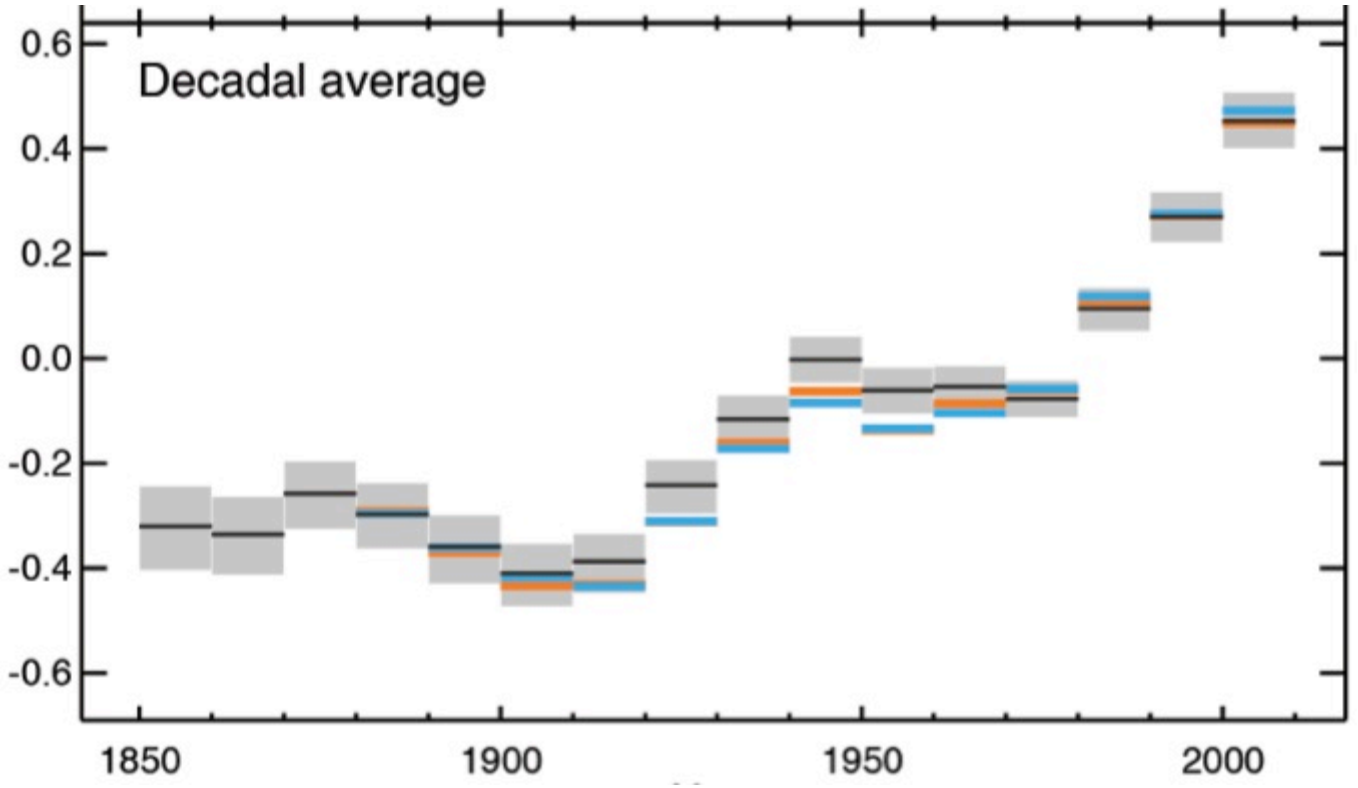
What is happening in the climate system?

Evolution de la température moyenne en surface 1901-2012: +0.89°C



(IPCC 2013, Fig. SPM.1b)

Le réchauffement du système climatique est sans équivoque



(IPCC 2013, Fig. SPM.1a)

Chacune des trois dernières décennies a été successivement plus chaude à la surface de la Terre que toutes les décennies précédentes depuis 1850

Dans l'hémisphère nord, la période 1983–2012 a probablement été la période de 30 ans la plus chaude des 1400 dernières années (degré de confiance moyen).

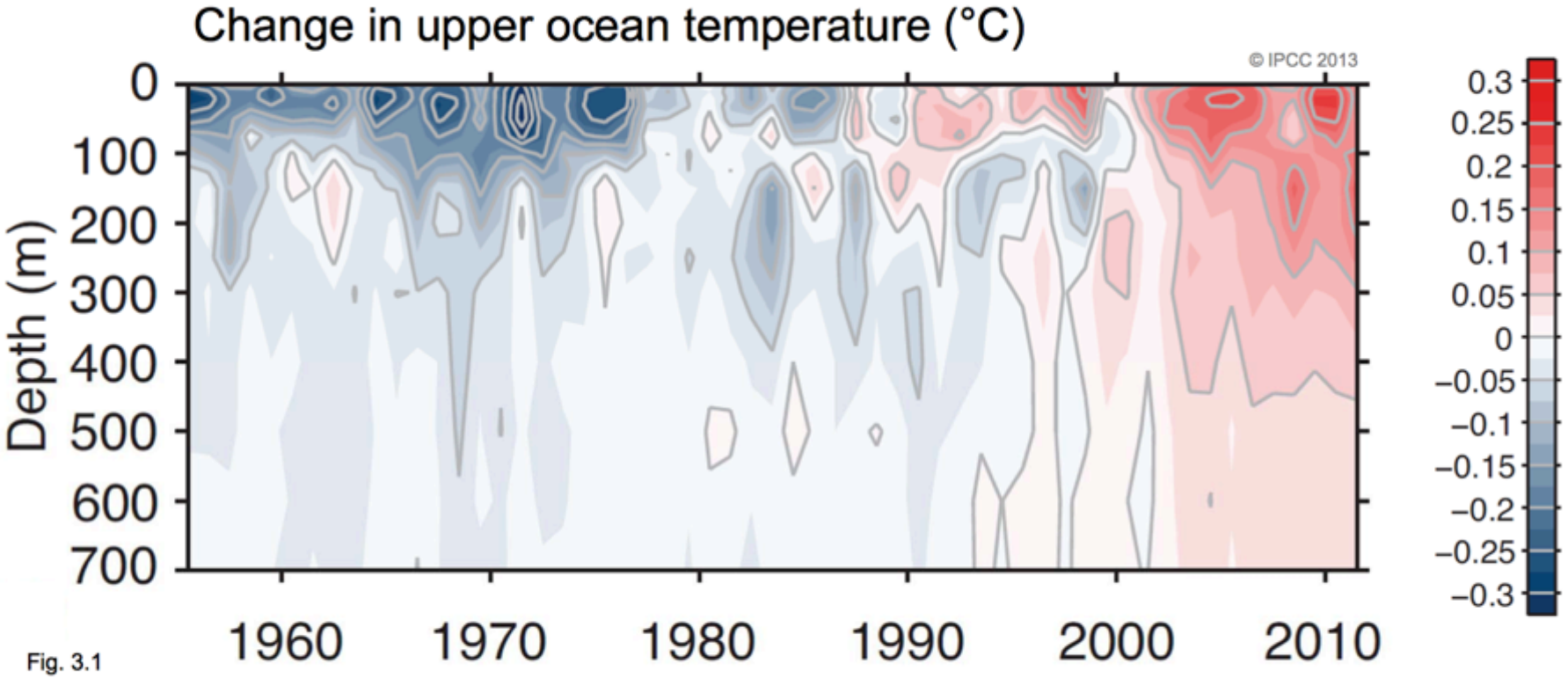


Fig. 3.1

It is *virtually certain* that the upper ocean (0-700 m) warmed from 1971 to 2010, [...]. It is *likely* that the ocean warmed between 700 and 2000 m from 1957 to 2009.

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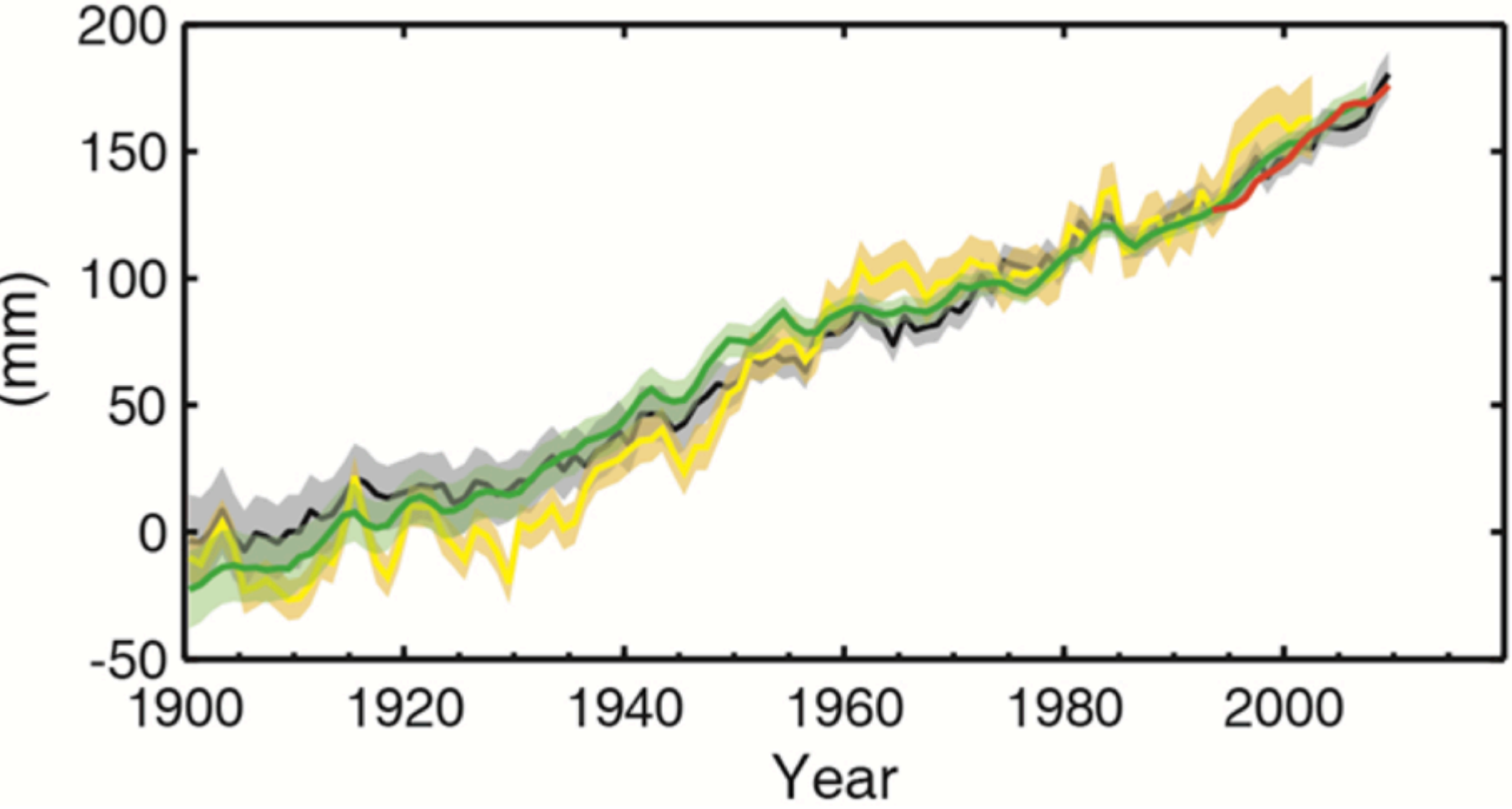
Plateau Glacier (1961)
(Alaska)

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

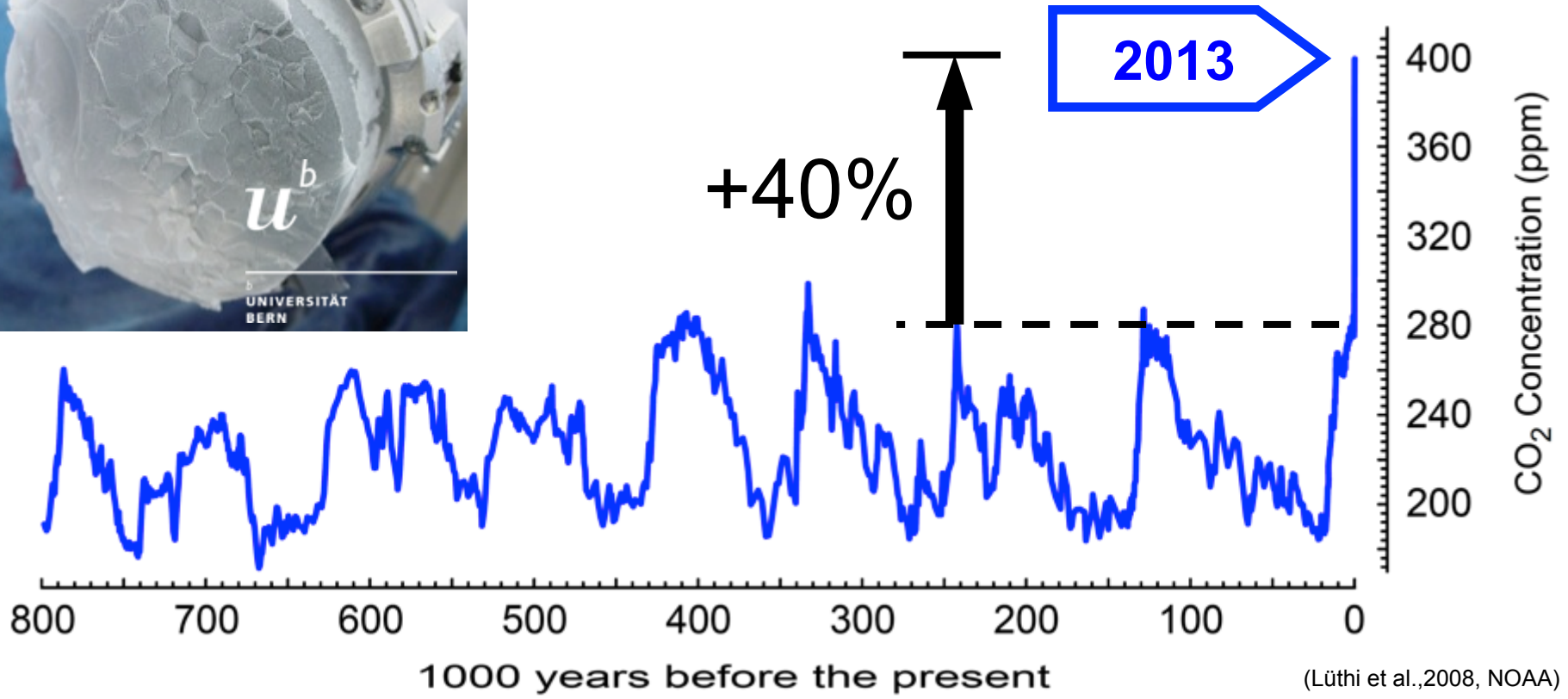
Plateau Glacier (2003)
(Alaska)

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

Change in average sea-level change



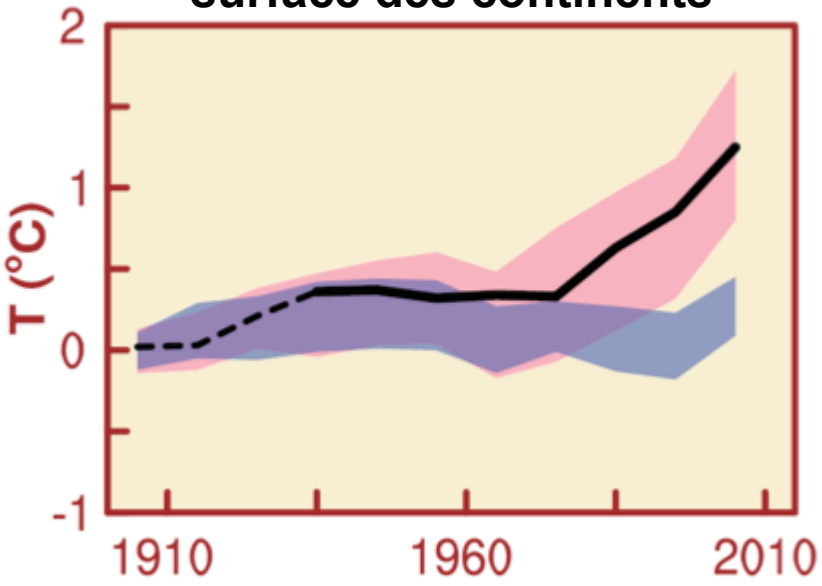
AR5 WGI SPM - Approved version / subject to final copyedit



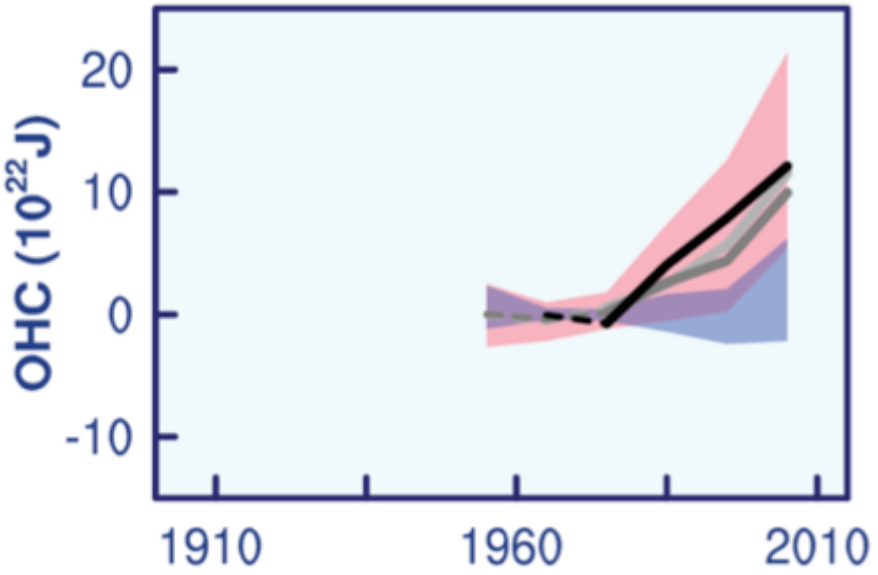
(Lüthi et al.,2008, NOAA)

The atmospheric concentrations of carbon dioxide, methane, and nitrous oxide have increased to levels unprecedented in at least the last 800,000 years.

Température moyenne surface des continents



Contenu thermique des océans



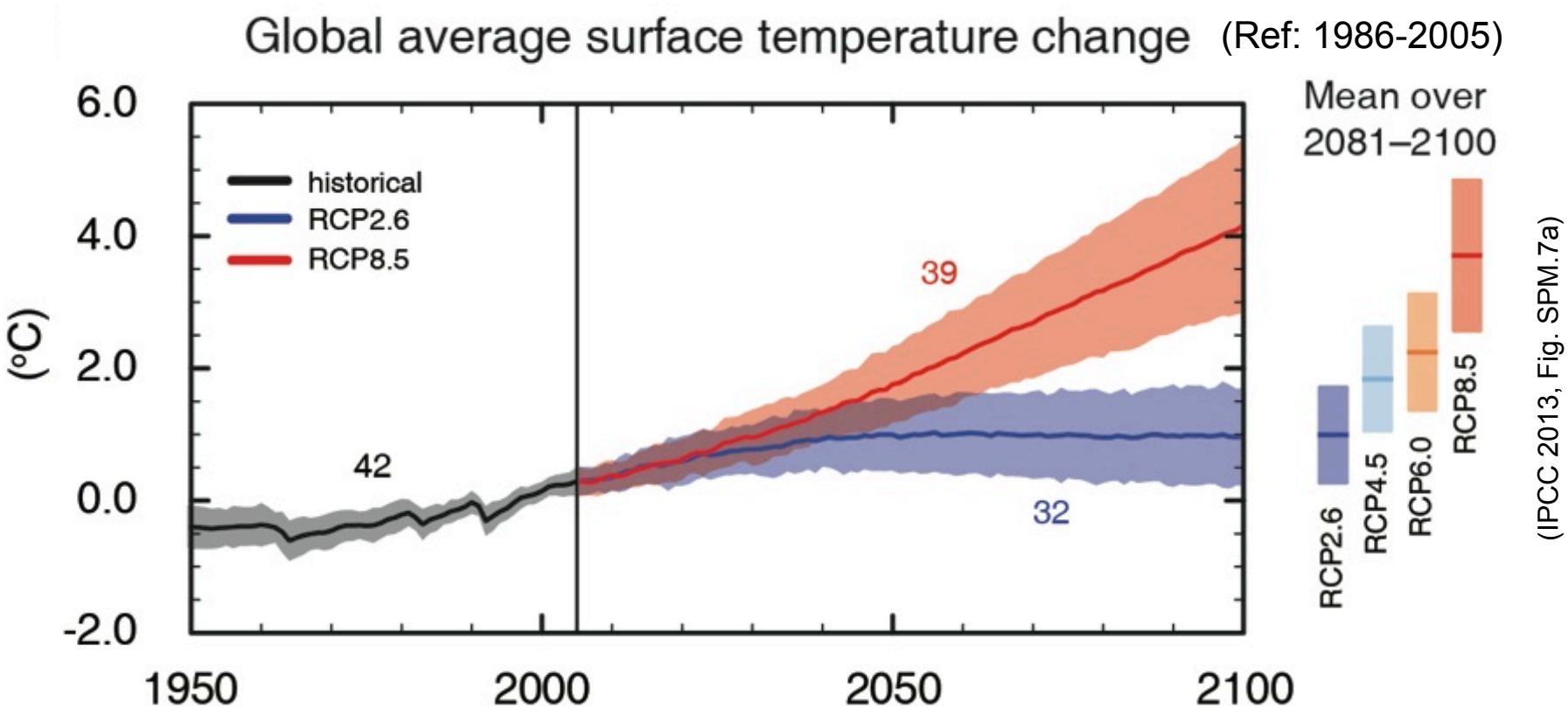
(IPCC 2013, Fig. SPM.6)

Noir: observations

Bleu: simulations avec seuls facteurs naturels

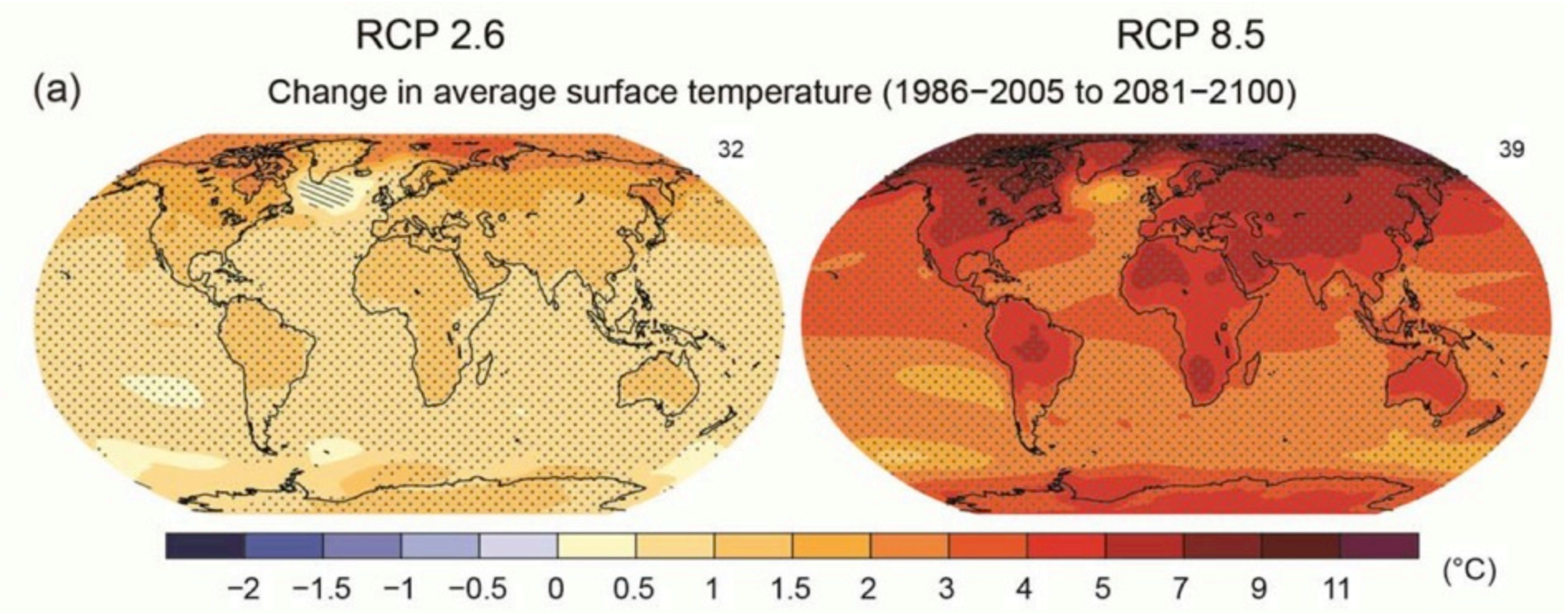
Rose: simulations avec facteurs naturels & humains

L'influence humaine sur le système climatique est sans équivoque; Il est *extrêmement probable* (95%) que l'influence humaine a été la cause principale du réchauffement depuis le milieu du 20ème siècle

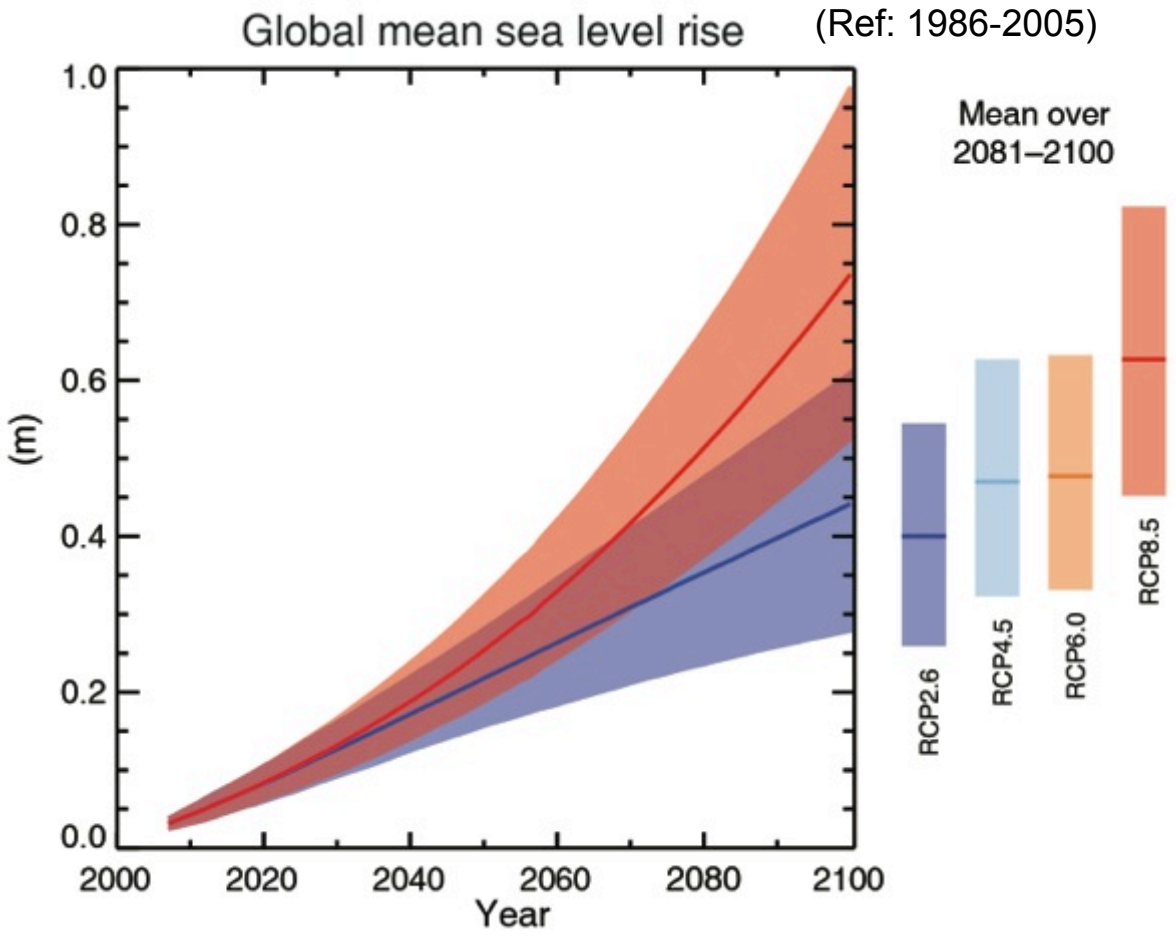


Le changement de la température moyenne du globe en surface pour la fin du XXI^{e} siècle dépassera *probablement* 1,5°C relativement à 1850-1900 pour tous les scénarios sauf pour le RCP2.6.
Dépassement *probable* de 2°C pour RCP6 et RCP8.5

Surface temperature projections



AR5 WGI SPM - Approved version / subject to final copyedit

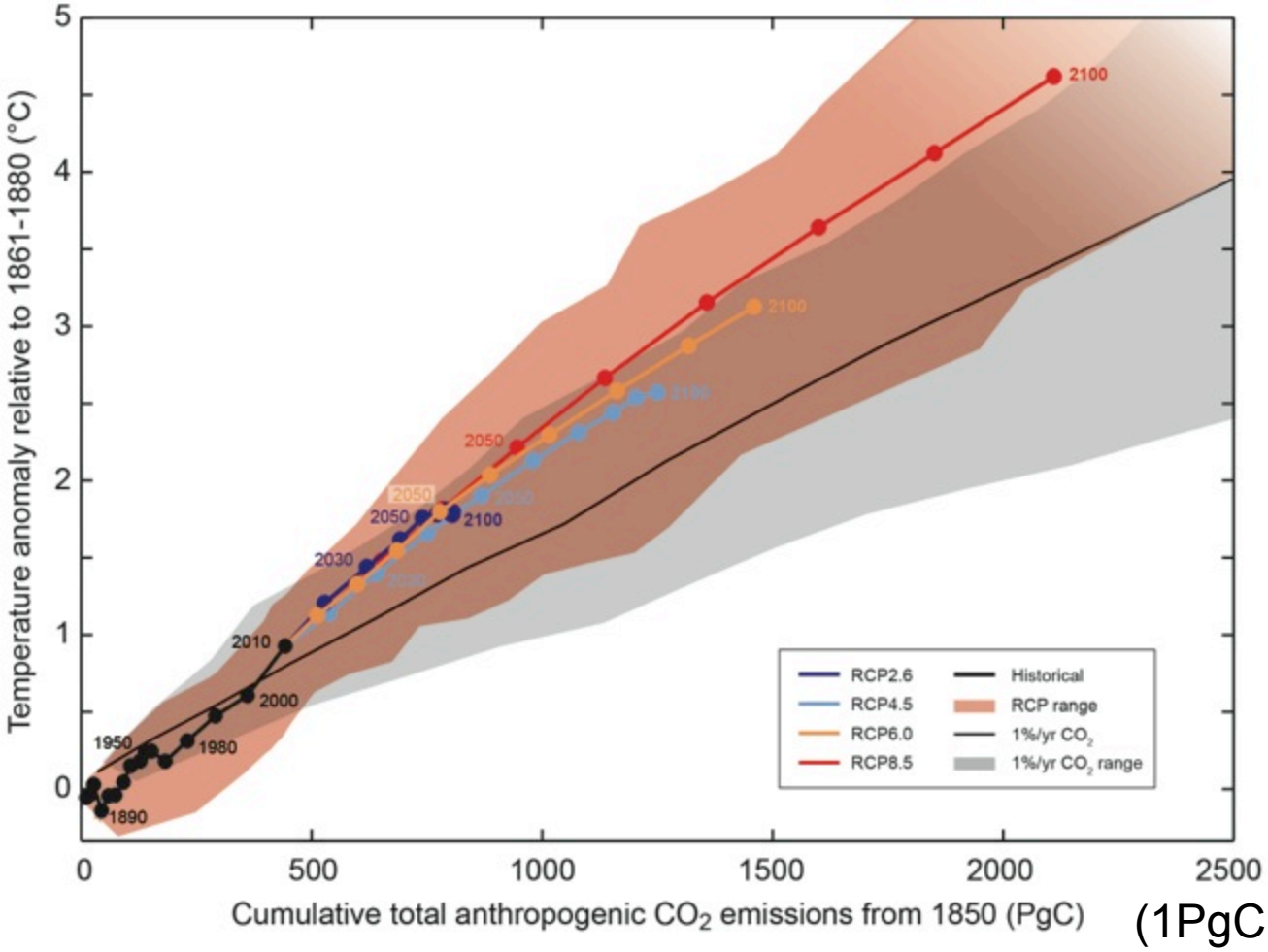


(IPCC 2013, Fig. SPM.9)

Le niveau moyen des mers continuera à s'élever au cours du XXIe siècle

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

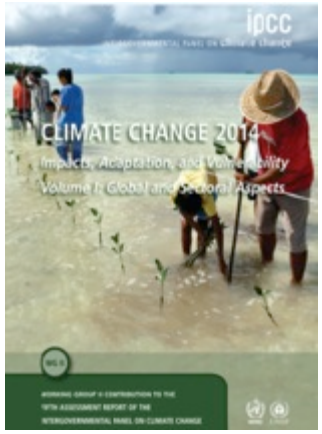
There is evidence that anthropogenic influences, including increasing atmospheric greenhouse gas concentrations, have changed these extremes



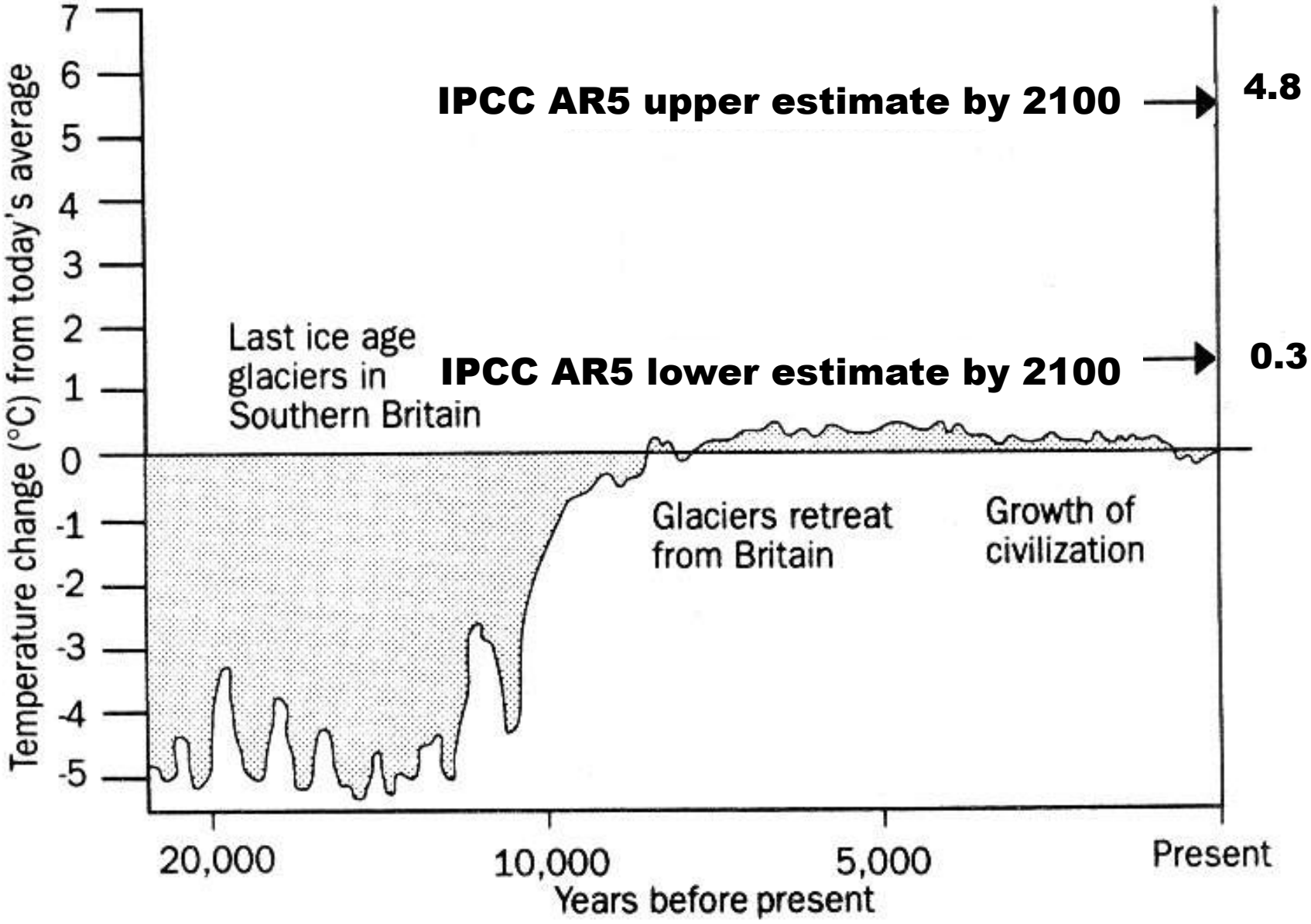
(IPCC 2013, Fig. SPM.10)

(1PgC = 1GtC)

Le total des émissions de CO_2 cumulées détermine dans une large mesure la moyenne globale du réchauffement en surface vers la fin du XXIème siècle et au delà



What are the risks?



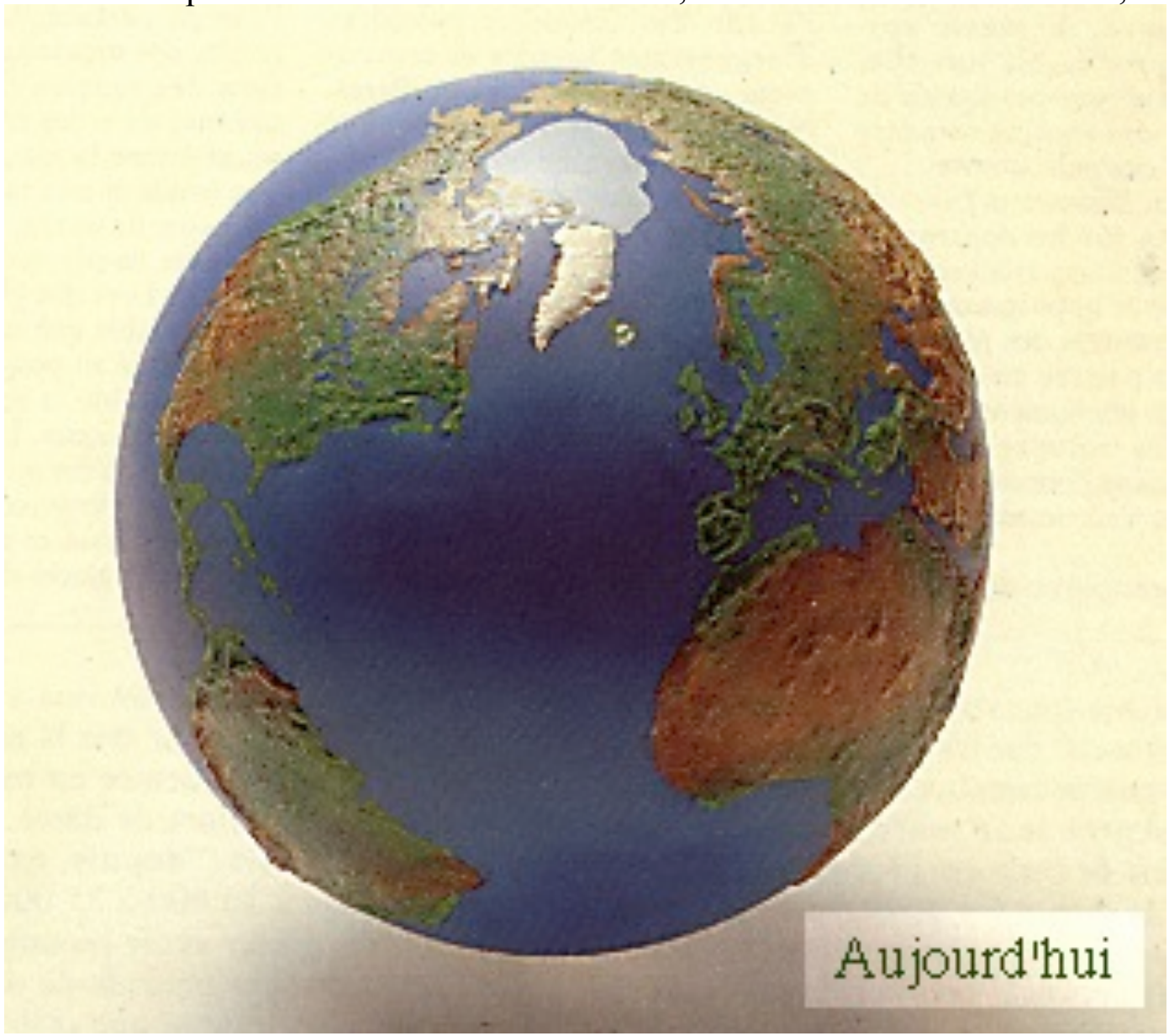
Adapted from: International Geosphere Biosphere Programme Report no.6, Global Changes of the Past, July1988

18-20000 years ago (Last Glacial Maximum)

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

Today, with +4-5°C globally

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



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THE WORKING GROUP II

CONTRIBUTION TO THE IPCC'S FIFTH ASSESSMENT REPORT

Risk = Hazard x Vulnerability x Exposure (Katrina flood victim)

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

VULNERABILITY AND EXPOSURE

AROUND THE WORLD

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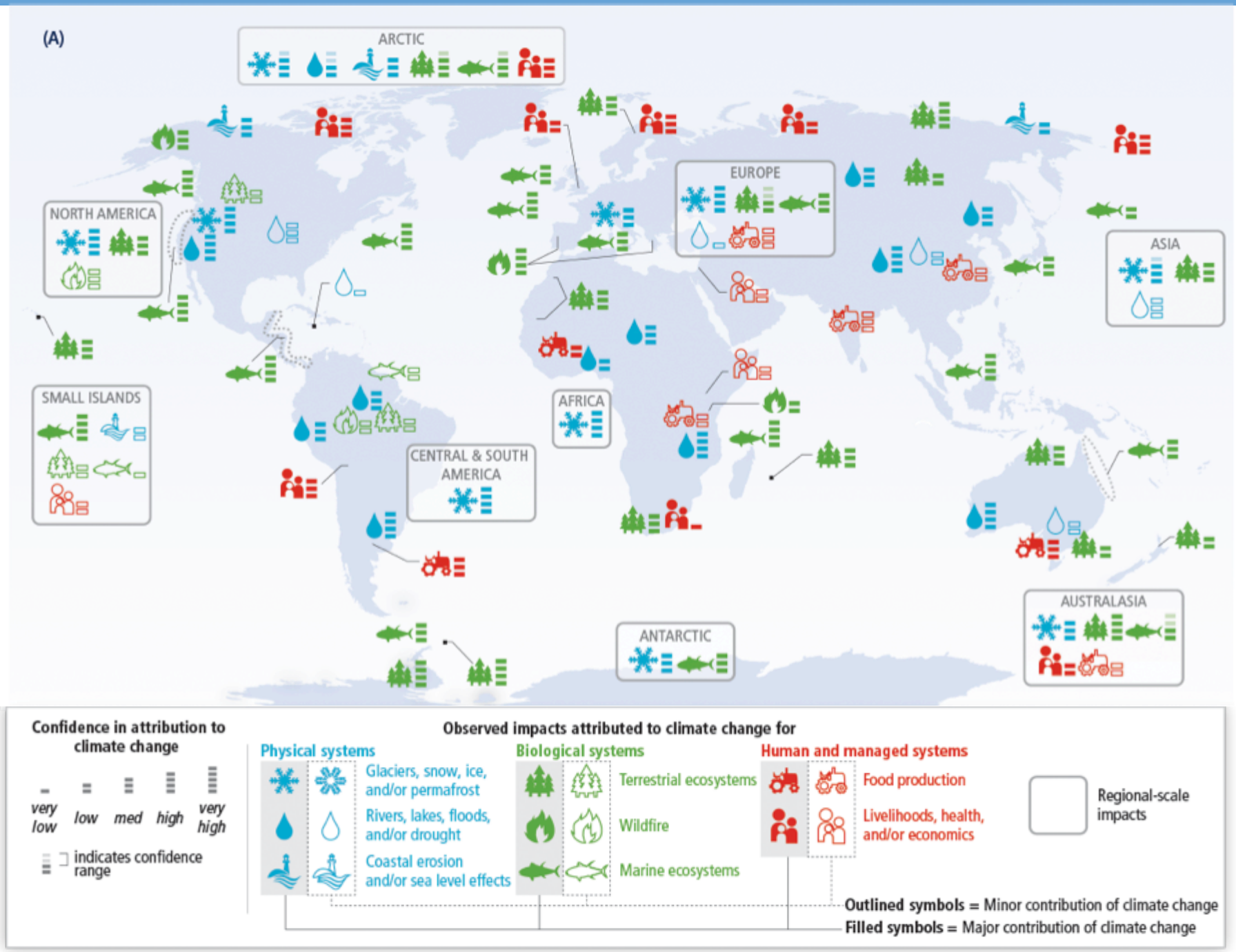
(A)
ARCTIC
NORTH AMERICA
EUROPE
ASIA
SMALL ISLANDS
AFRICA
CENTRAL & SOUTH AMERICA
AUSTRALASIA
ANTARCTIC
Confidence in attribution to climate change
very low
low
med
high
very high
indicates confidence range
Observed impacts attributed to climate change for
Physical systems
Glaciers, snow, ice, and/or permafrost
Rivers, lakes, floods, and/or drought
Coastal erosion and/or sea level effects
Biological systems
Terrestrial ecosystems
Wildfire
Marine ecosystems
Human and managed systems
Food production
Livelihoods, health, and/or economics
Regional-scale impacts
Outlined symbols = Minor contribution of climate change
Filled symbols = Major contribution of climate change

Effects on Nile delta: 10 M people above 1m

(Time 2001)


ADAPTATION IS
ALREADY OCCURRING
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ADAPTATION IS
ALREADY OCCURRING
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CLIMATE CHANGE

REDUCING AND MANAGING RISKS

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RISKS OF
CLIMATE CHANGE
INCREASE
WITH CONTINUED
HIGH EMISSIONS
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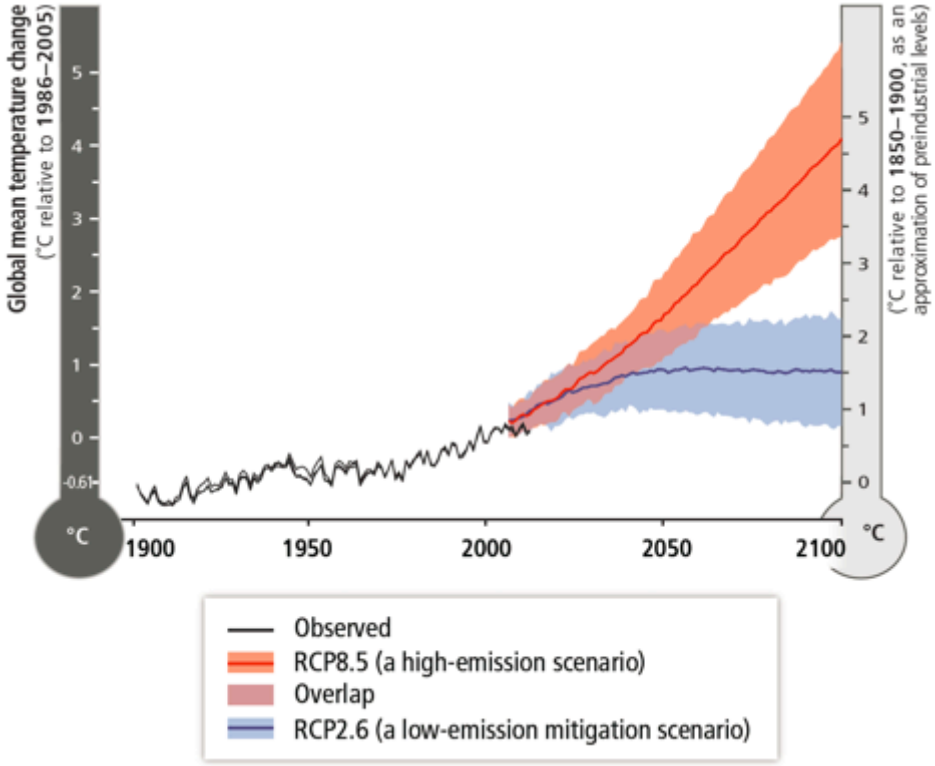

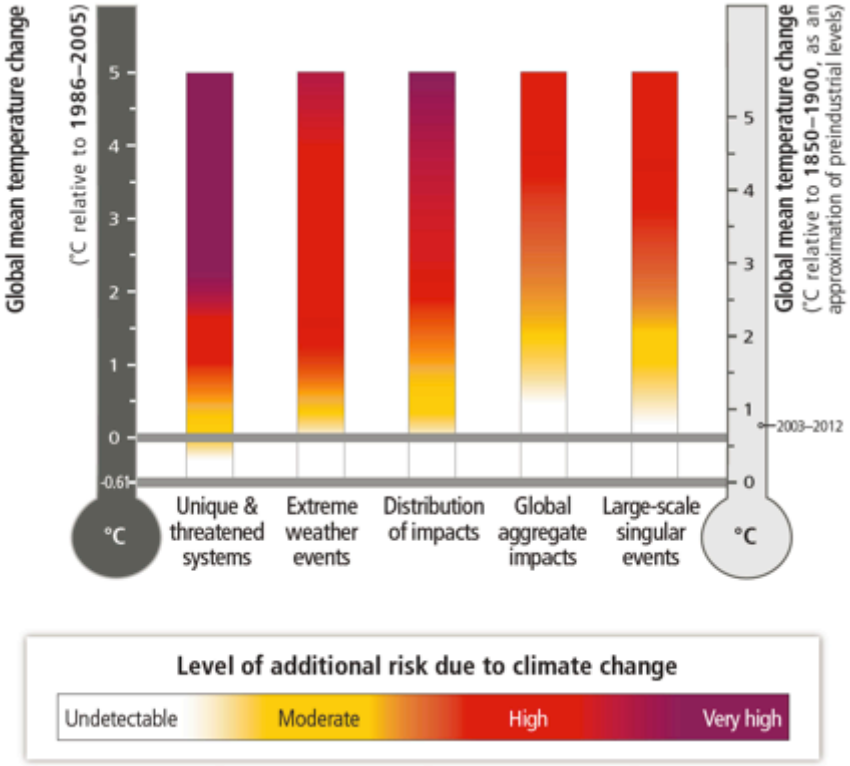

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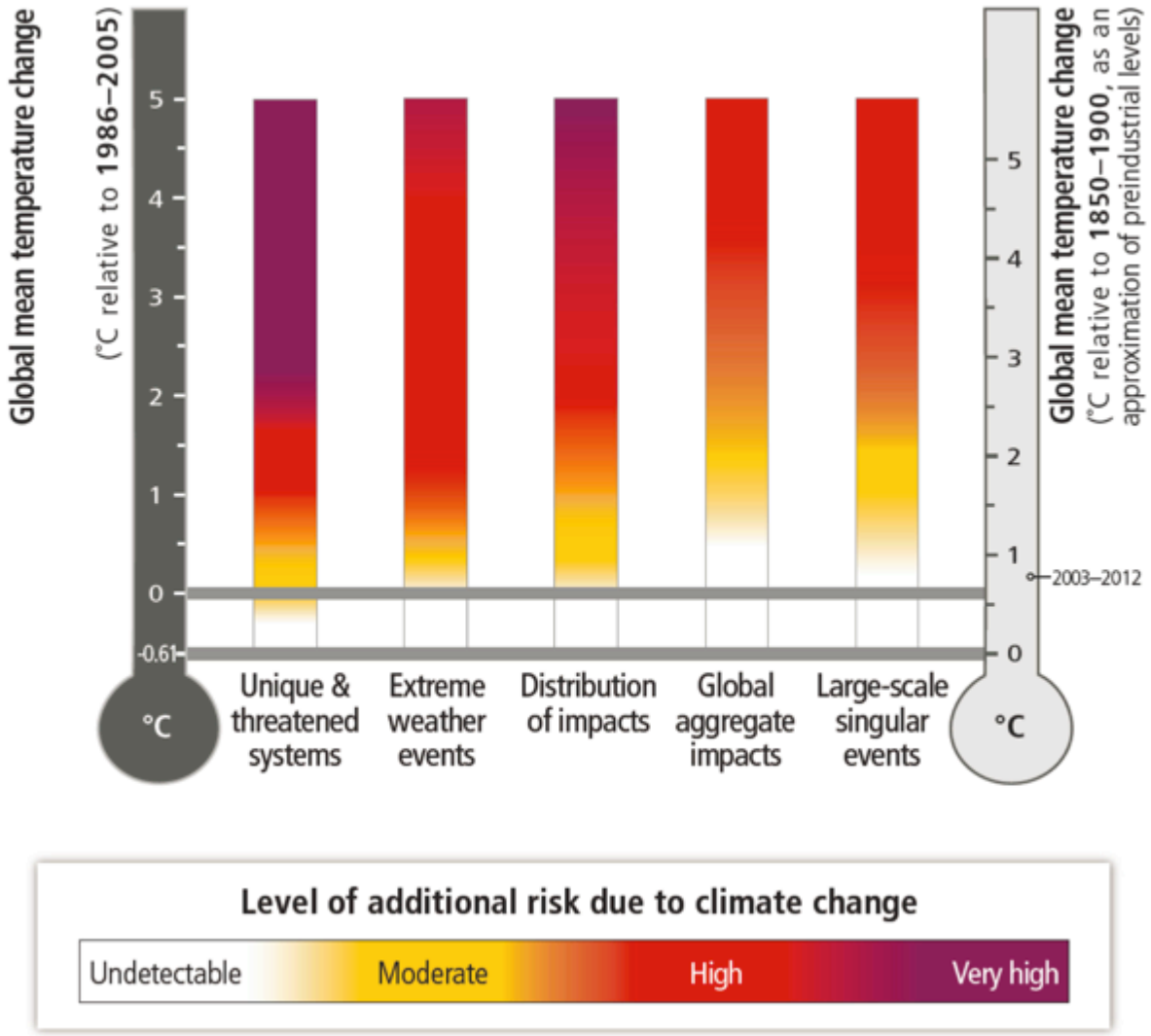

AR5, WGII, Box SPM.1 Figure 1

What can be done?

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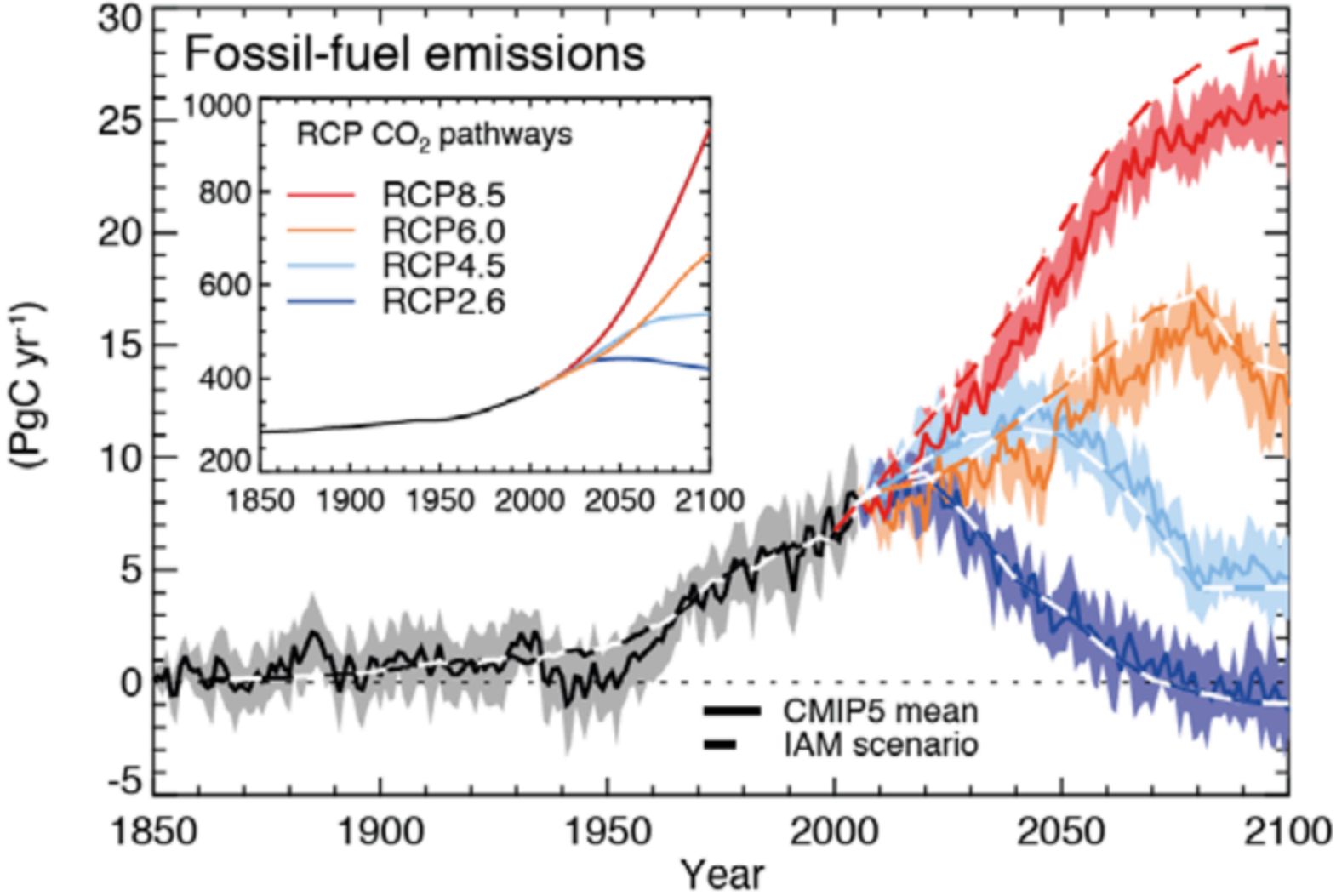
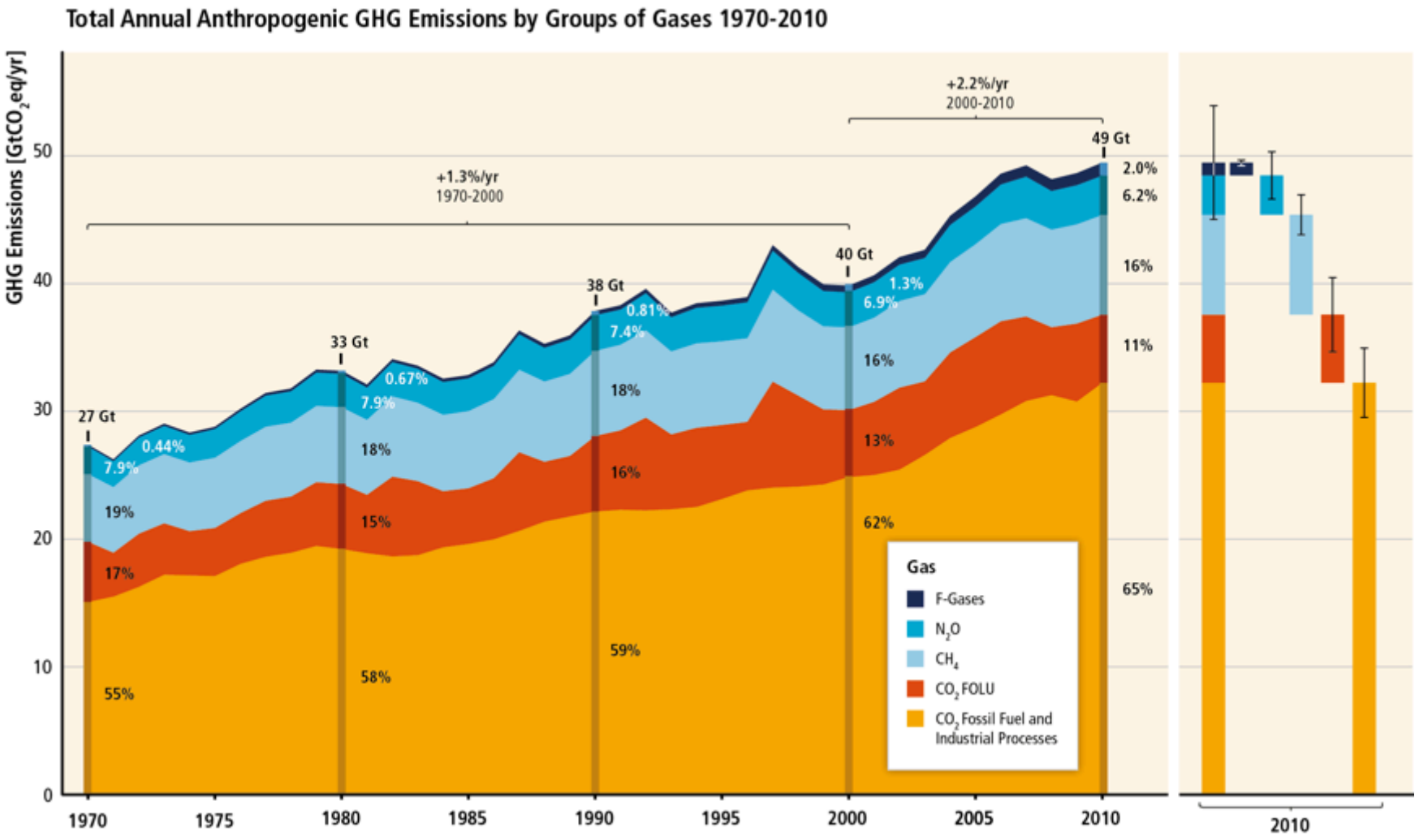
Compatible fossil fuel emissions simulated by the CMIP5 models for the four RCP scenarios



AR5 WGI TS – Fig TS 19

GHG emissions accelerate despite reduction efforts. Most emission growth is CO_2 from fossil fuel combustion and industrial processes.



Working Group III contribution to the
IPCC Fifth Assessment Report

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INTERGOVERNMENTAL PANEL ON climate change

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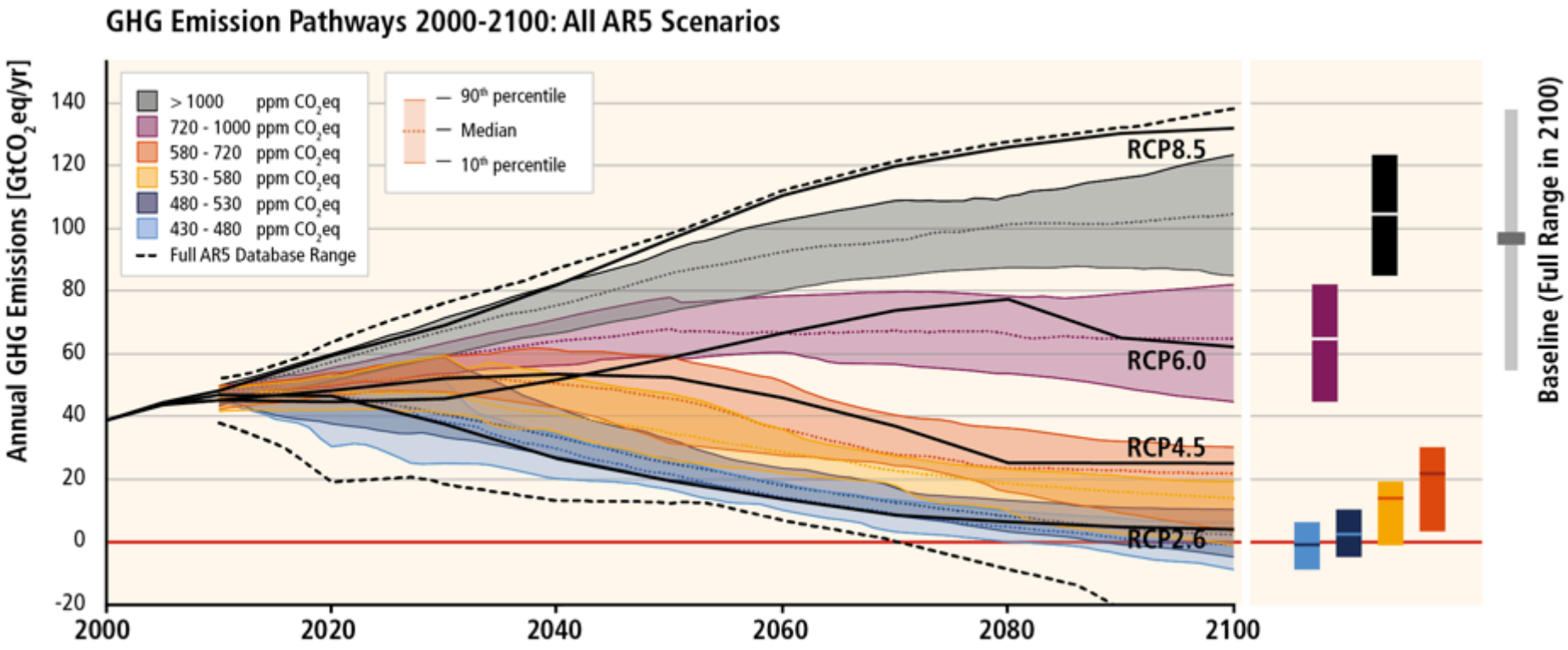
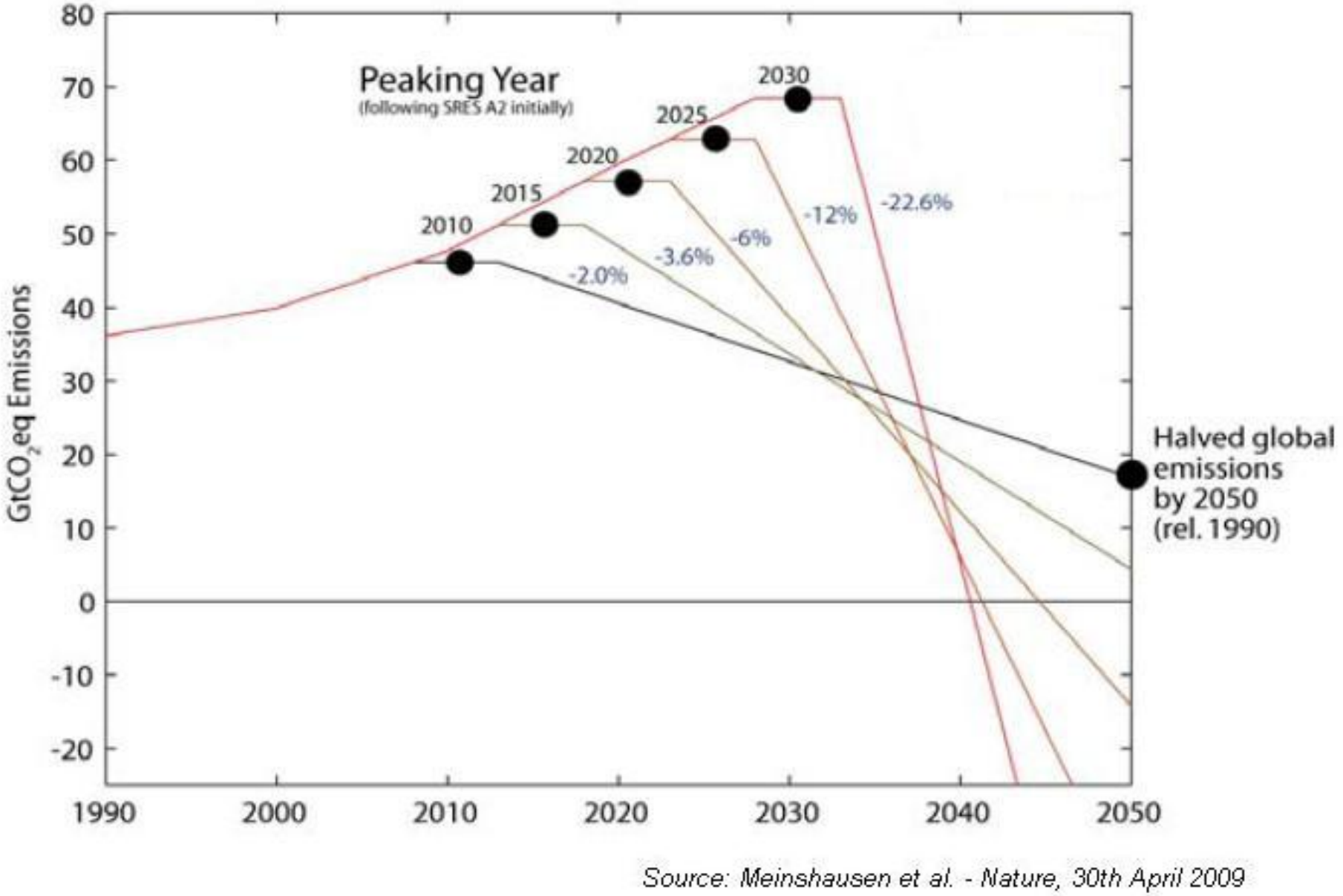
Without more mitigation, global mean surface temperature might increase by 3.7° to 4.8°C over the 21st century.



The more we wait, the more difficult it will be



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

Can temperature rise still be kept below 1.5 or 2°C (over the 21st century) compared to pre-industrial ?

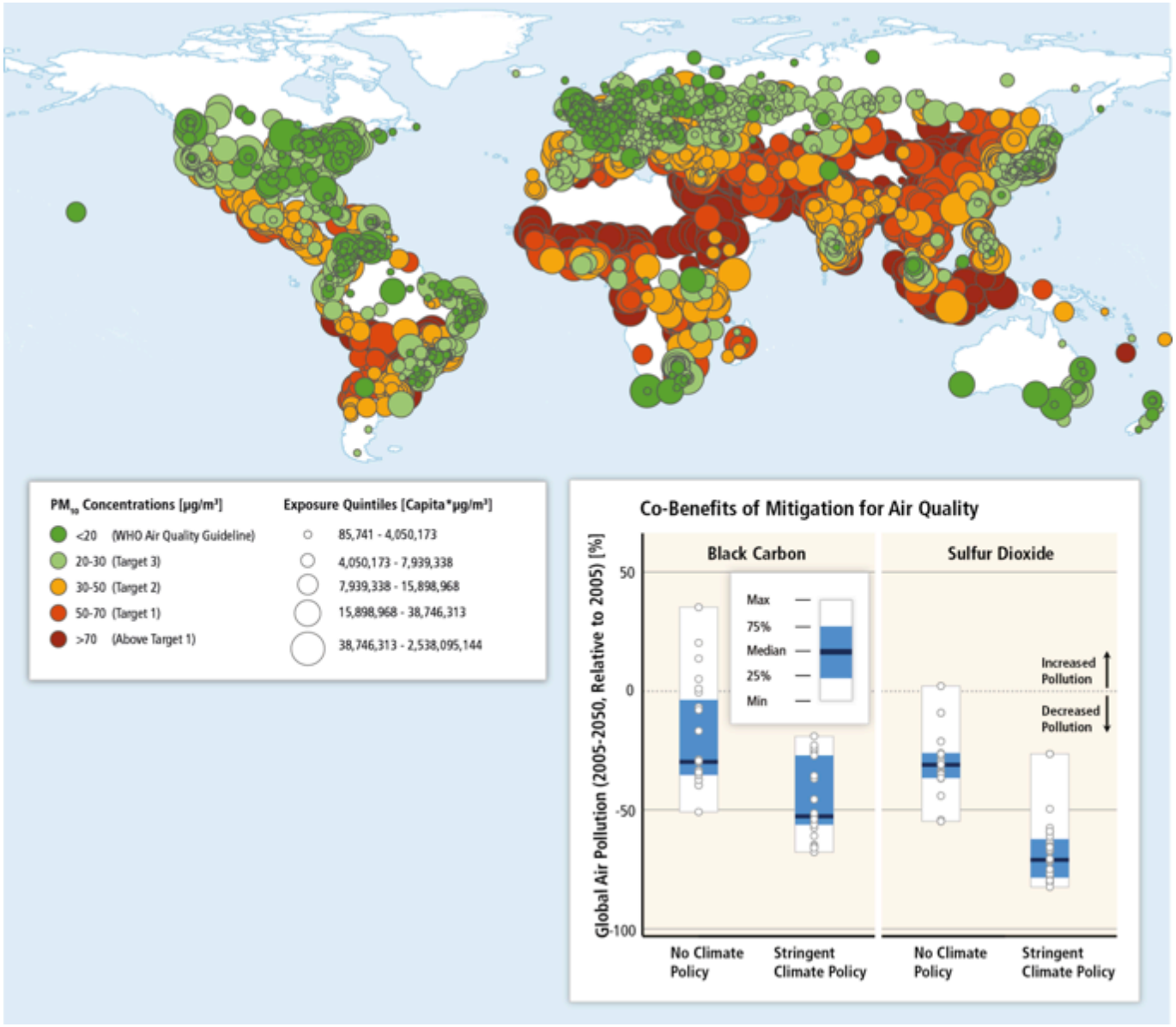
- **Many scenario studies confirm that it is technically and economically feasible to keep the warming below 2°C, with more than 66% probability ("likely chance").** This would imply limiting atmospheric concentrations to 450 ppm CO_2-eq by 2100.
- **Such scenarios** for an above 66% chance of staying below 2°C **imply reducing by 40 to 70% global GHG emissions compared to 2010 by mid-century, and reach zero or negative emissions by 2100.**

Can temperature rise still be kept below 1.5 or 2°C (over the 21st century) compared to pre-industrial ?

- **These scenarios are characterized by rapid improvements of energy efficiency and a near quadrupling of the share of low-carbon energy supply (renewables, nuclear, fossil and bioenergy with CCS), so that it reaches 60% by 2050.**
- **Keeping global temperature increase below 1.5°C would require even lower atmospheric concentrations (<430 ppm CO_2eq) to have a little more than 50% chance.** There are not many scenario studies available that can deliver such results, **requiring even faster reductions** in the medium term, indicating how difficult this is.

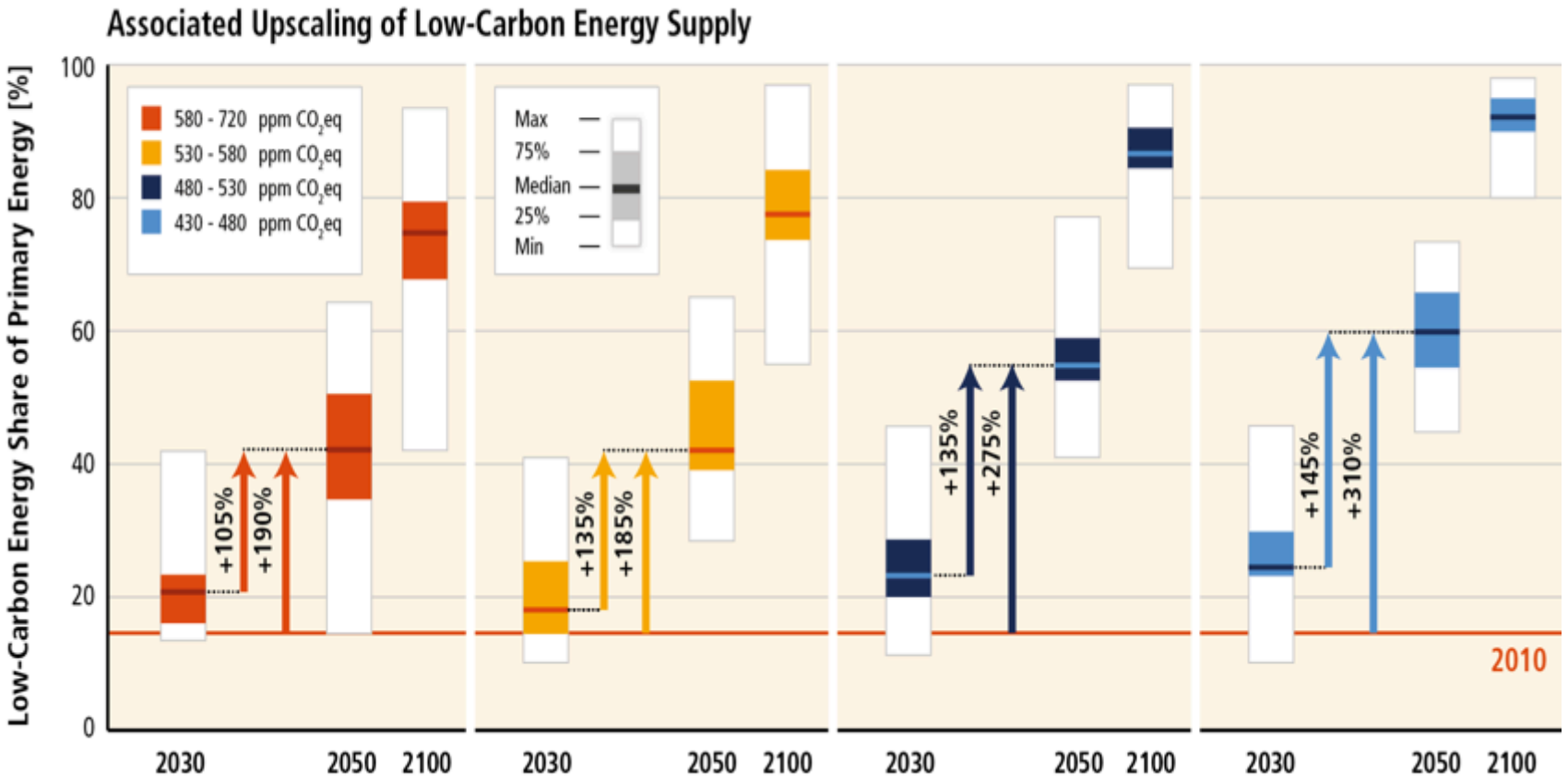
Can temperature rise still be kept below 1.5 or 2°C (over the 21st century) compared to pre-industrial ?

- **Both categories of scenarios (< 1.5 and < 2°C) typically rely on the availability and widespread deployment of BECCS** (Bioenergy with Carbon dioxide Capture and Storage) and afforestation after 2050. There is only limited evidence for such a potential, and **BECCS entails challenges and risks** (including large-scale biomass provision, and the CCS technology itself).

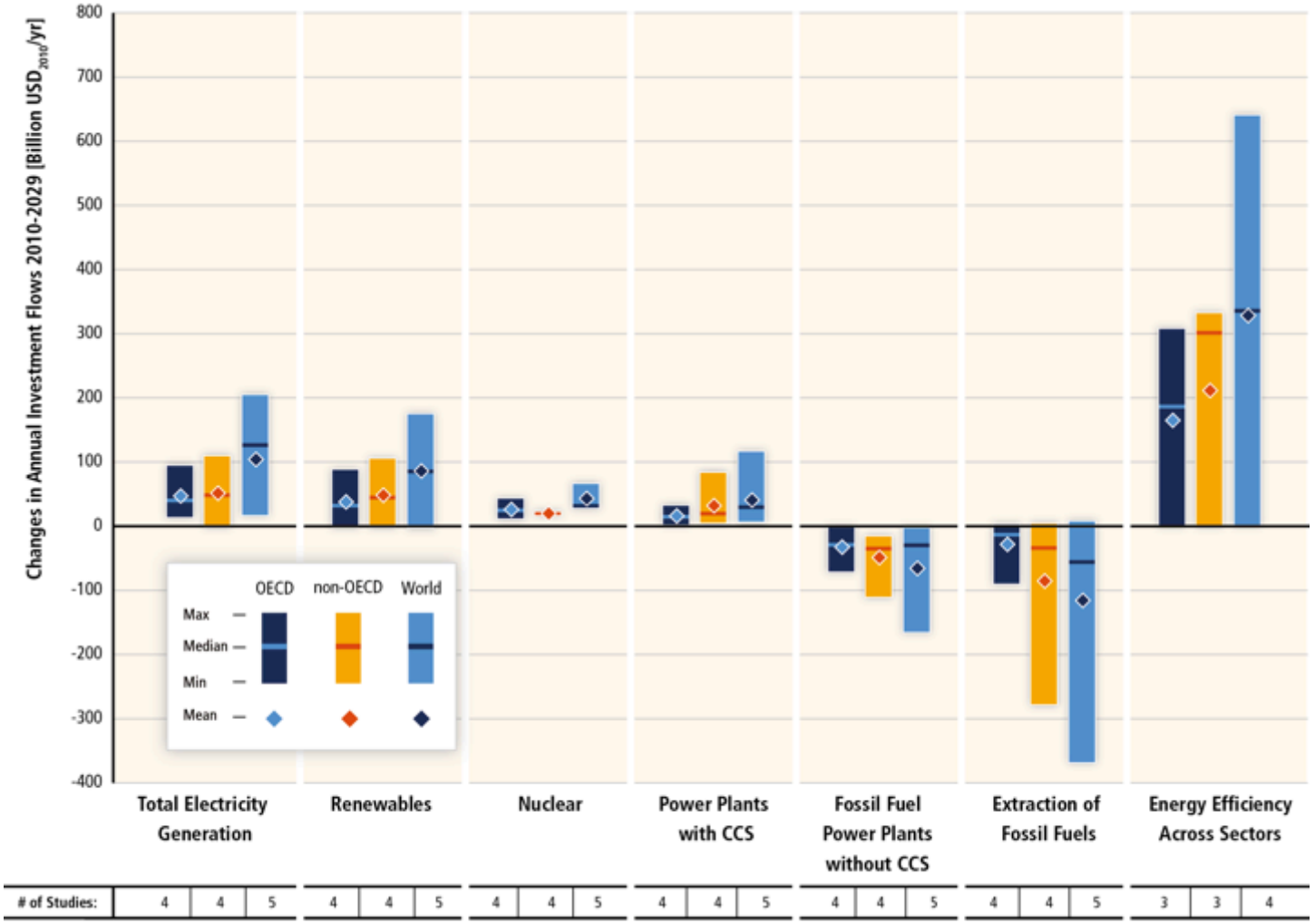


Mitigation can result in large co-benefits for human health and other societal goals.

Mitigation requires major technological and institutional changes including the upscaling of low- and zero carbon energy



Substantial reductions in emissions would require large changes in investment patterns.



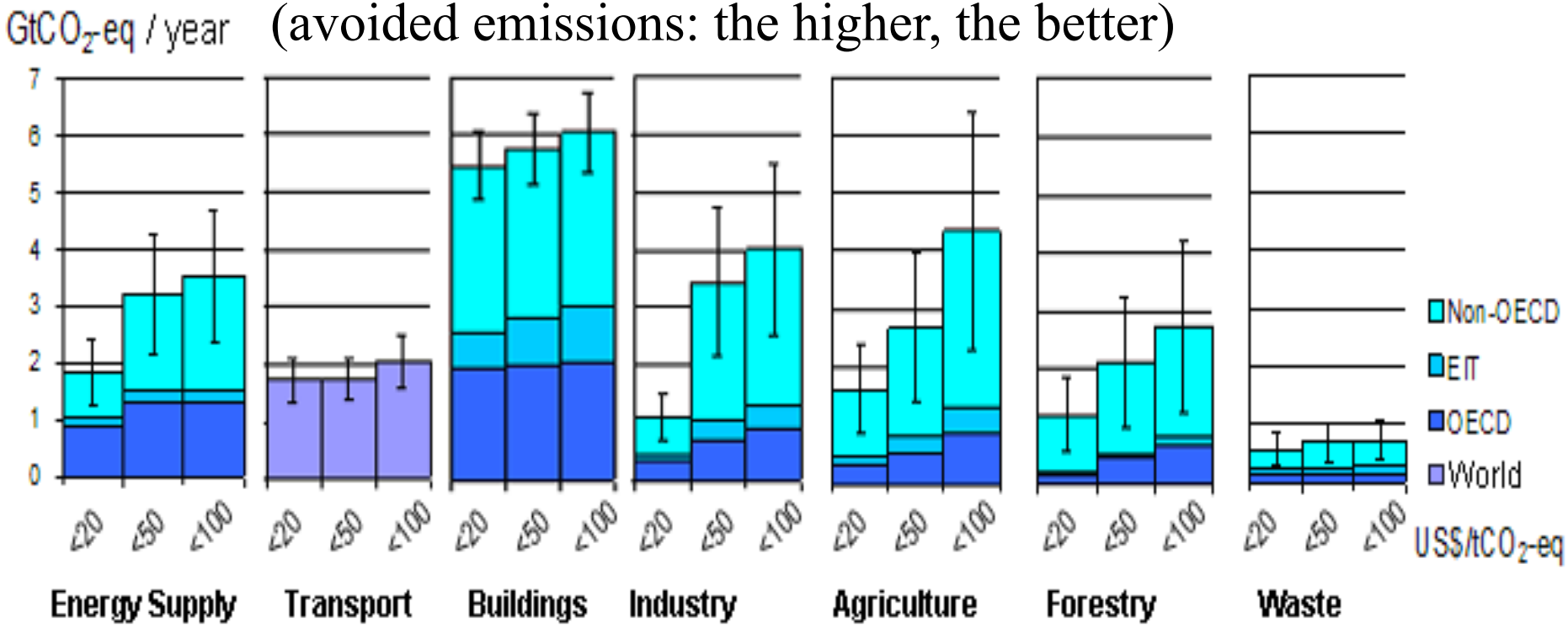
Since AR4, there has been an increased focus on policies designed to integrate multiple objectives, increase co-benefits and reduce adverse side-effects.

- **Sector-specific policies** have been more widely used than economy-wide policies.
- **Regulatory approaches and information** measures are widely used, and are often environmentally effective.
- Since AR4, **cap and trade systems** for GHGs have been established in a number of countries and regions.
- In some countries, **tax-based policies** specifically aimed at reducing GHG emissions–alongside technology and other policies–have helped to weaken the link between GHG emissions and GDP
- The **reduction of subsidies** for GHG-related activities in various sectors can achieve emission reductions, depending on the social and economic context.

Effective mitigation will not be achieved if individual agents advance their own interests independently.

- Existing and proposed **international climate change cooperation** arrangements vary in their focus and degree of centralization and coordination.
- Issues of **equity, justice, and fairness** arise with respect to mitigation and adaptation.
- Climate policy may be informed by a consideration of a diverse array of **risks and uncertainties**, some of which are difficult to measure, notably events that are of low probability but which would have a significant impact if they occur.

All sectors and regions have the potential to contribute by 2030

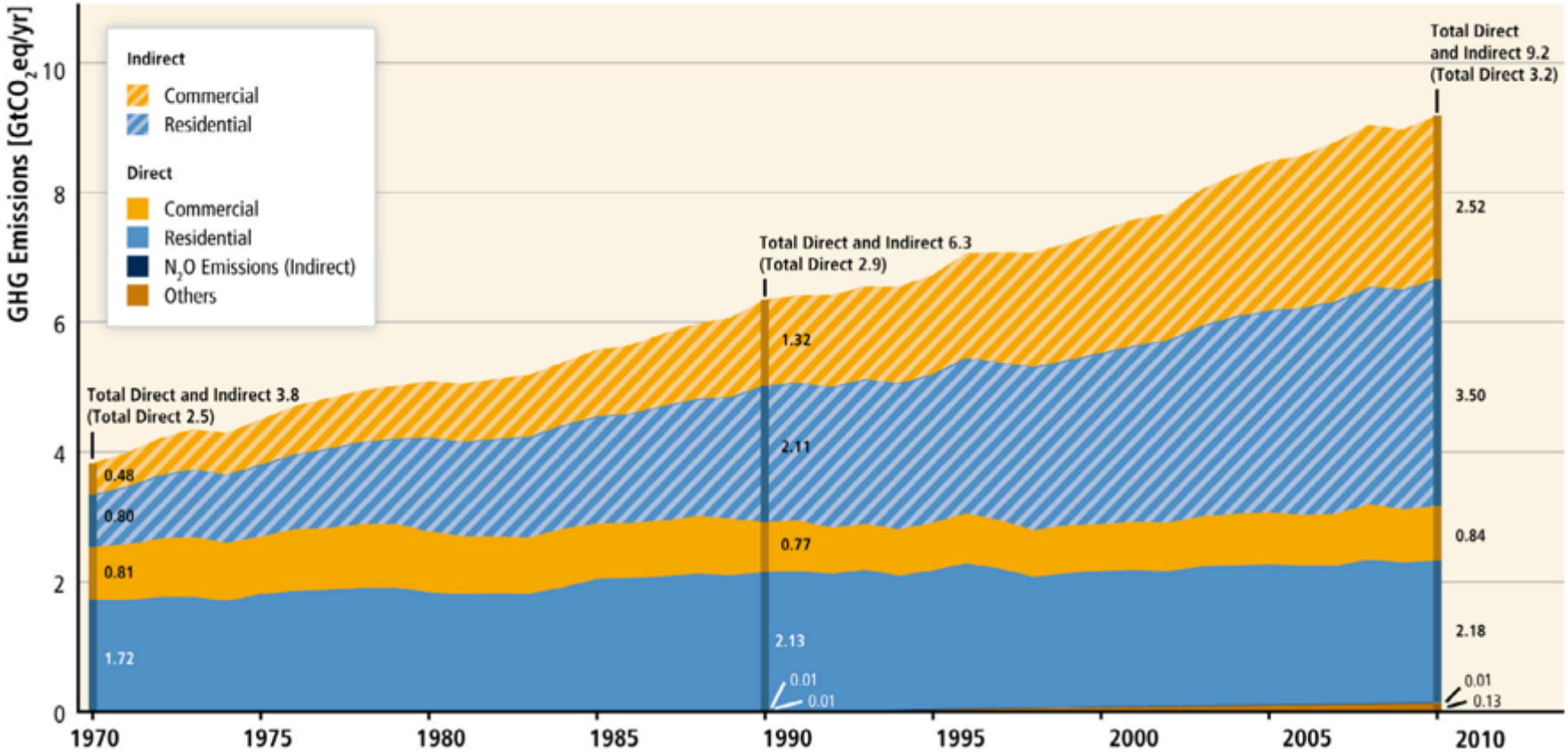


IPCC AR4 (2007)

Note: estimates do not include non-technical options, such as lifestyle changes.

In 2010 buildings accounted for 32% of total global final energy use, 19% of energy-related GHG emissions (including electricity-related), approximately one-third of black carbon emissions, and an eighth to a third of F-gases (*medium evidence, medium agreement*)

Direct and indirect (from electricity and heat production) emissions in the building subsectors



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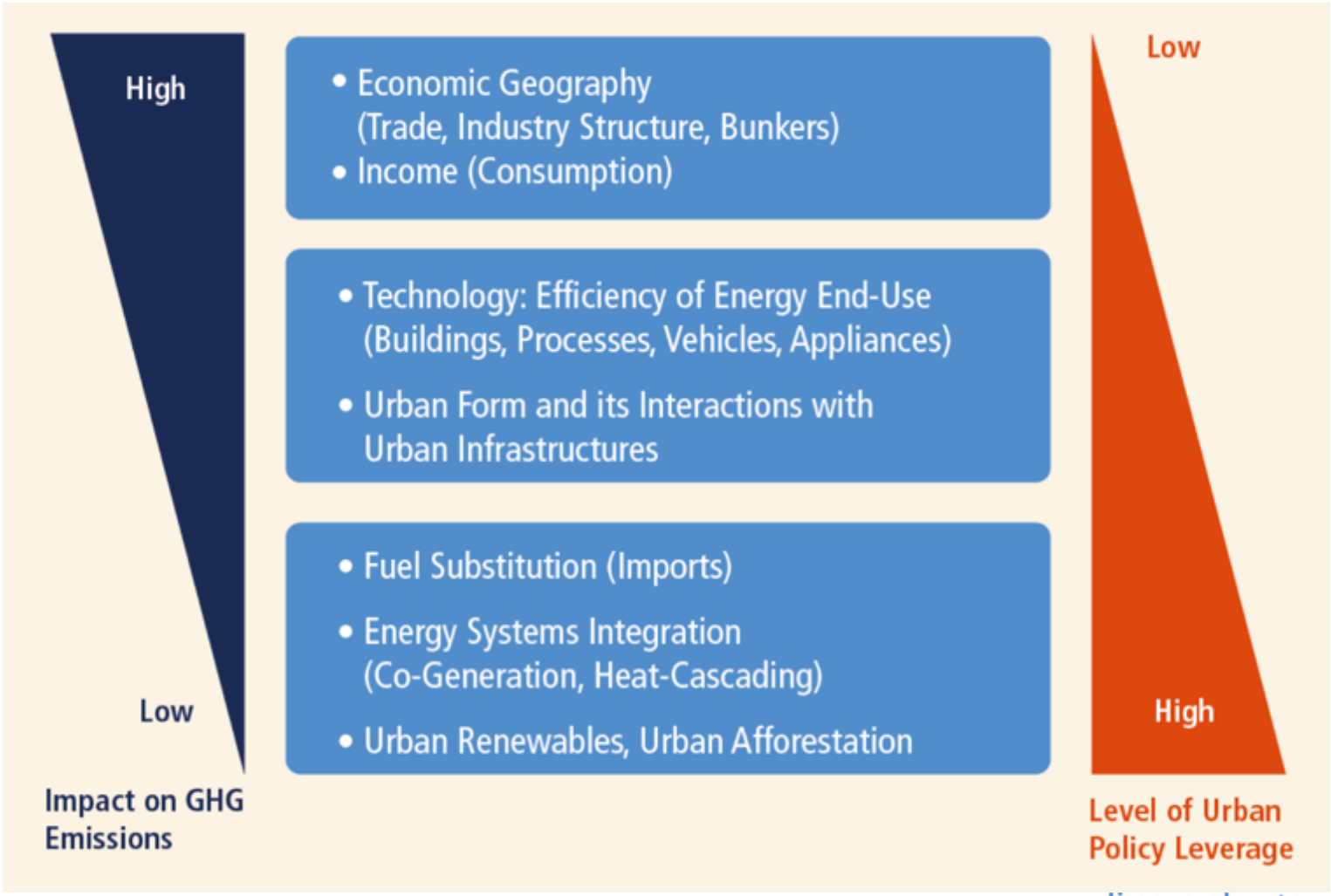
WMO UNEP

AR5, WGIII, Chap.9, Fig.9.1

Urban areas account for between 71% and 76% of CO2 emissions from global final energy use and between 67–76% of global energy use *[medium evidence, medium agreement]*

The anticipated growth in urban population will require a massive build-up of urban infrastructure, which is a key driver of emissions across multiple sectors *[limited evidence, high agreement]*

Stylized hierarchy of drivers of urban GHG emissions and policy leverages by urban scale decision making

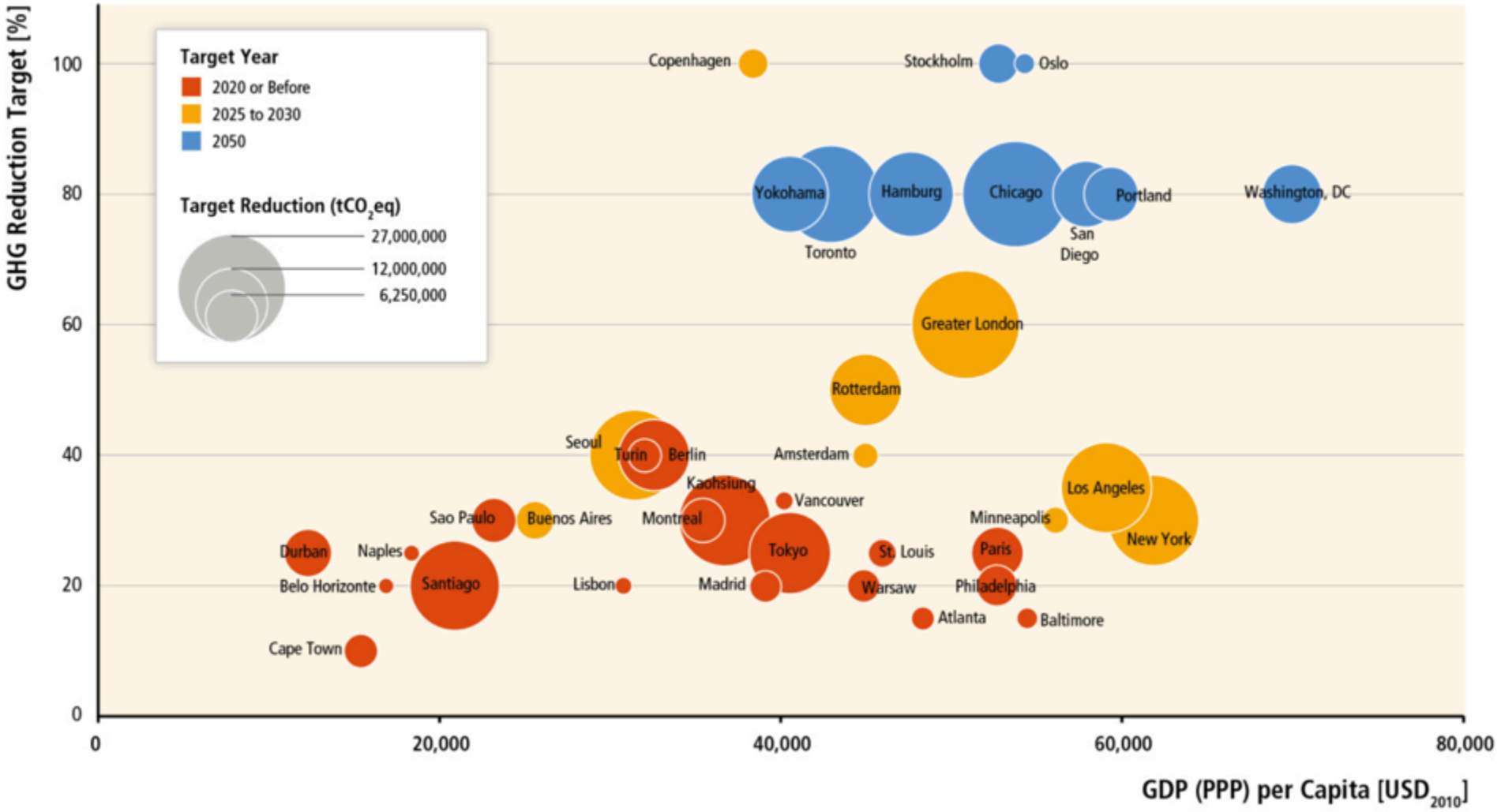


INTERGOVERNMENTAL PANEL ON climate change

WMO UNEP

AR5, WGIII, Chap.12, Table12.12

Mitigation targets for 42 cities



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AR5, WGIII, Chap.12, Fig. 12.21

“There is hope, modest hope”

(Co-chair WGIII Edenhofer)

Pour en savoir plus :

- www.ipcc.ch : GIEC ou IPCC
- www.climate.be/vanyp : beaucoup de mes dias et d'autres documents
- **On Twitter: @JPvanYpersele**

Jean-Pascal van Ypersele
(vanypersele@astr.ucl.ac.be)