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Professor Corinne Le Quéré, Director
Professor Robert Watson. Strategic Director
Professor Kevin Anderson, Deputy Director
Professor Trevor Davies, Deputy Director for International Activities

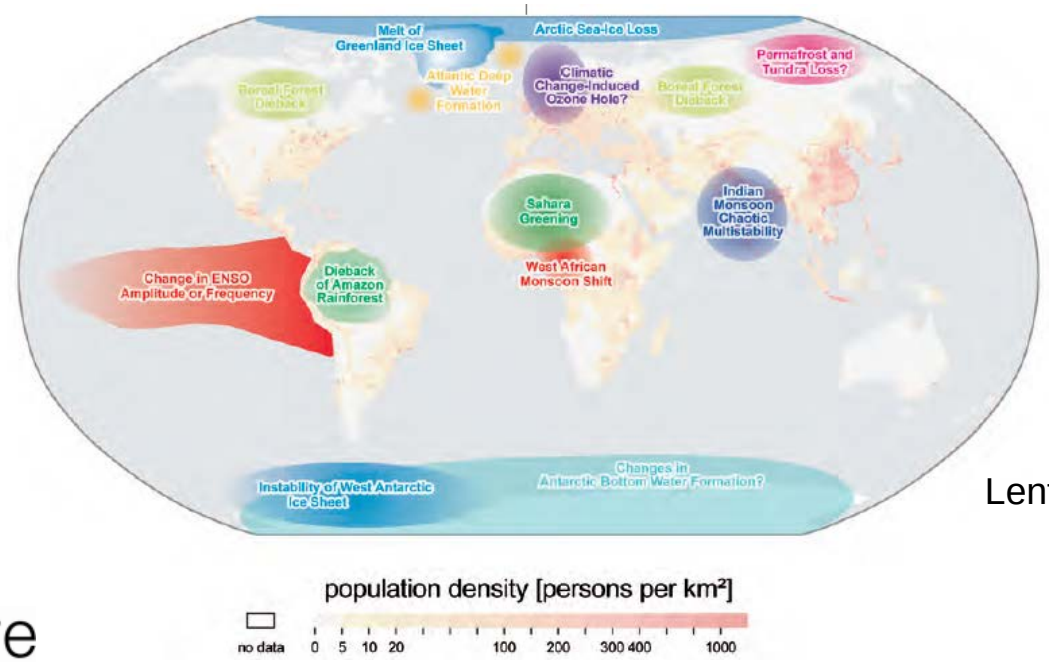
The scientific case for radical emissions reductions

Corinne Le Quéré

High quality and interdisciplinary climate change research since 2000

scientific basis for a two degree limit

- + 2°C was the warmest temperature on earth in the past 800,000 years, so analogues can be found in the geological record
- – 4/5°C was the temperature on earth during glaciations, when the earth surface was transformed compared with today
- there are thresholds in the climate system whose levels and effects are poorly known
- the risks and costs of warming between 2°C and 4°C have been little explored



Lenton et al. PNAS 2008

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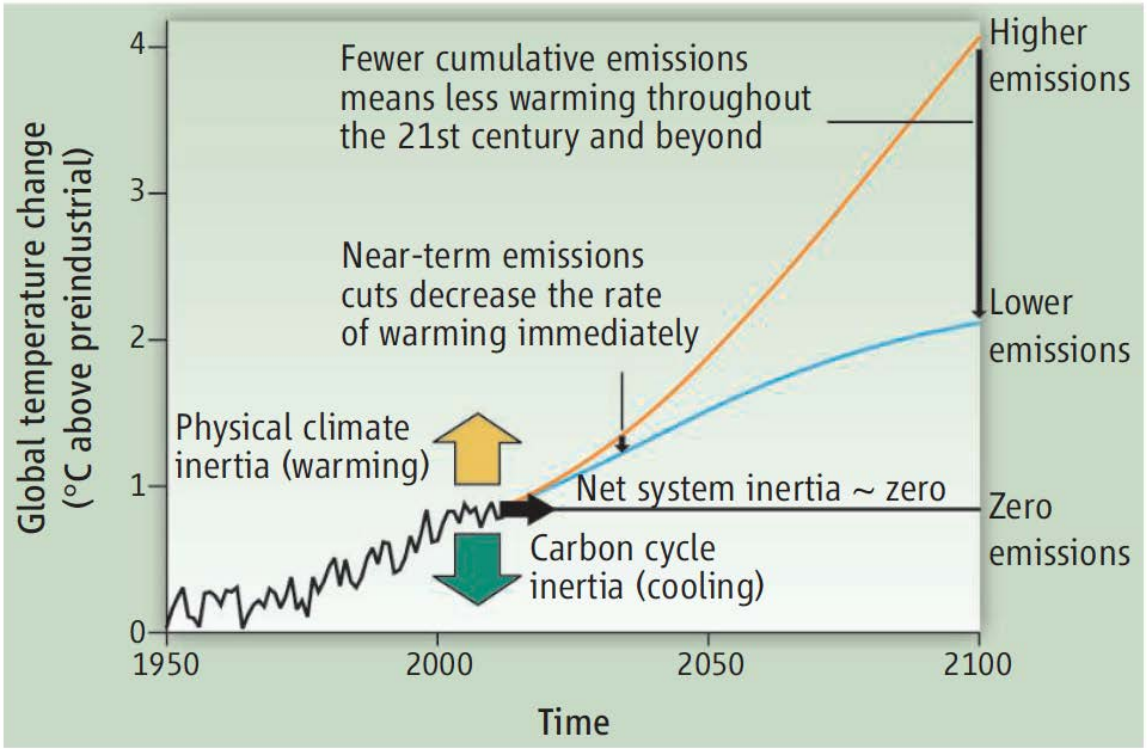
committed warming and irreversibility

- warming from CO_2 is largely irreversible for multiple century to millennial (IPCC 2013)
- future warming is in future emissions (IPCC 2013)
- "sources of the most threatening emissions have yet to be build (Davis et al 2010)"
- emissions cuts decrease the rate of warming immediately (Matthews and Solomon 2013)



Irreversible Does Not Mean Unavoidable
H. Damon Matthews and Susan Solomon
Science **340**, 438 (2013);
DOI: 10.1126/science.1236372

Future CO_2 Emissions and Climate Change from Existing Energy Infrastructure

Steven J. Davis,[1*] Ken Caldeira,[1] H. Damon Matthews[2]

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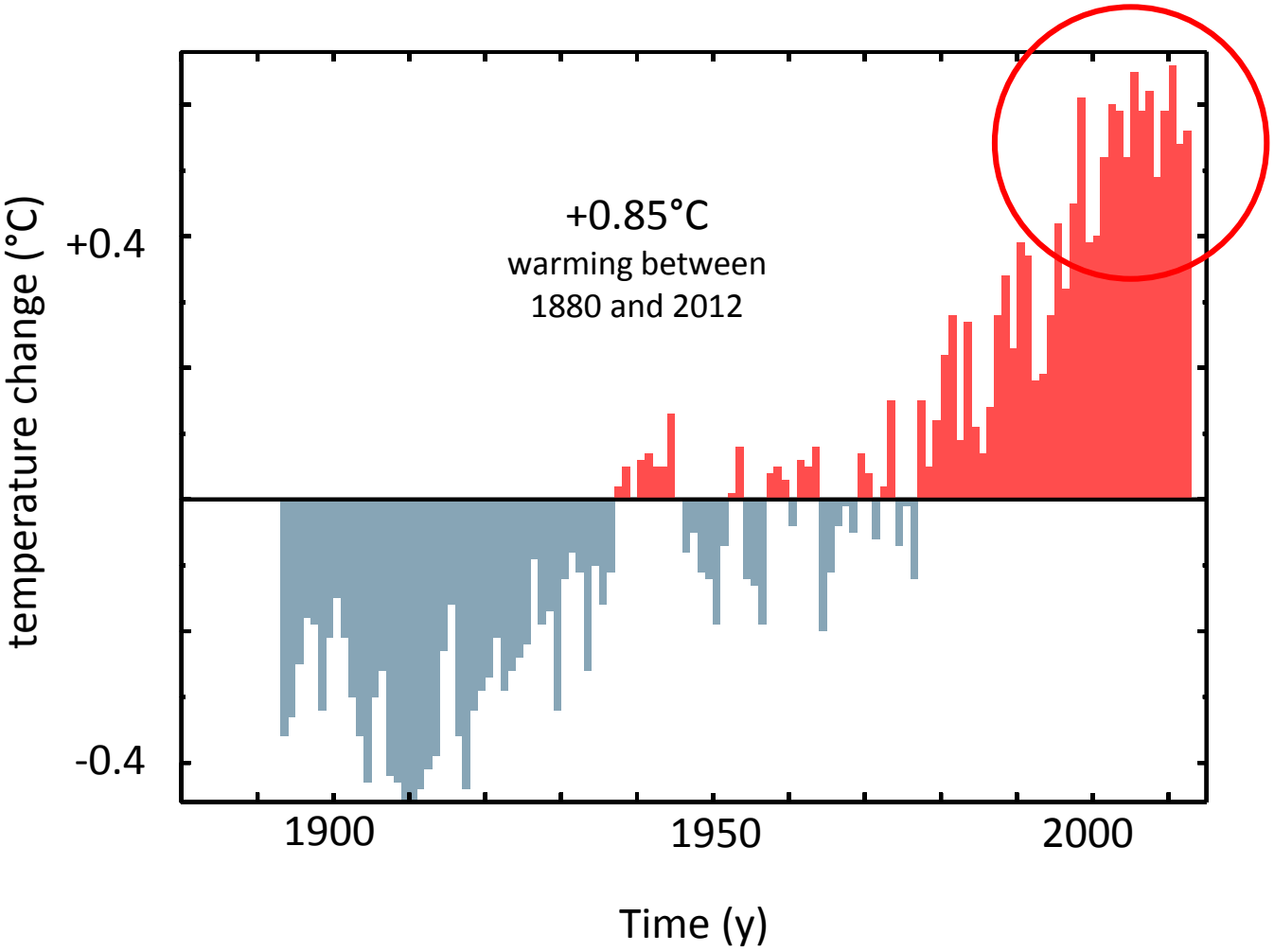
observed warming of global air temperature

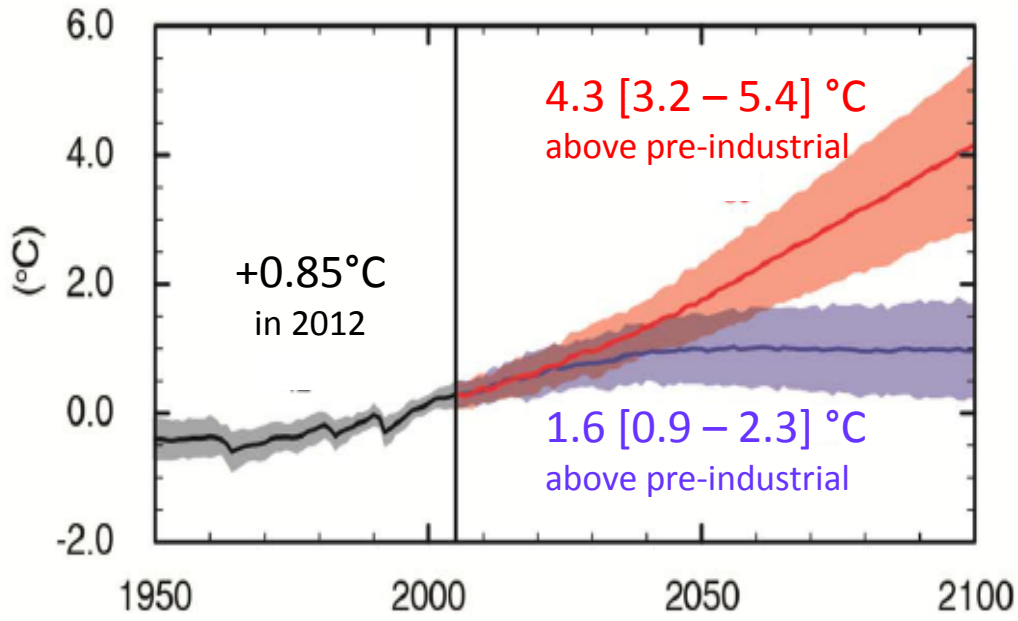


Explanation(s) for slower warming recently:

- Redistribution of heat in the ocean (internal variability)
- Weak and declining solar cycle and series of small volcanic eruptions (external variability)
- Possible 20% reduced transient climate response (Otto et al NGeo 2013)
- Expected return to long-term warming trend (about 0.1 to 0.5 °C above today by around 2025)

data source: NASA-GISS, reference period 1951-1980; IPCC 2013

projected global average surface temperature change



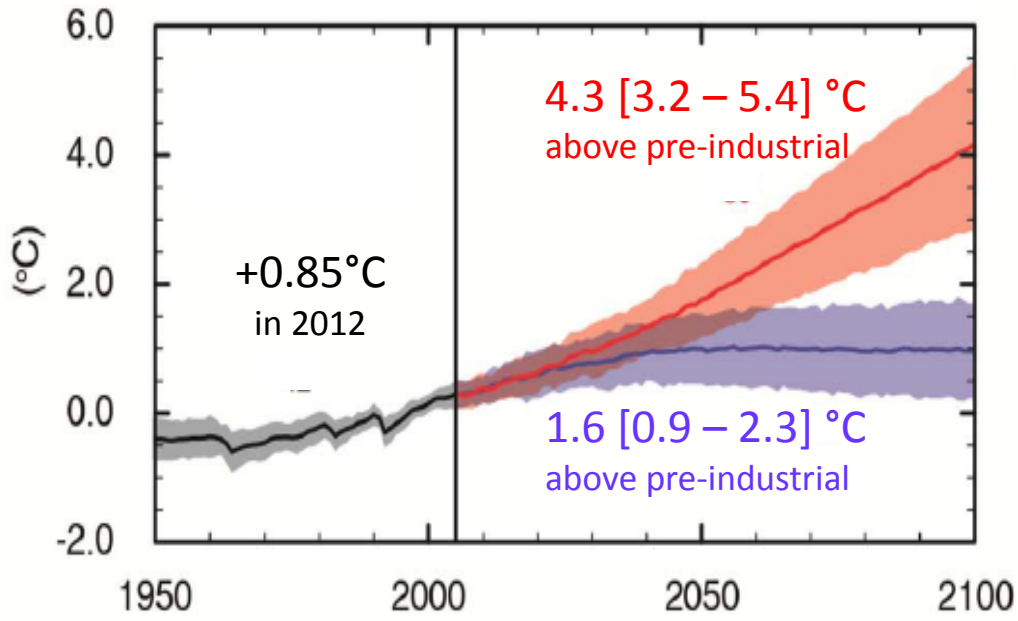
CO_2 already emitted

during 1870 – 2011

515 [445 – 585] GtC

source: IPCC 2013

projected global average surface temperature change



about 3 x historical emissions

about half the historical emissions

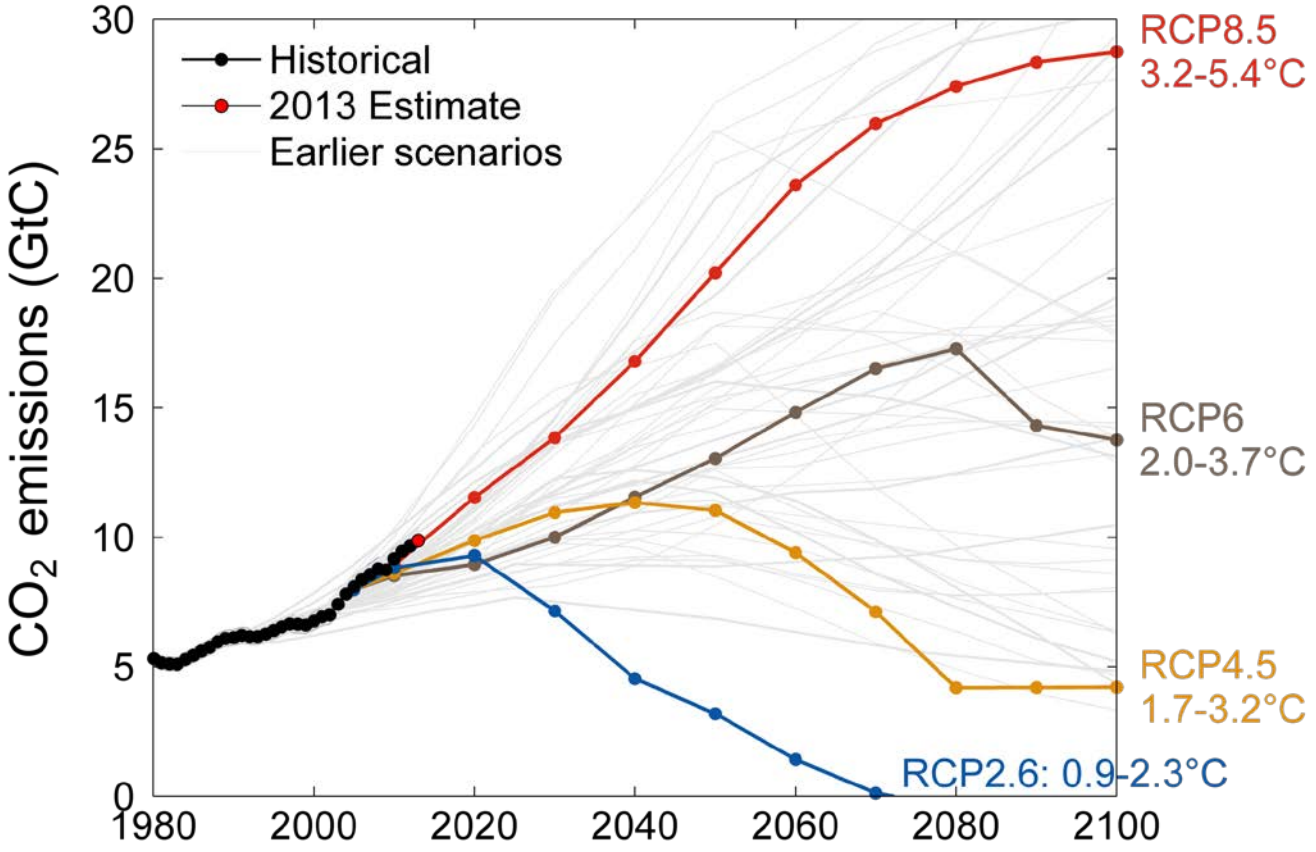
CO_2 already emitted during 1870 – 2011

515 [445 – 585] GtC

temperature change scales with cumulative emissions

source: IPCC 2013

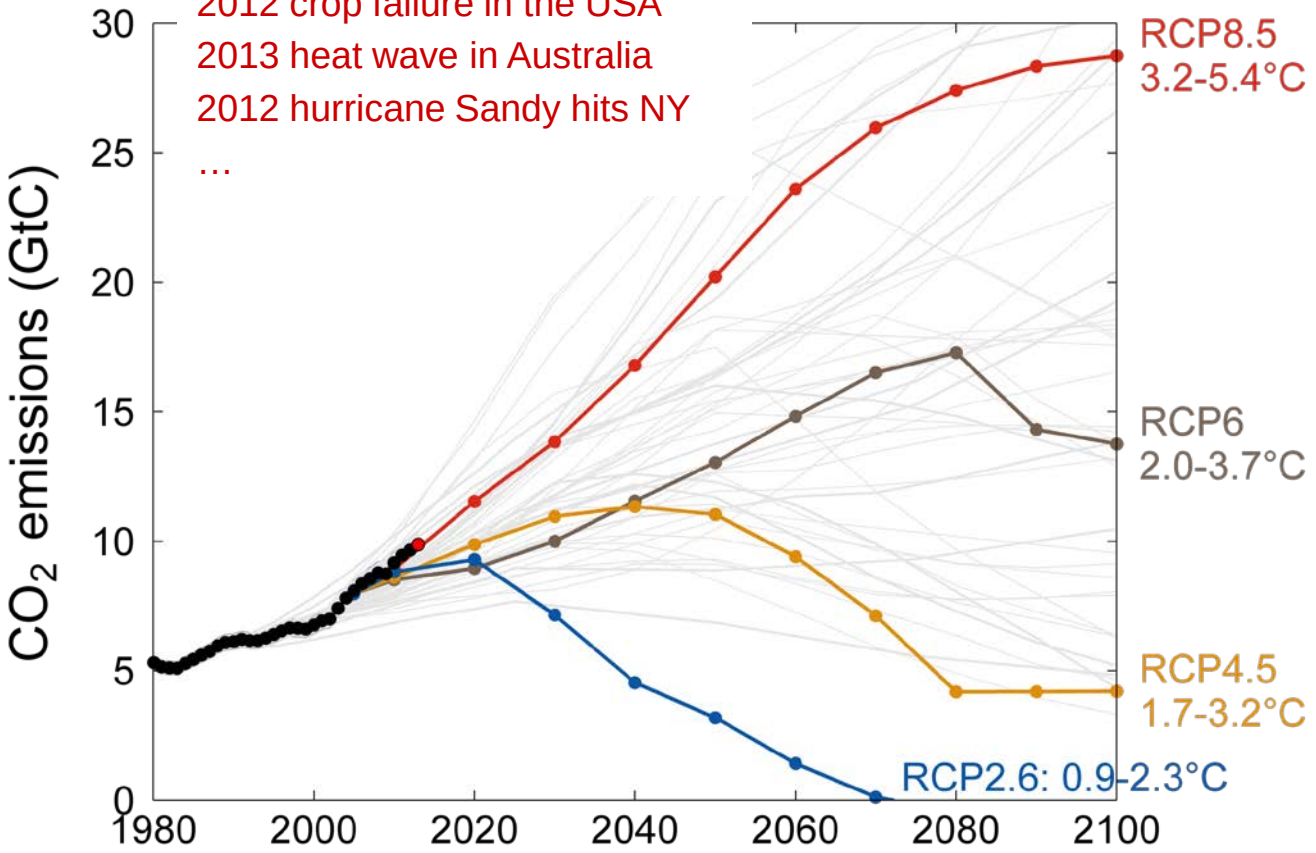
CO_2 emissions and climate change



Le Quéré et al. 2013; Peters et al. 2013; Global Carbon Project; CDIAC data

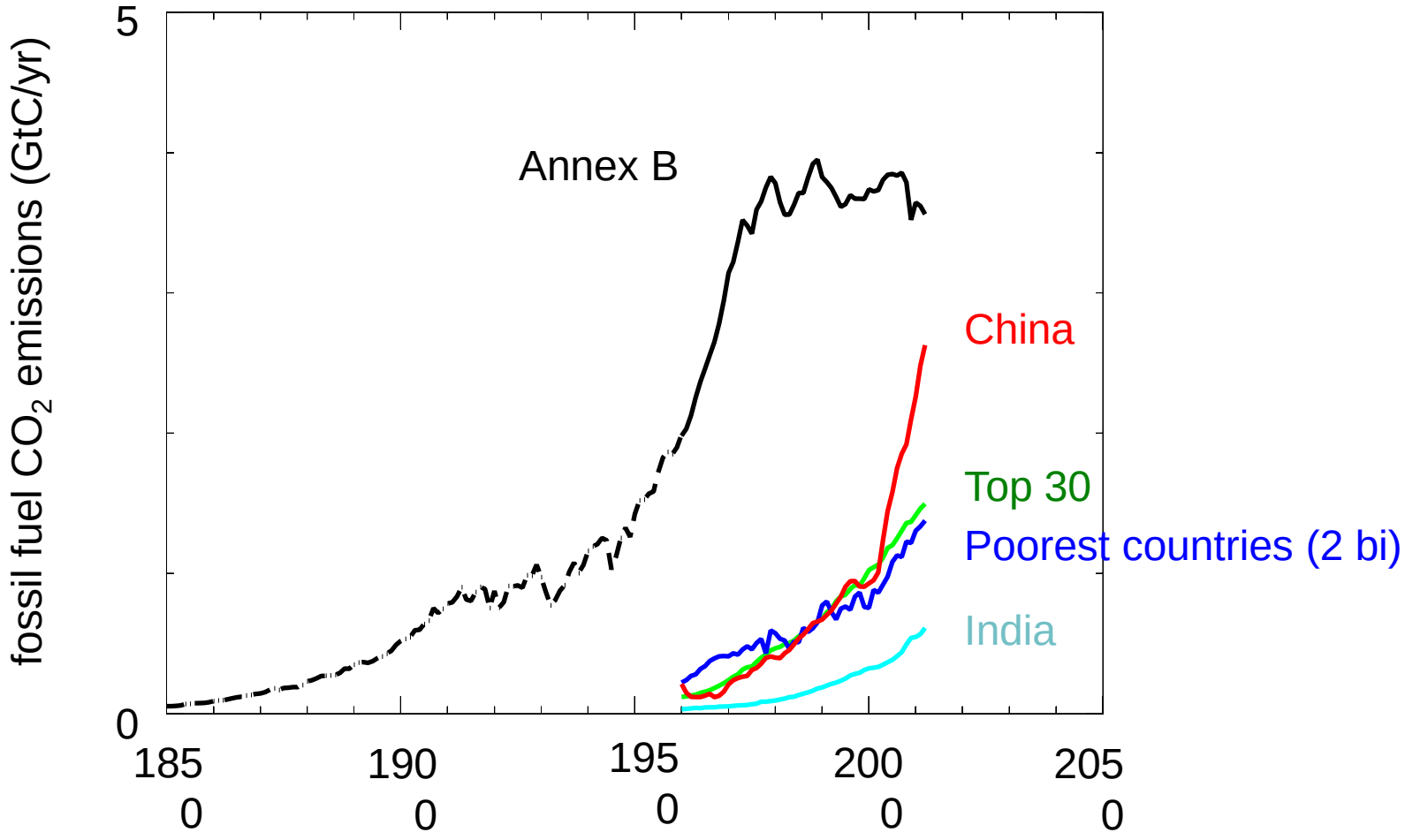
will tipping points in society trigger the impetus to act?

2005 European Heat Wave
2010 crop failure in Russia
2012 crop failure in the USA
2013 heat wave in Australia
2012 hurricane Sandy hits NY
…



Le Quéré et al. 2013; Peters et al. 2013; Global Carbon Project; CDIAC data

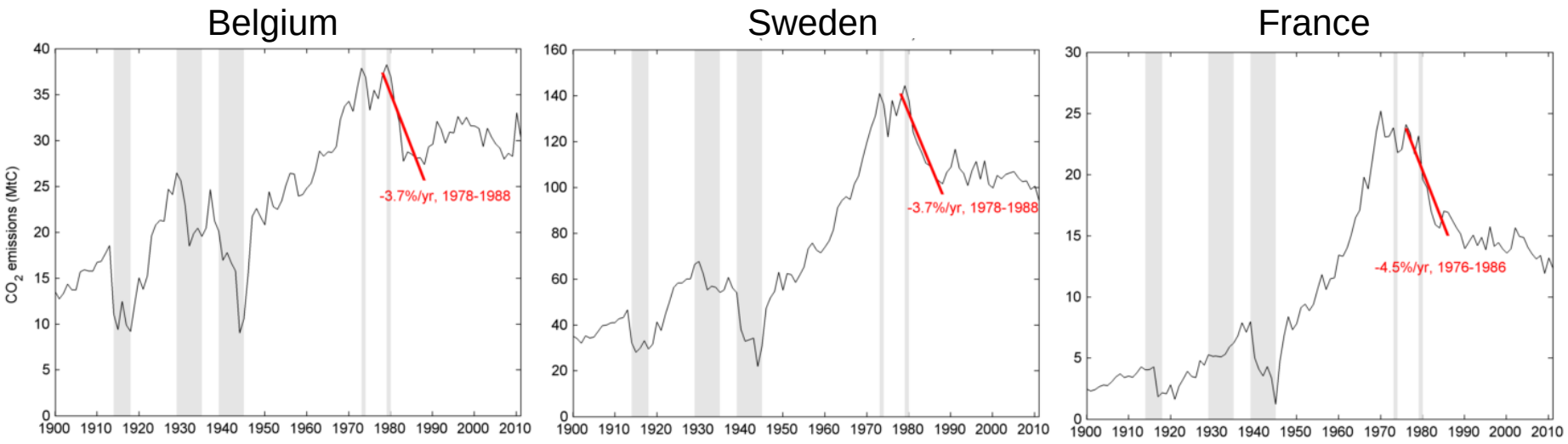
historical emissions by groups of about 1.2 billion people



Source: CDIAC Data; Le Quéré et al. 2012; Global Carbon Project 2013

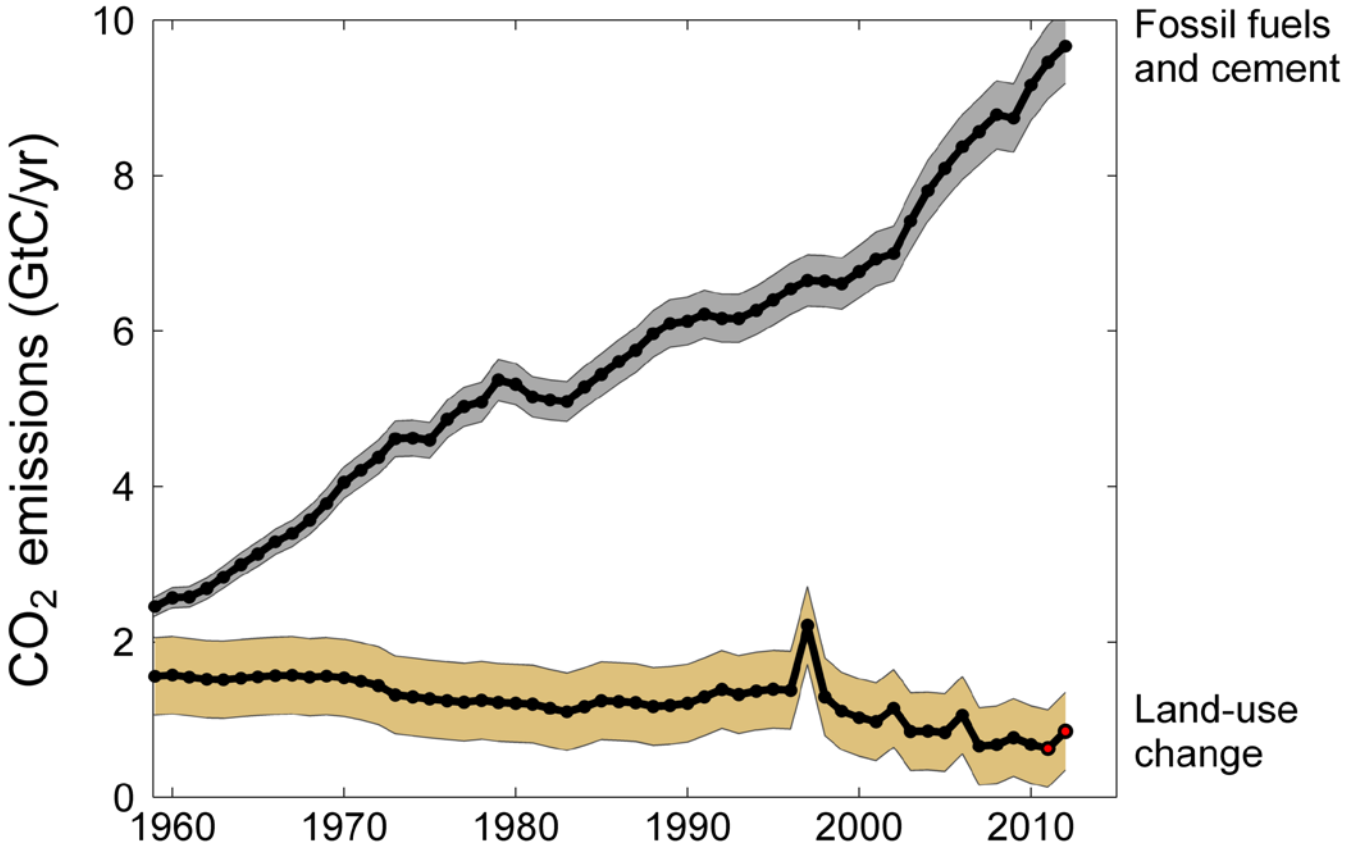
examples of rapid emission reductions

Precedents without climate policy



Source: CDIAC Data; Peters et al. 2013; Global Carbon Project 2012

fossil fuel emissions dominate total emissions in 2012 (and in future climate projections)



Source: Le Quéré et al 2013; CDIAC Data; Houghton & Hackler (in review); Global Carbon Project 2013

What are we seeking to achieve at this meeting?

1. Explore answers to some important questions, including:

can a prosperous society be aligned with rapidly reducing energy demand?

which policy options could efficiently, effectively and equitably deliver?

where can we find examples of radical change and why have they worked?

what are the impacts and opportunities for scaling up radical change?

2. Identify key triggers, barriers and/or opportunities, and develop an agenda to progress beyond this Conference

3. Generate momentum for radical change thinking and share ideas and experience between academics and practitioners

140 abstracts received for 37 talks. See the many excellent posters tonight!

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Special Issue in *Carbon Management*, with working title:

Overcoming obstacles and barriers for Radical Emissions Reductions

Carbon Management provides an international peer-reviewed forum for current insights from the diverse array of disciplines working to enhance our understanding of carbon interactions… [It] examines the mechanisms by which we can both manage current GHG levels and reduce future emissions effectively, to mitigate climate change.

Senior Editors: Shobhakar Dhakal and Skee Houghton
First Impact Factor to be published in 2014.

Open access option at £1700+VAT (group price under negotiations). Typical article length 10-20 printed pages, ~10 figures or tables.

Special issue to be published in August 2014
Deadline for submissions → 28 February 2014
Email interest to bea.jefferson@manchester.ac.uk no later than this Friday

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References used in this presentation

Global Carbon Project (2012) More information, data sources and data files at www.globalcarbonproject.org

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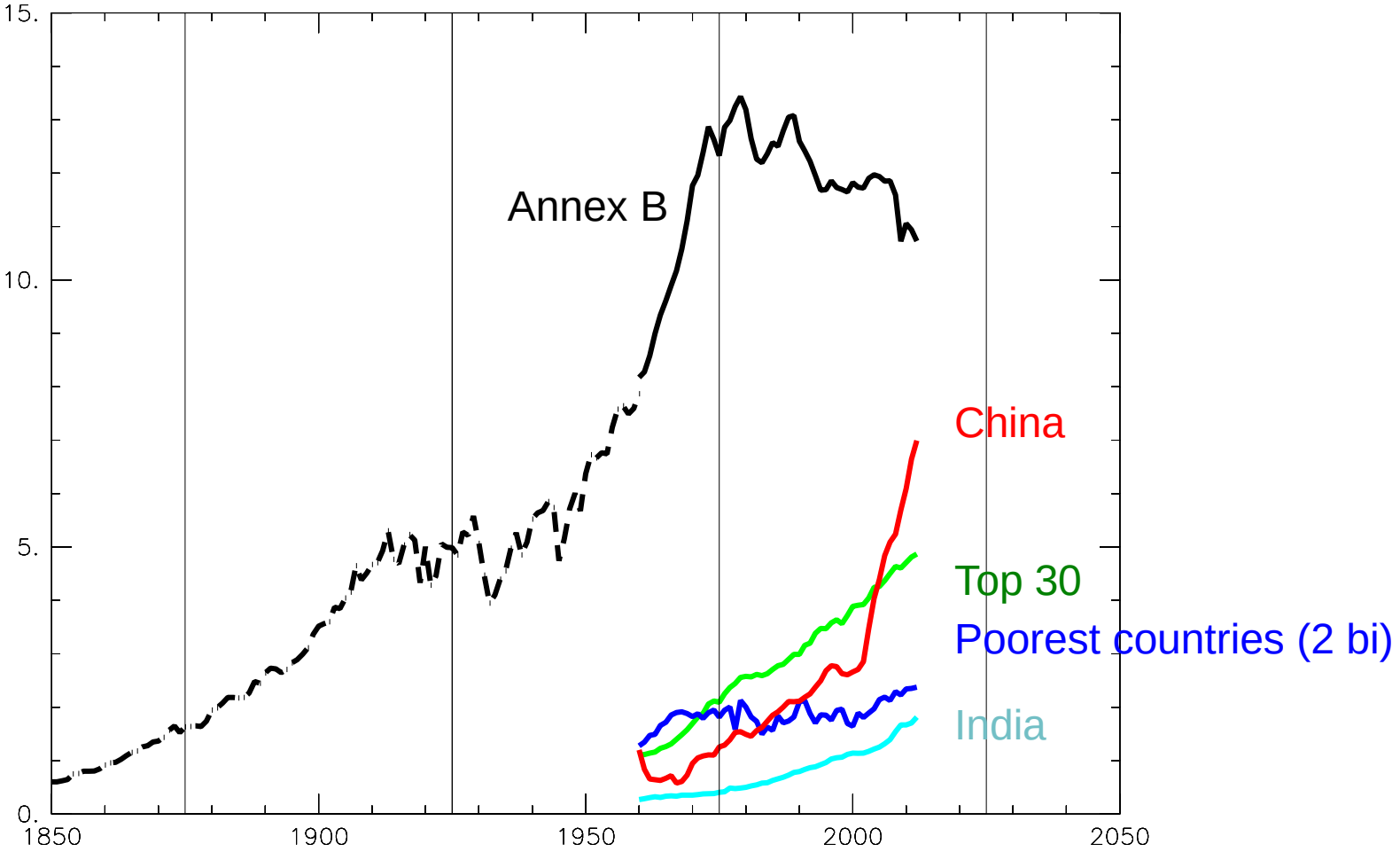
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10.
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1850
1900
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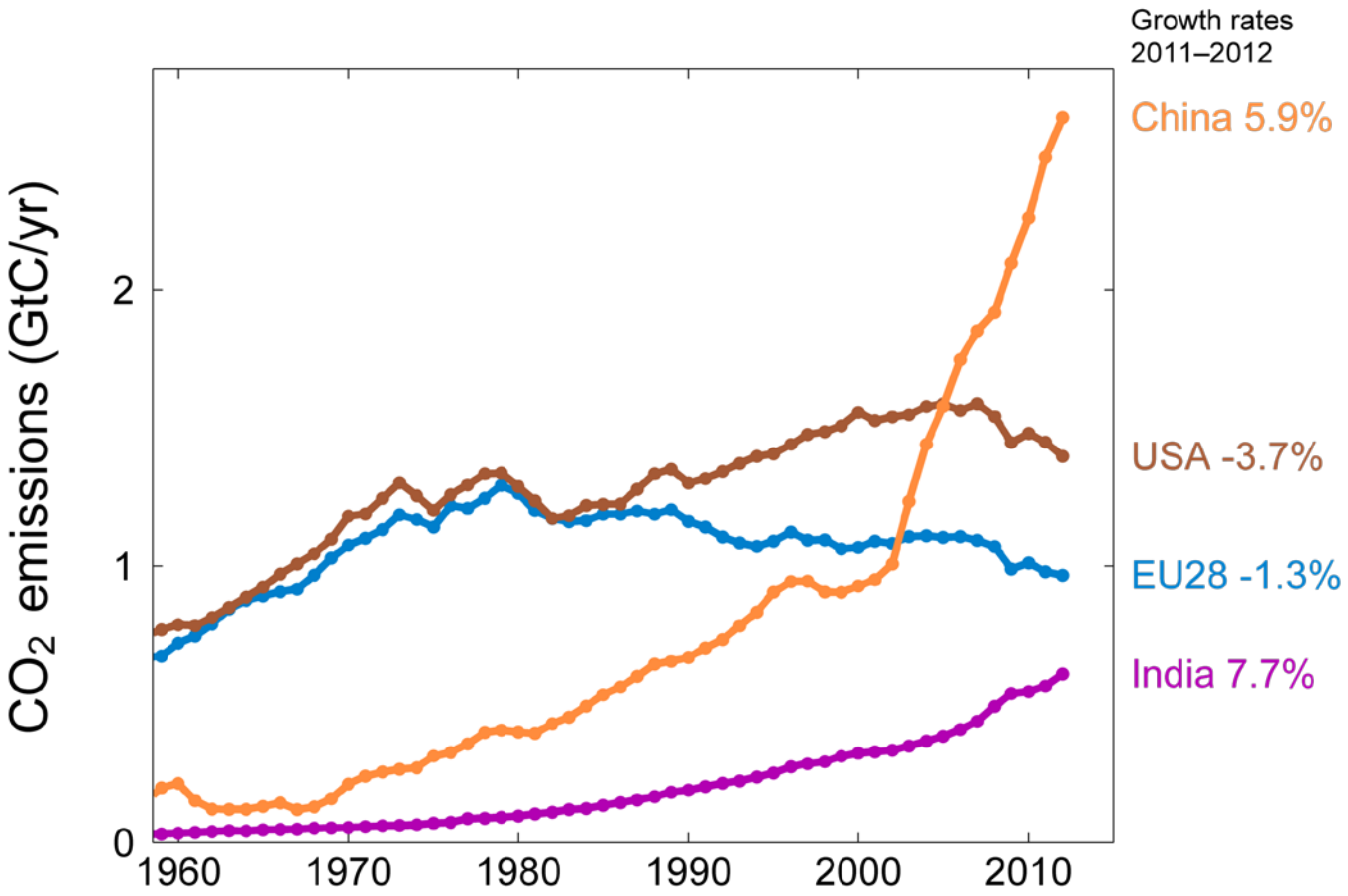
2050
Annex B
China
Top 30
Poorest countries (2 bi)
India

top fossil fuel emitters



Source: CDIAC Data; Le Quéré et al. 2012; Global Carbon Project 2012