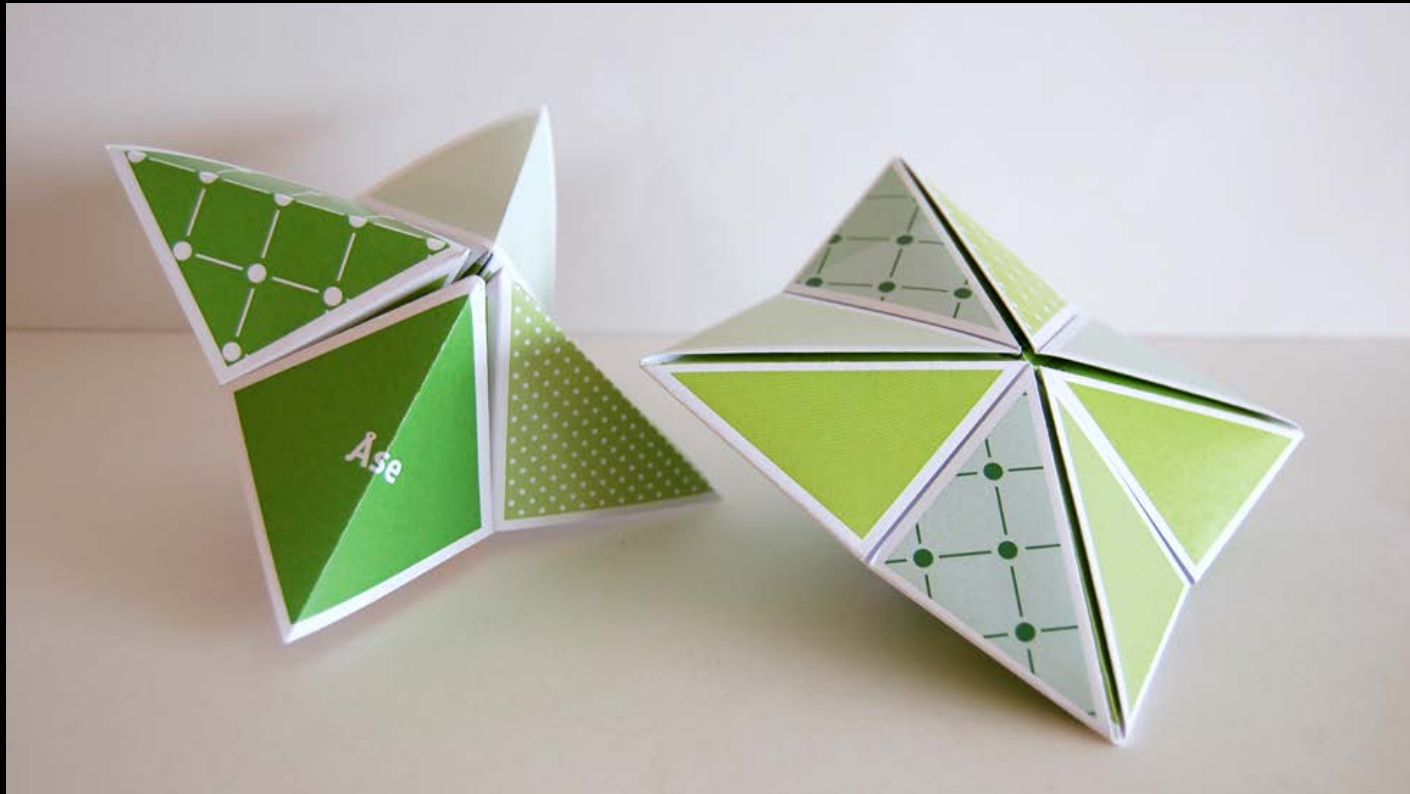
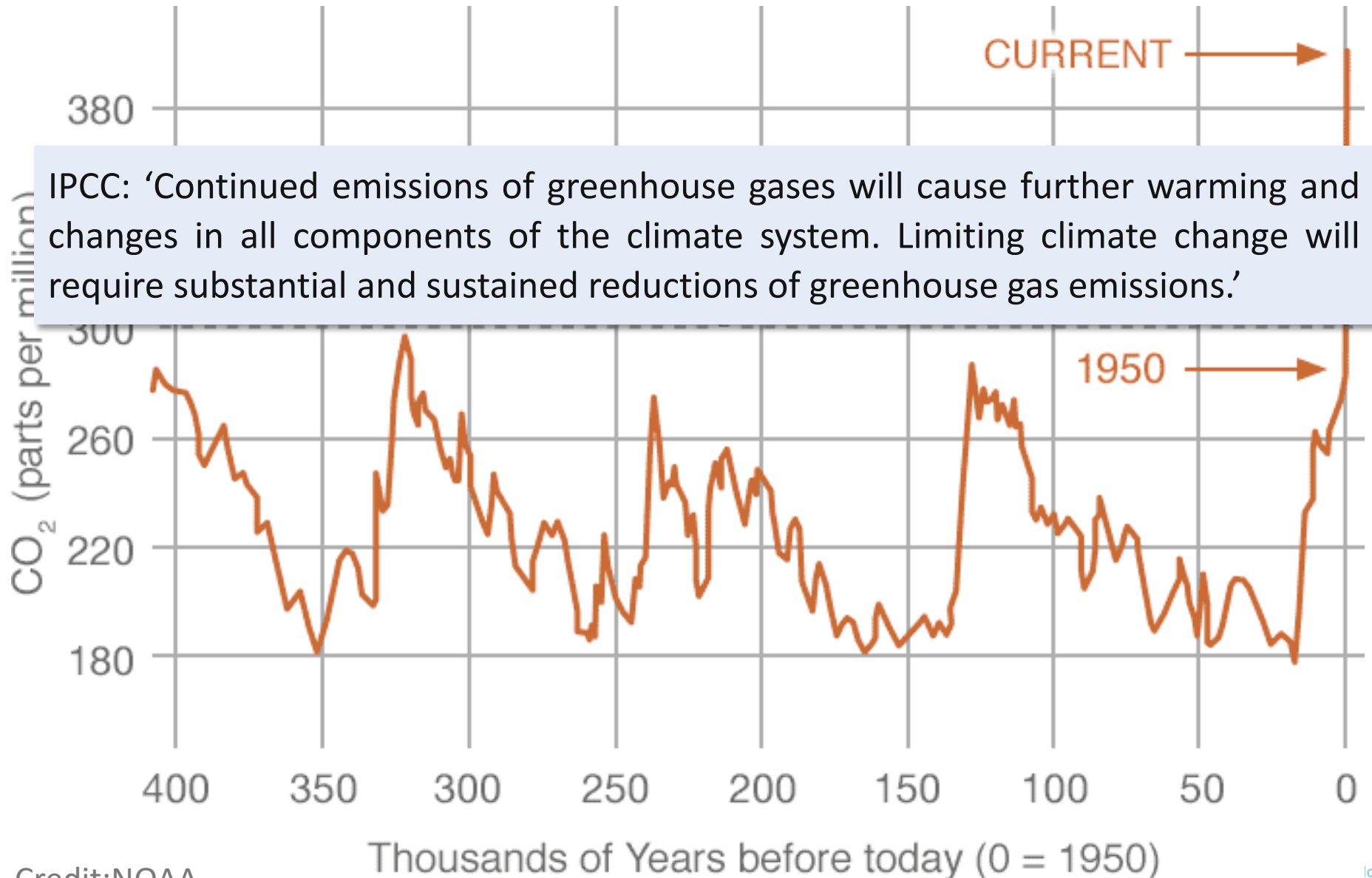


How warm will it get? A closer look into the future



CO₂ emissions and future climate

During the last glacial cycles CO₂ levels varied between 180 ppm and 280 ppm



CARBON STORY

The Global Carbon Project is a scientific program that aims to draw a complete picture of the carbon cycle on planet Earth.
Take a short tour of our carbon story.



ENTER THE PAST

Trace human progress through time and the human impact on the carbon in the atmosphere



ENTER THE PRESENT

Discover when, where and by whom carbon dioxide is emitted

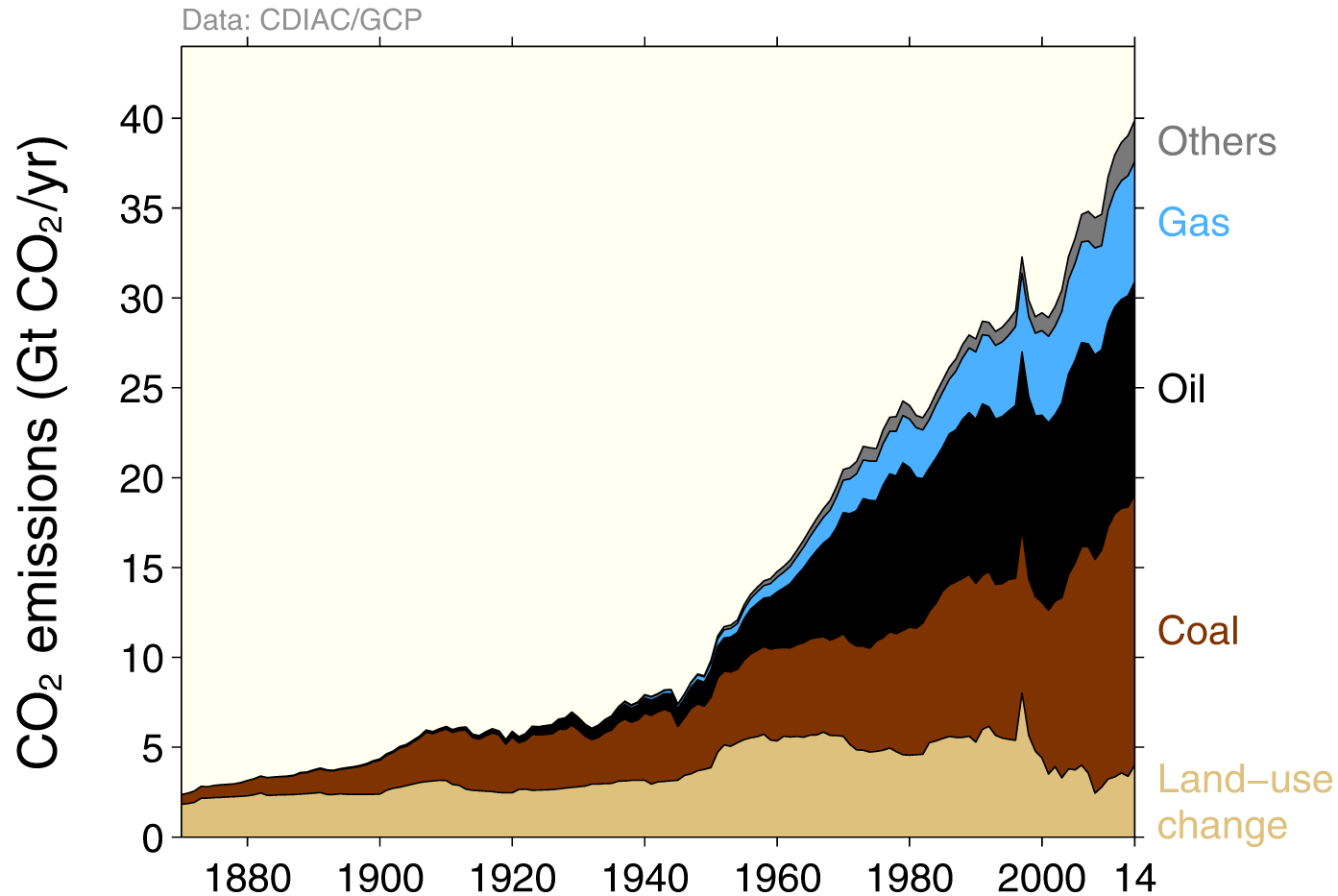


ENTER THE FUTURE

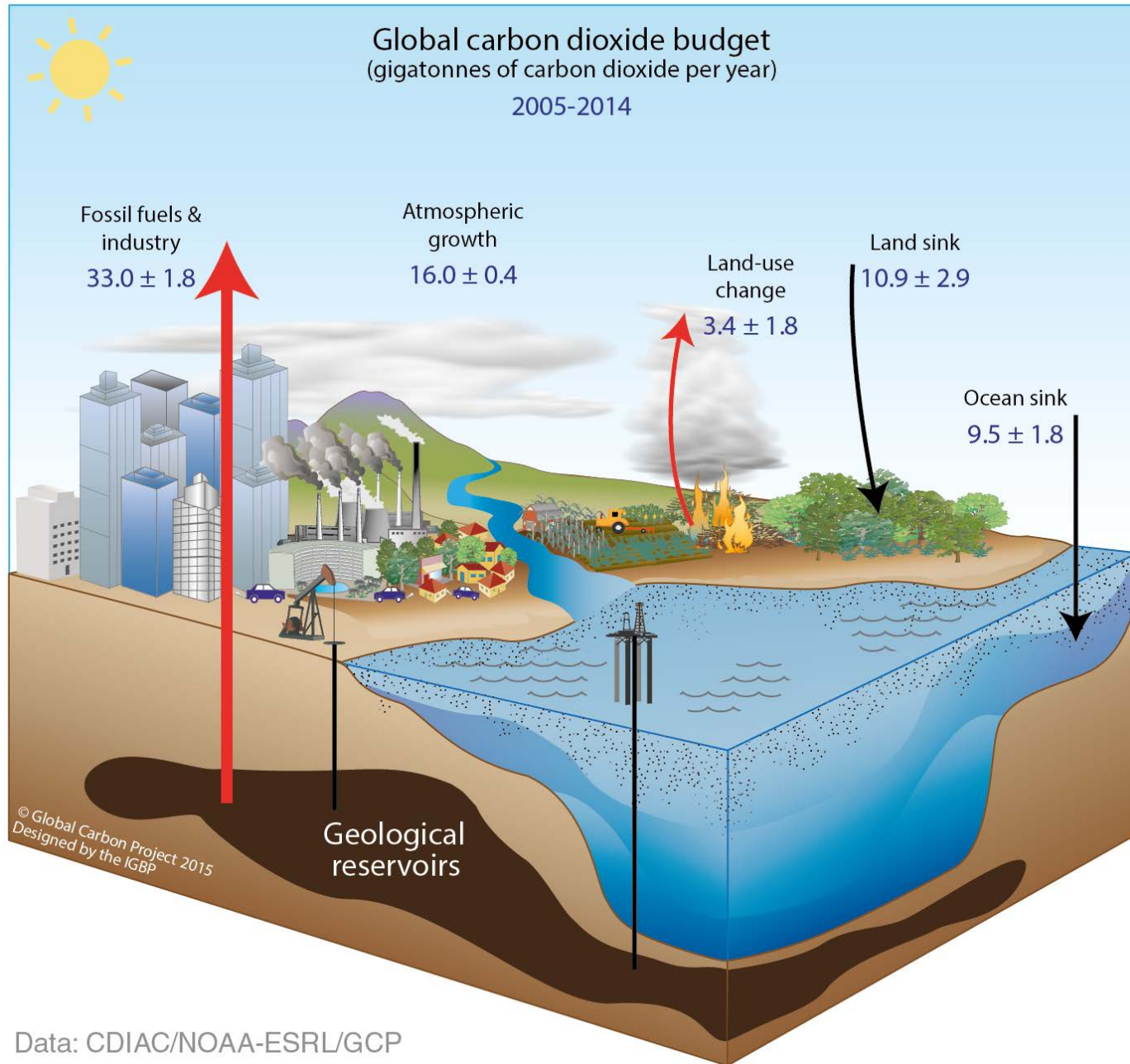
Think about the climate that you would choose for your future

Total global emissions by source

Land-use change was the dominant source of annual CO₂ emissions until around 1950

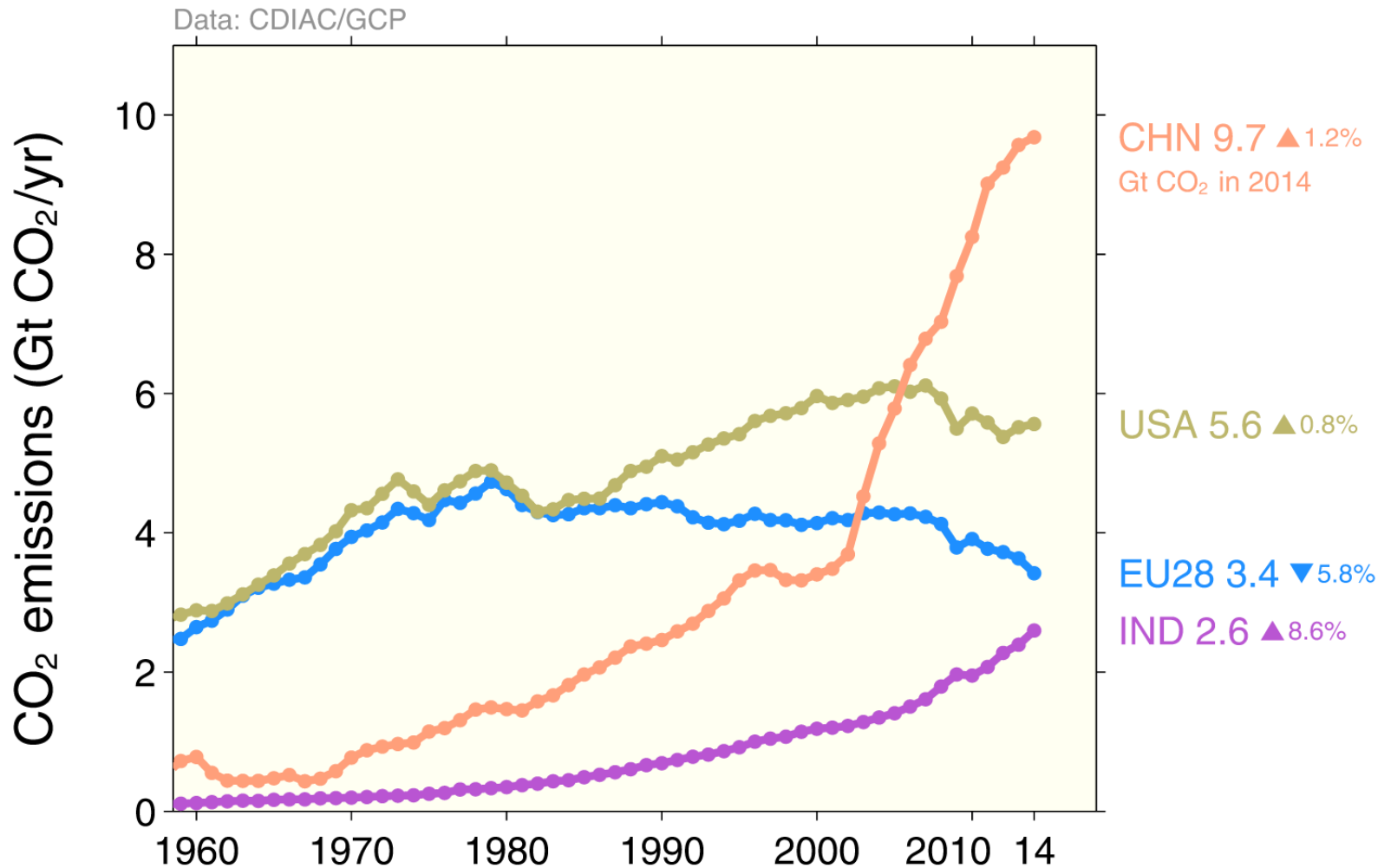


Anthropogenic perturbation of the global carbon cycle



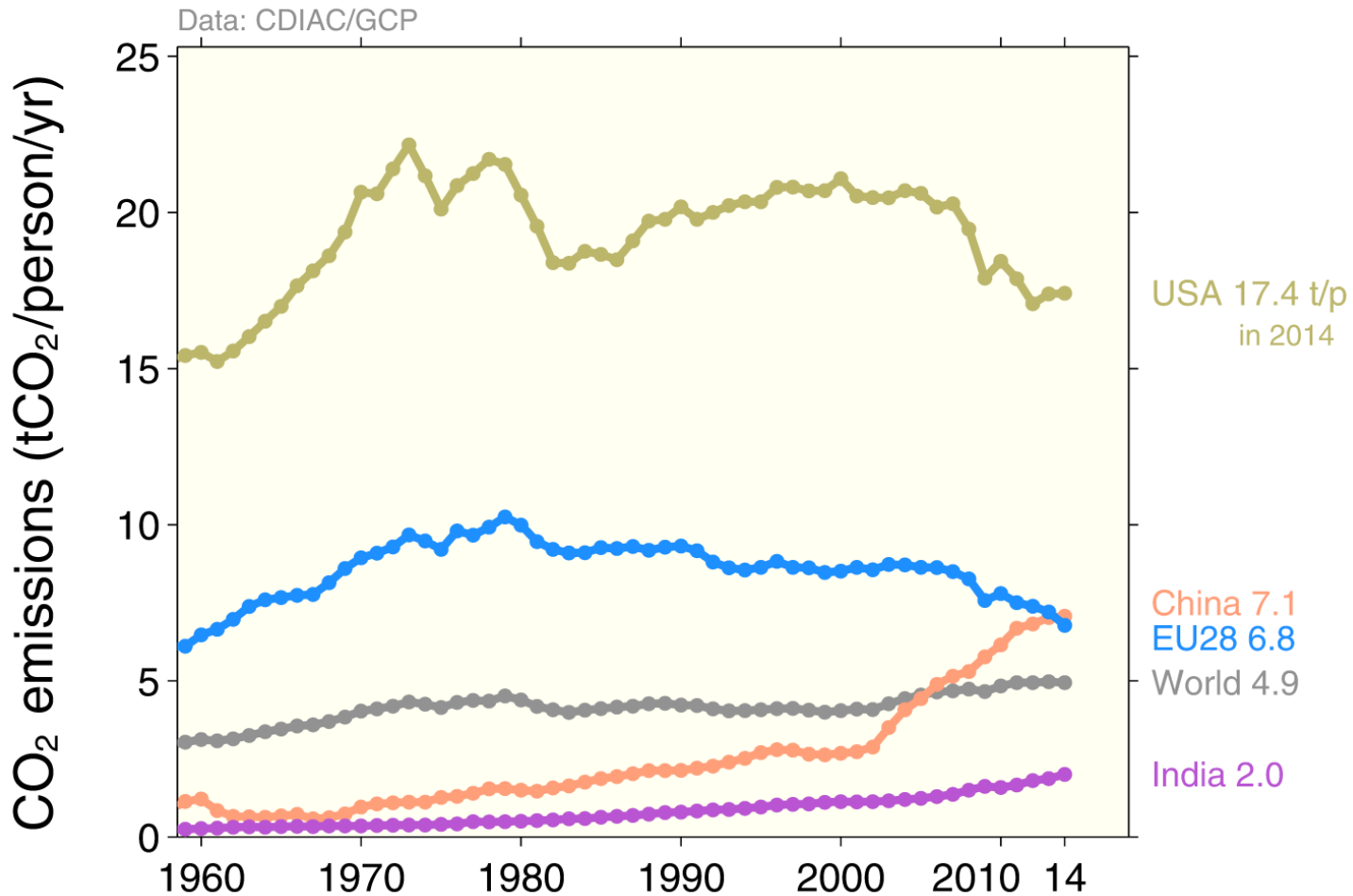
Top four fossil fuel emitters

The top four emitters in 2014 covered 59% of global emissions
China (27%), United States (15%), EU28 (10%), India (7%)



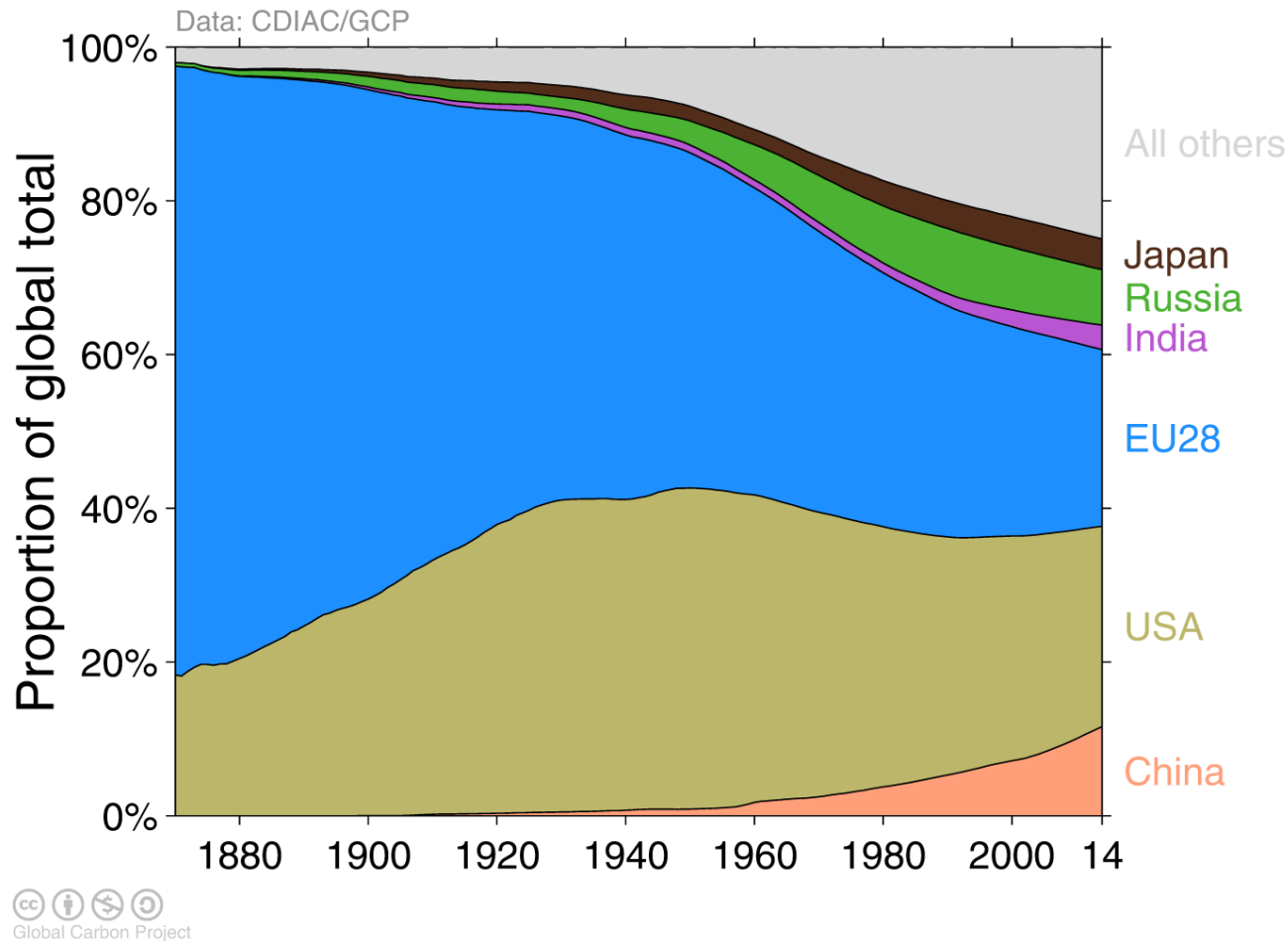
Top fossil fuel emitters (per capita)

Countries have a broad range of per capita emissions reflecting their national circumstances
 China's per capita emissions have passed the EU28 and are 43% above the global average



Historical cumulative emissions by country

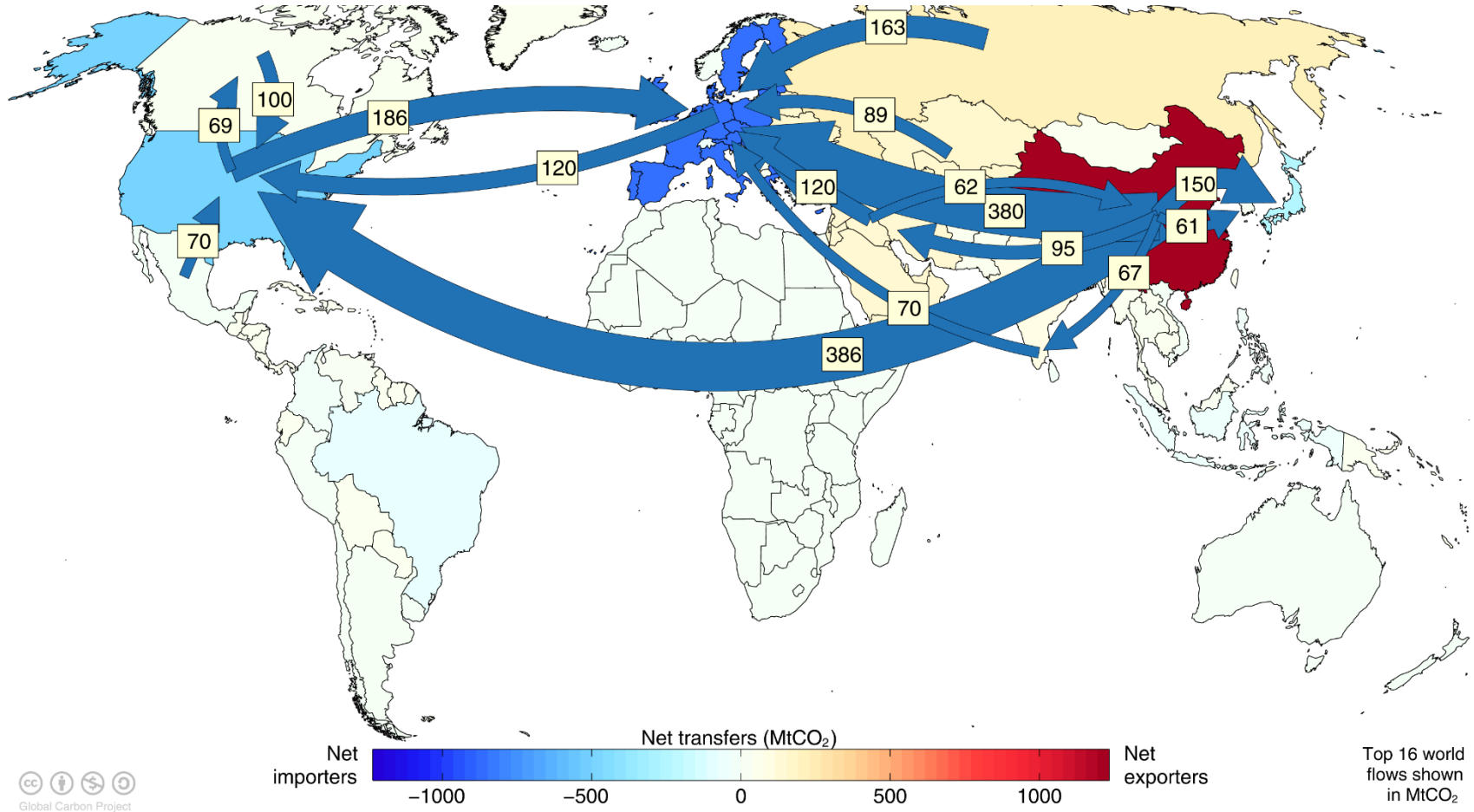
Cumulative emissions from fossil-fuel and cement were distributed (1870–2014): USA (26%), EU28 (23%), China (12%), and India (3%) covering 64% of the total share



Cumulative emissions (1990–2014) were distributed : USA (20%), China (19%), EU28 (15%), India (5%)

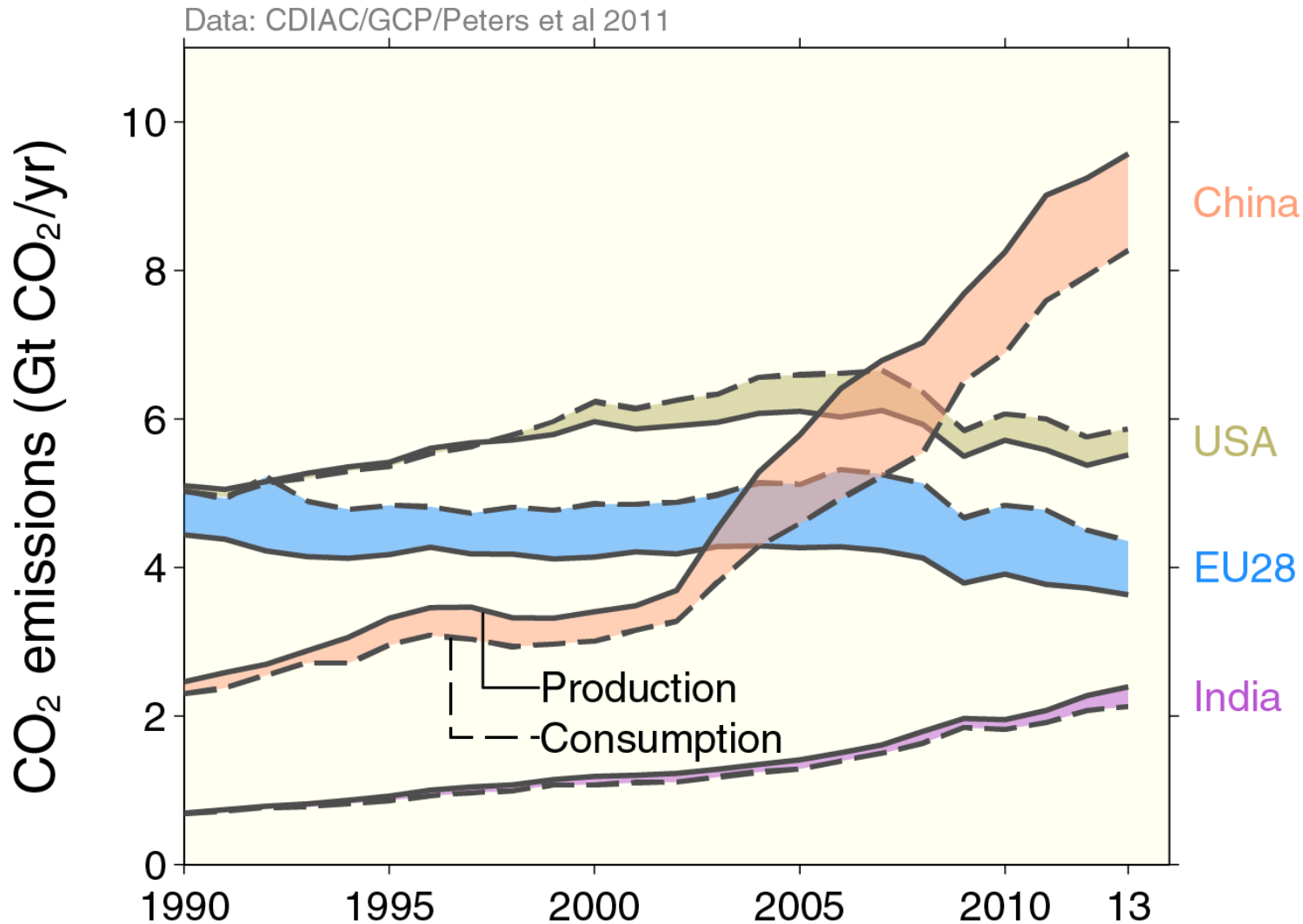


G Flows from location of generation of emissions to location of consumption of goods and services

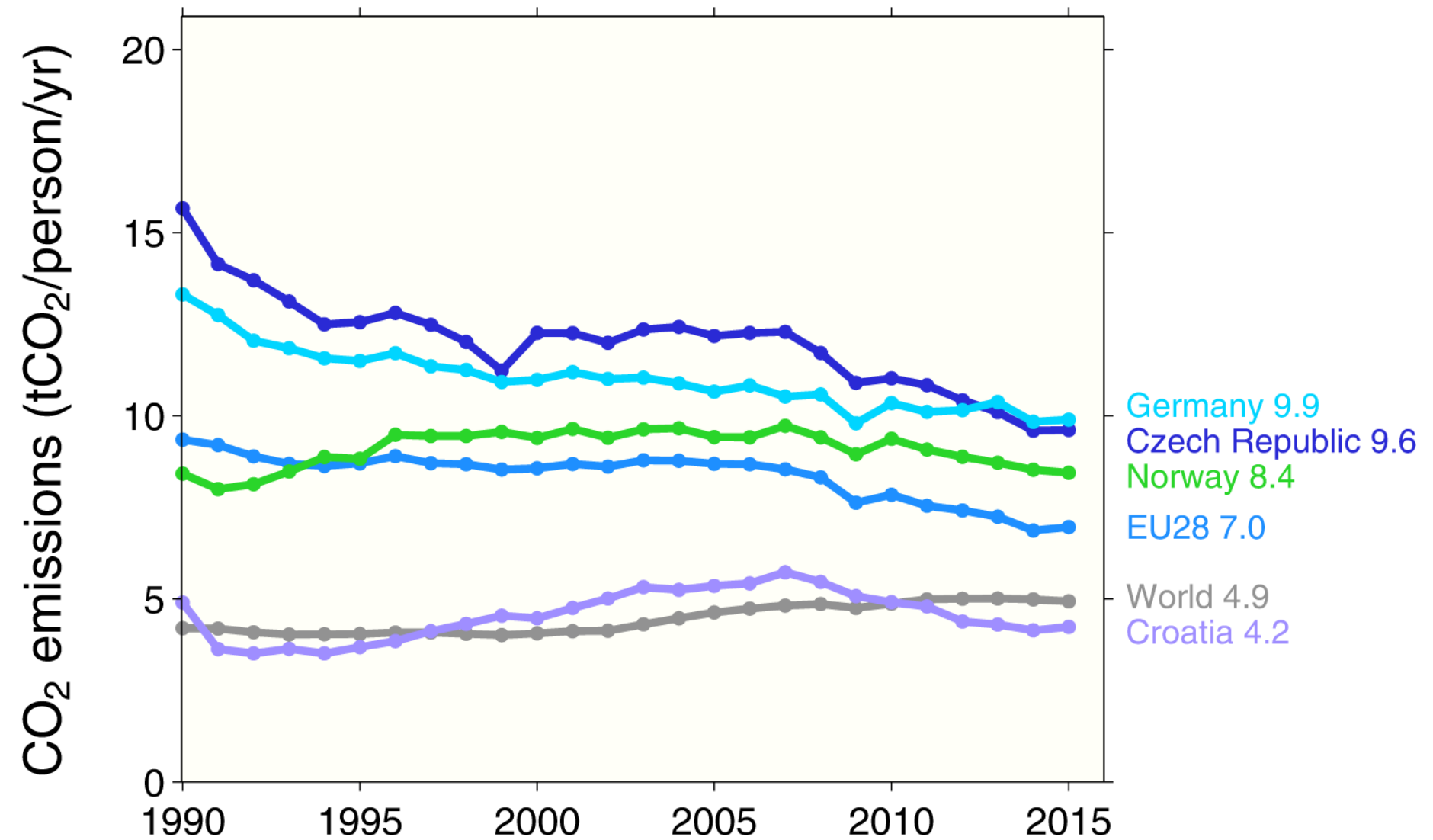


Values for 2011. EU is treated as one region. Units: MtCO₂
 Source: [Peters et al 2012](#)

Allocating emissions to the consumption of goods and services provides an alternative perspective on emission drivers



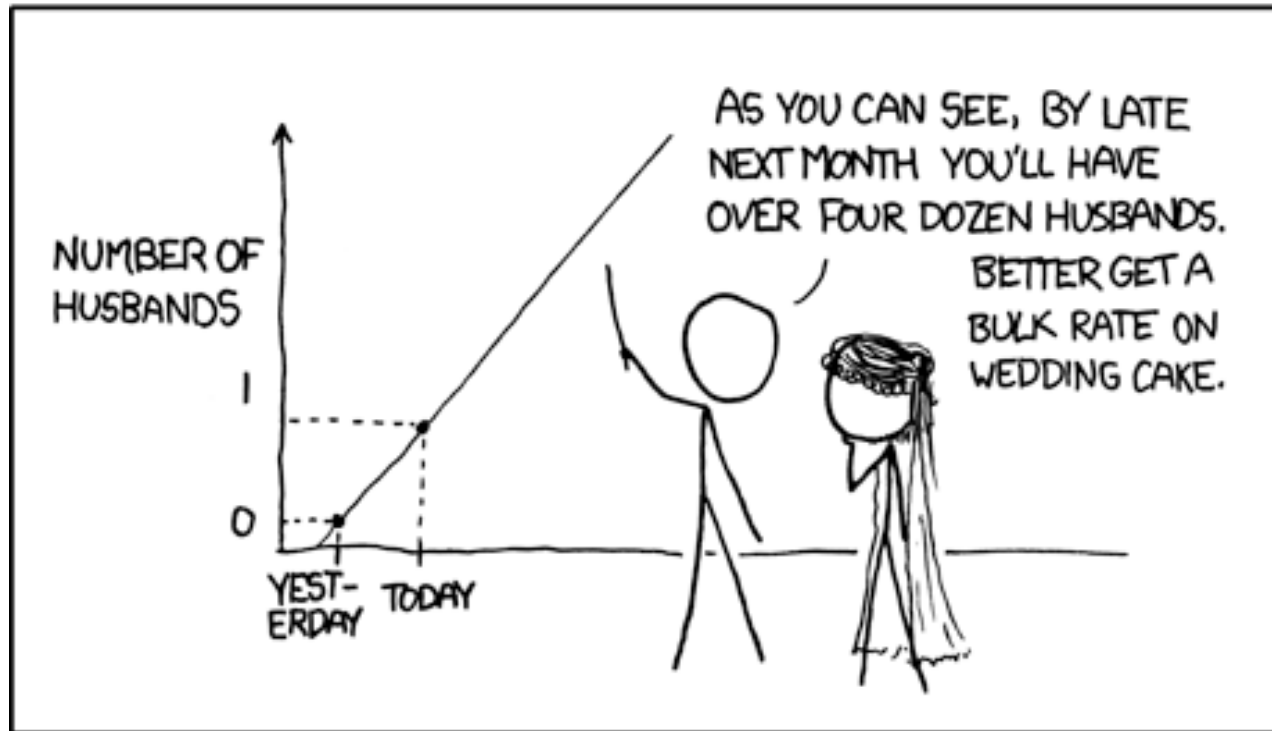
Emissions from the countries participating in this course



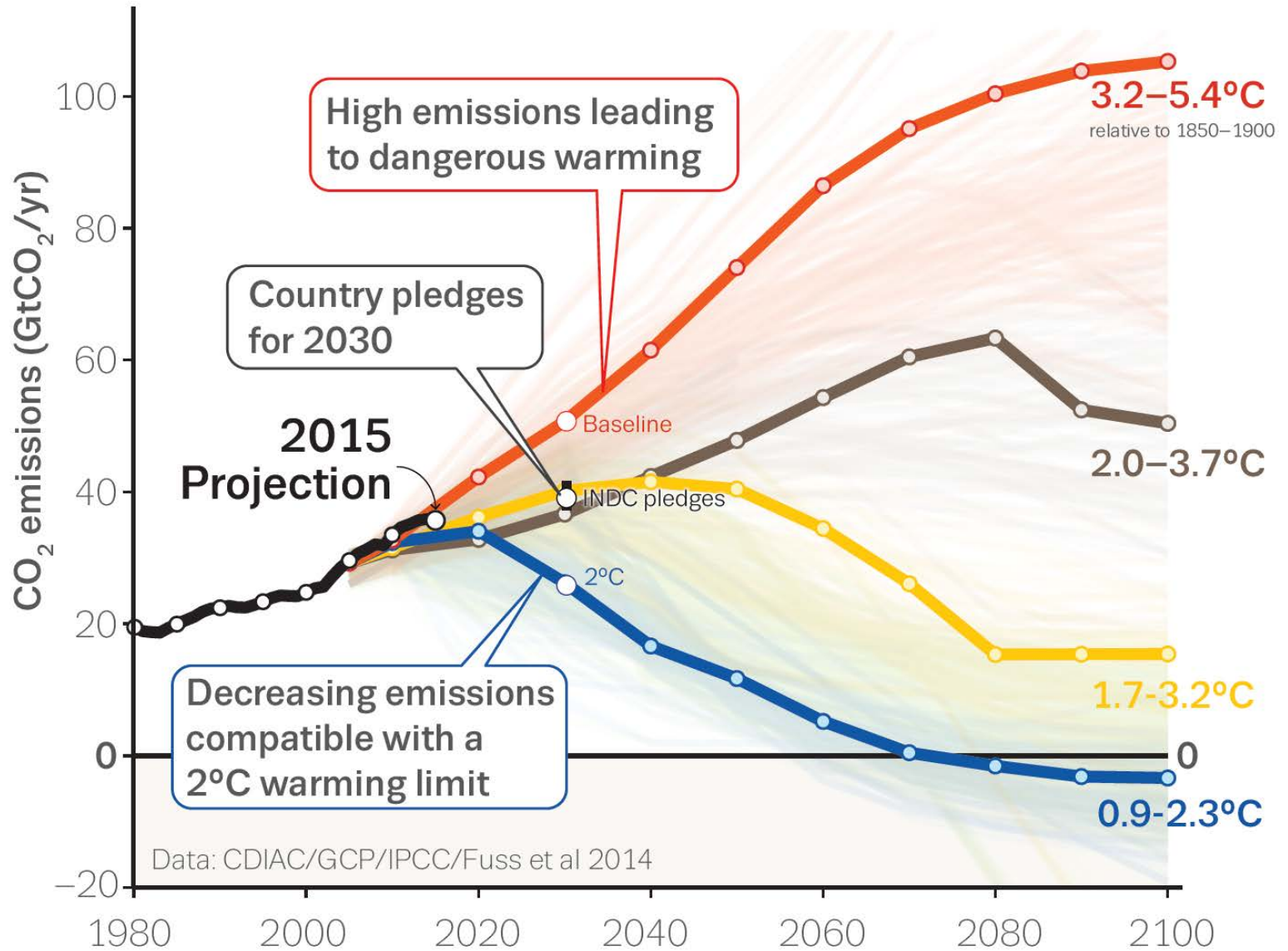
Thanks to Robbie Andrew for making this plot

What will the future climate look like?

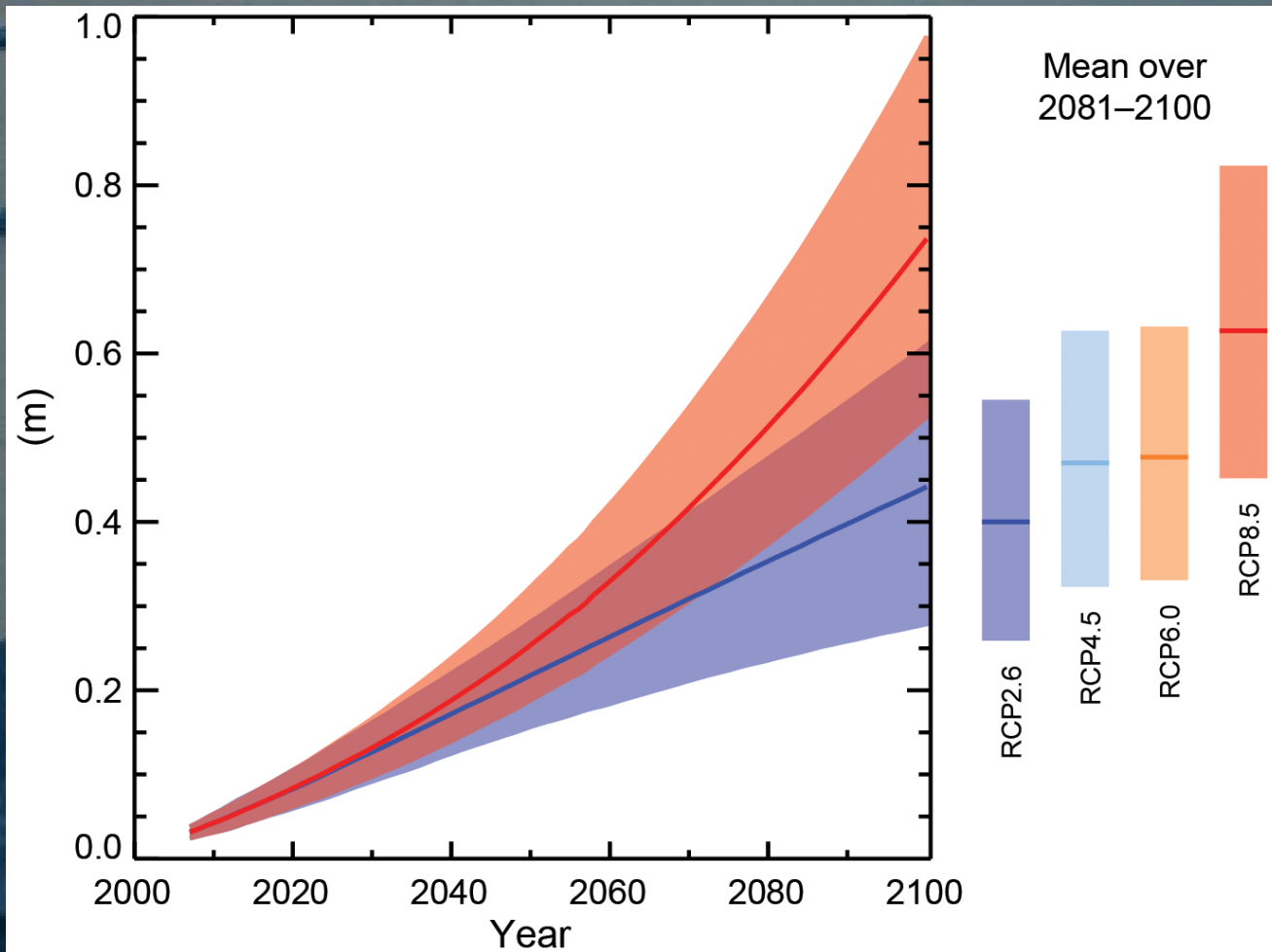
MY HOBBY: EXTRAPOLATING



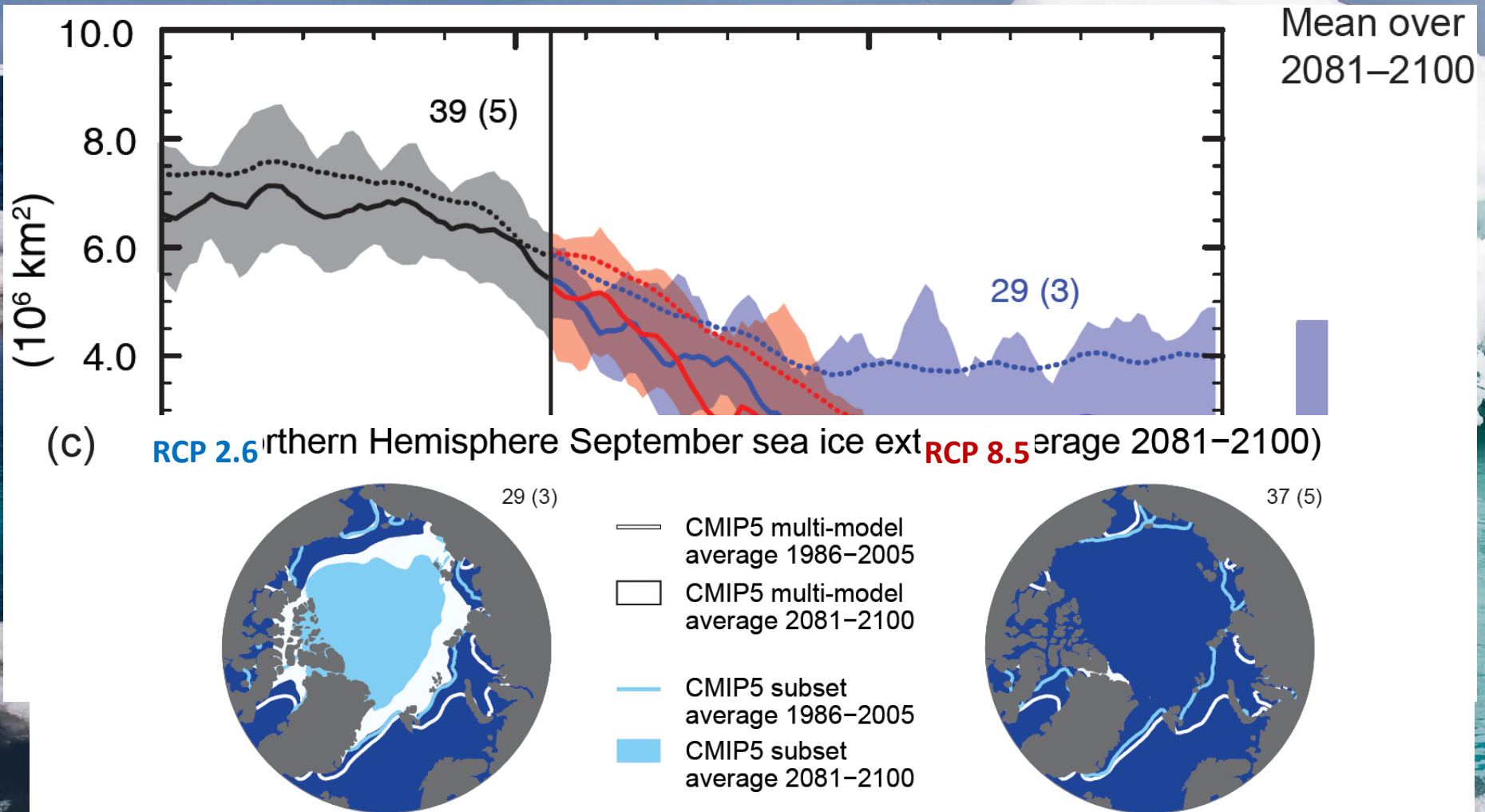
Observed emissions and future emissions scenarios



Projections of global mean sea level rise over the 21st century show that sea levels will continue to increase



The models predicts that the Arctic can become ice free in 2050



Ocean Acidification: The Other Carbon Dioxide Problem

The pH of surface ocean waters has fallen by 0.1 pH units; a 30 % increase in acidity

OCEAN ACIDIFICATION

HOW WILL CHANGES IN OCEAN CHEMISTRY AFFECT MARINE LIFE?

CO₂ absorbed from the atmosphere



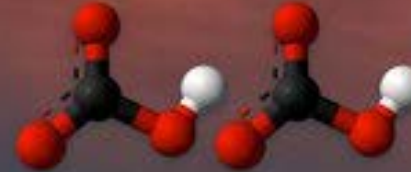
carbon dioxide



water



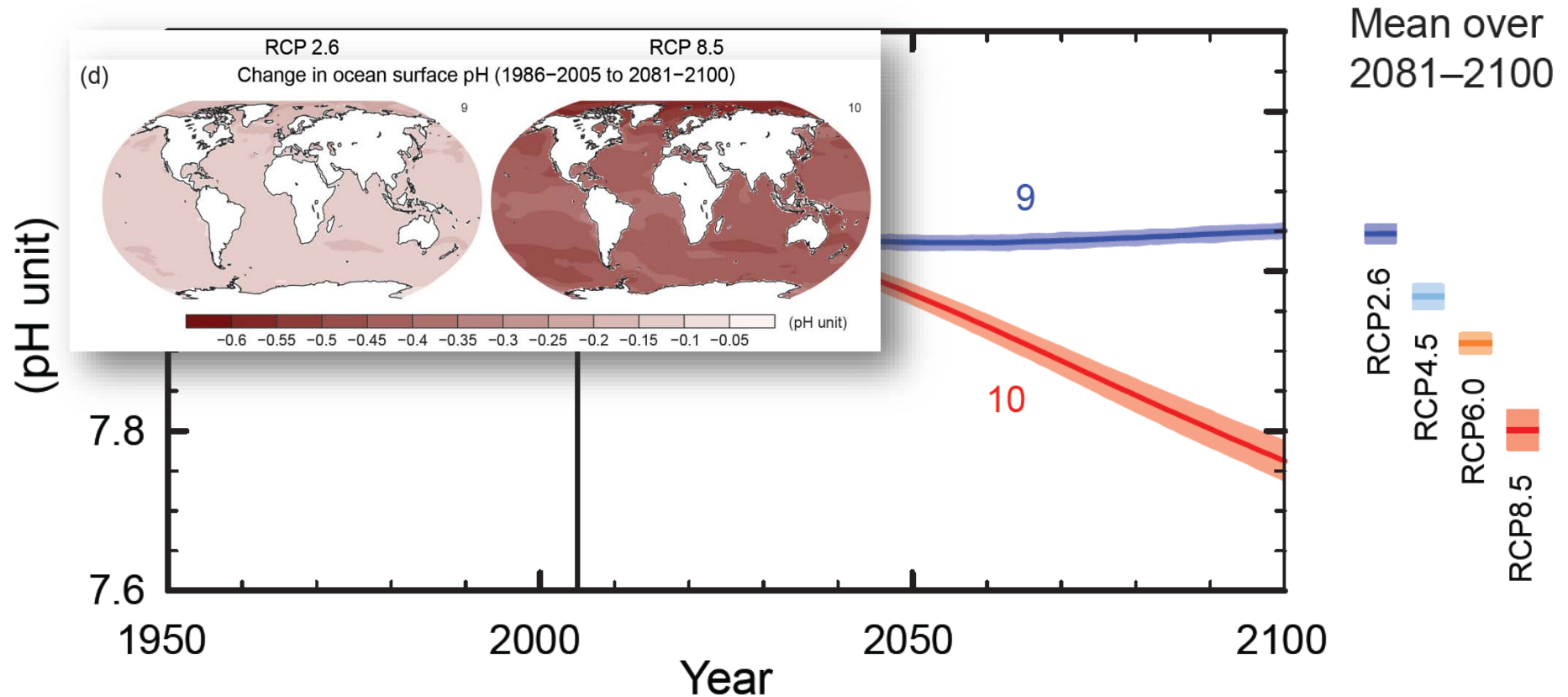
carbonate ion



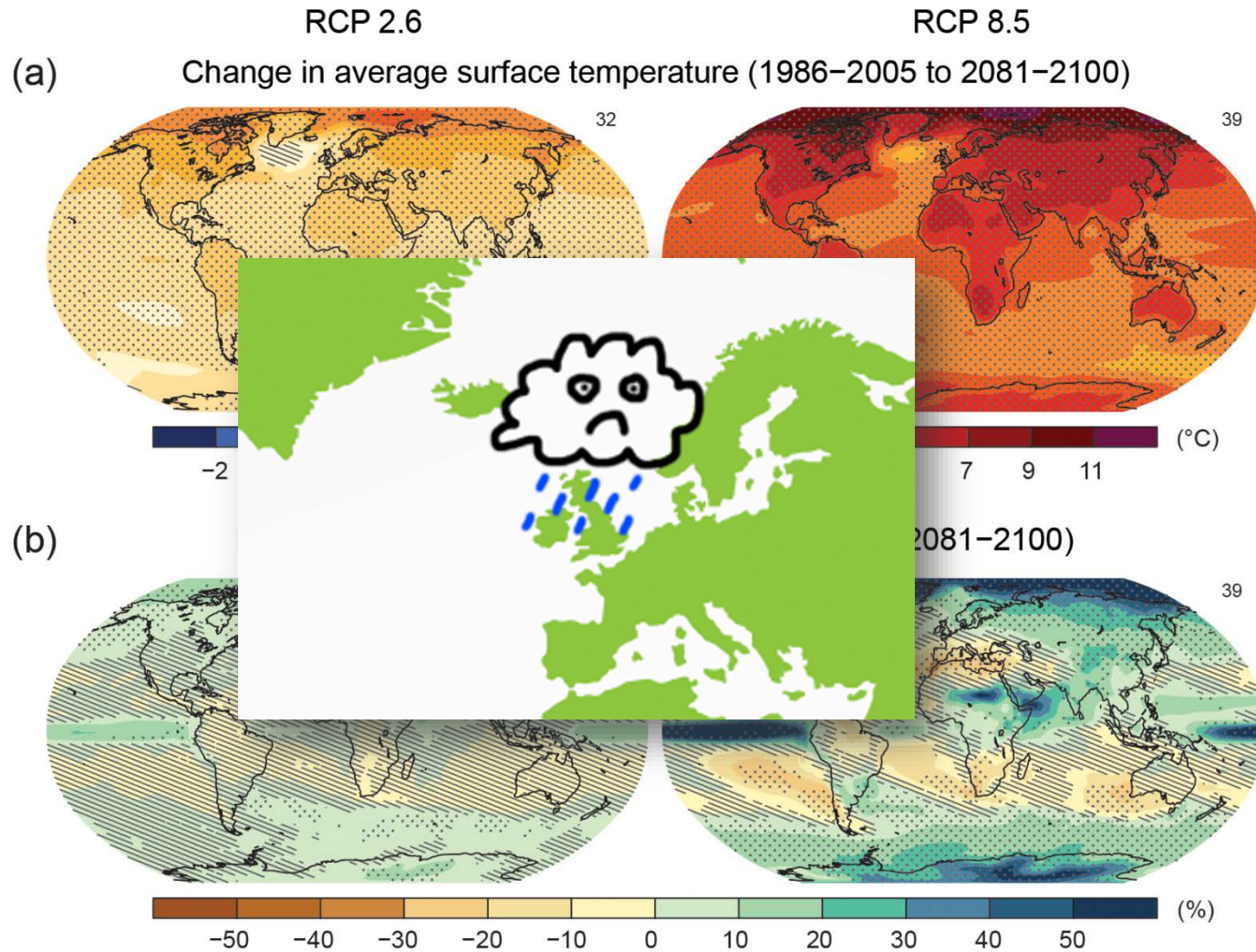
2 bicarbonate ions

consumption of carbonate ions impedes calcification

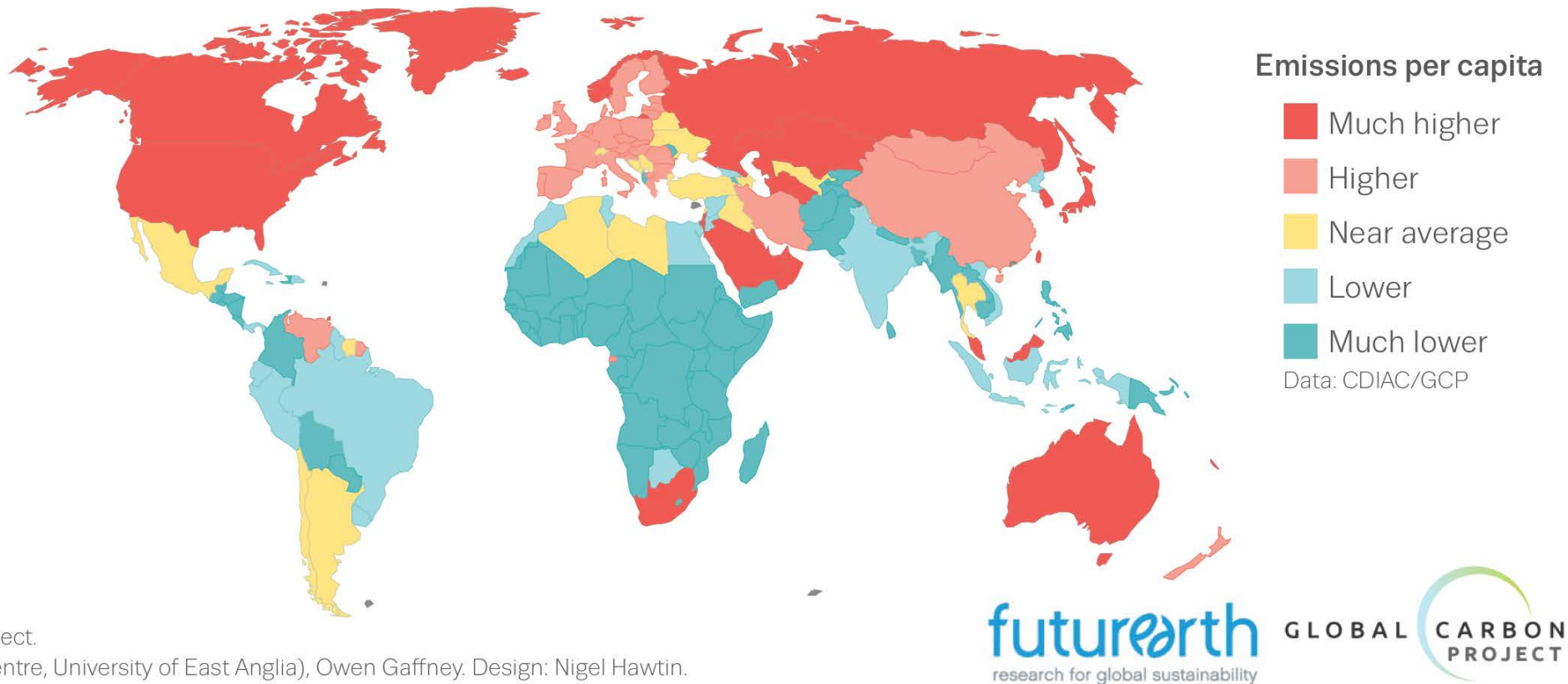
By the end of this century the surface waters of the ocean could be nearly 150 % more acidic (business as usual)



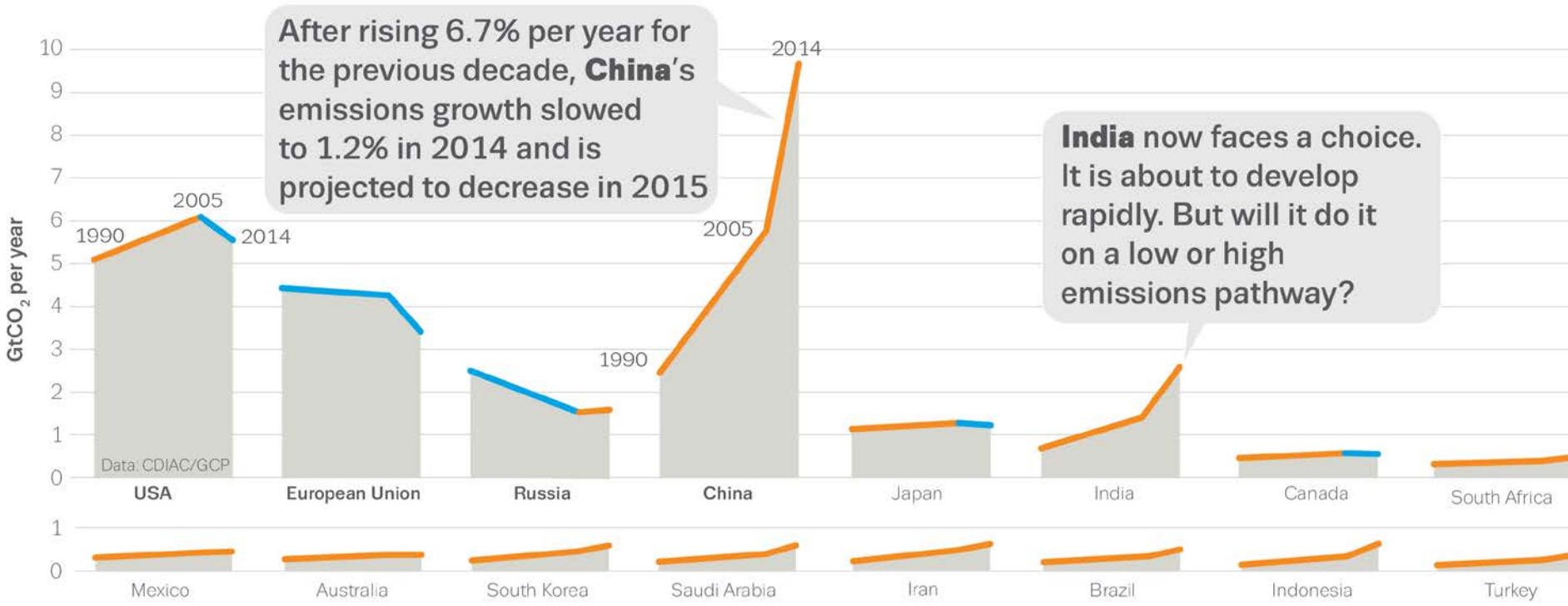
There is a large difference between the 'two worlds'



Global emissions must quickly drop to zero to hold to 2°C



...though emissions are beginning to **decline** in many countries



Climate and weather are not the same
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The winter of 2014



Norge kommer til å få uslåelige værrekorder: Ikke en dråpe nedbør i januar flere steder i landet.

– Det er kjempesjeldent at vi opplever en så stabil vær-situasjon over så lang tid, sier statsmeteorolog Justyna Wodziczko om det tørre været som så langt har bidratt til tre alvorlige branner i Lærdal, på Flatanger og Frøya.

- [Stor brannfare langs kysten](#)
- Les mer om [det brannfarlige været](#).



The winter of 2014

