Climate change and health – challenges and opportunities

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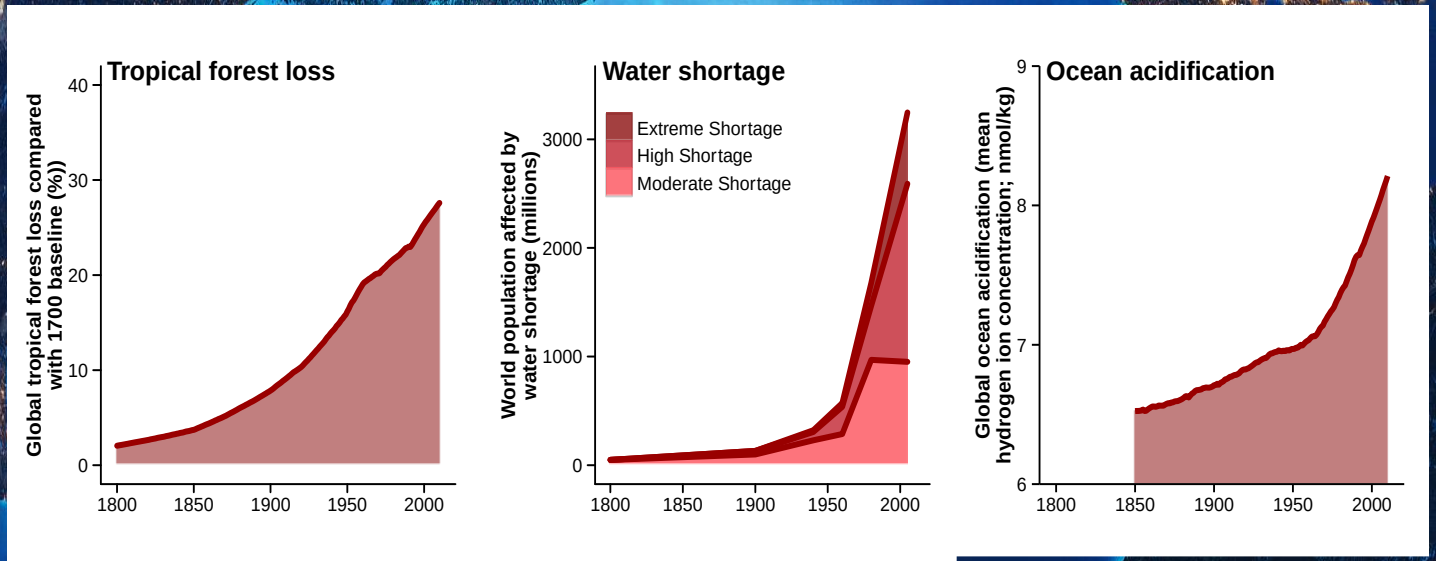
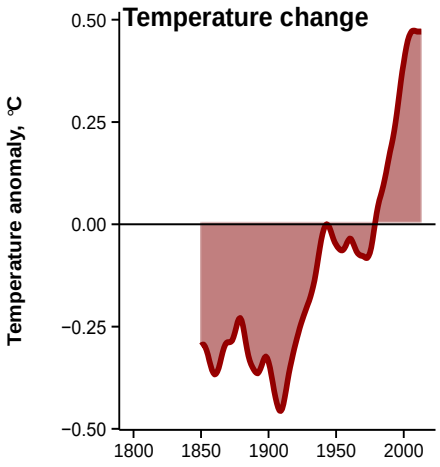
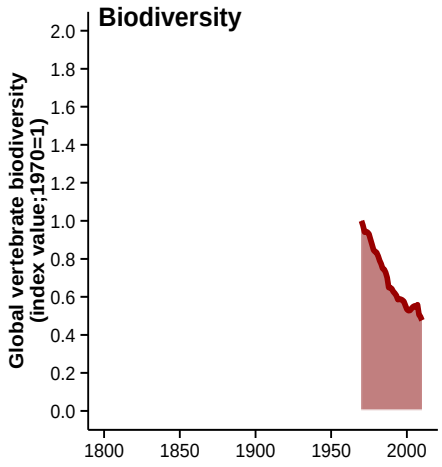
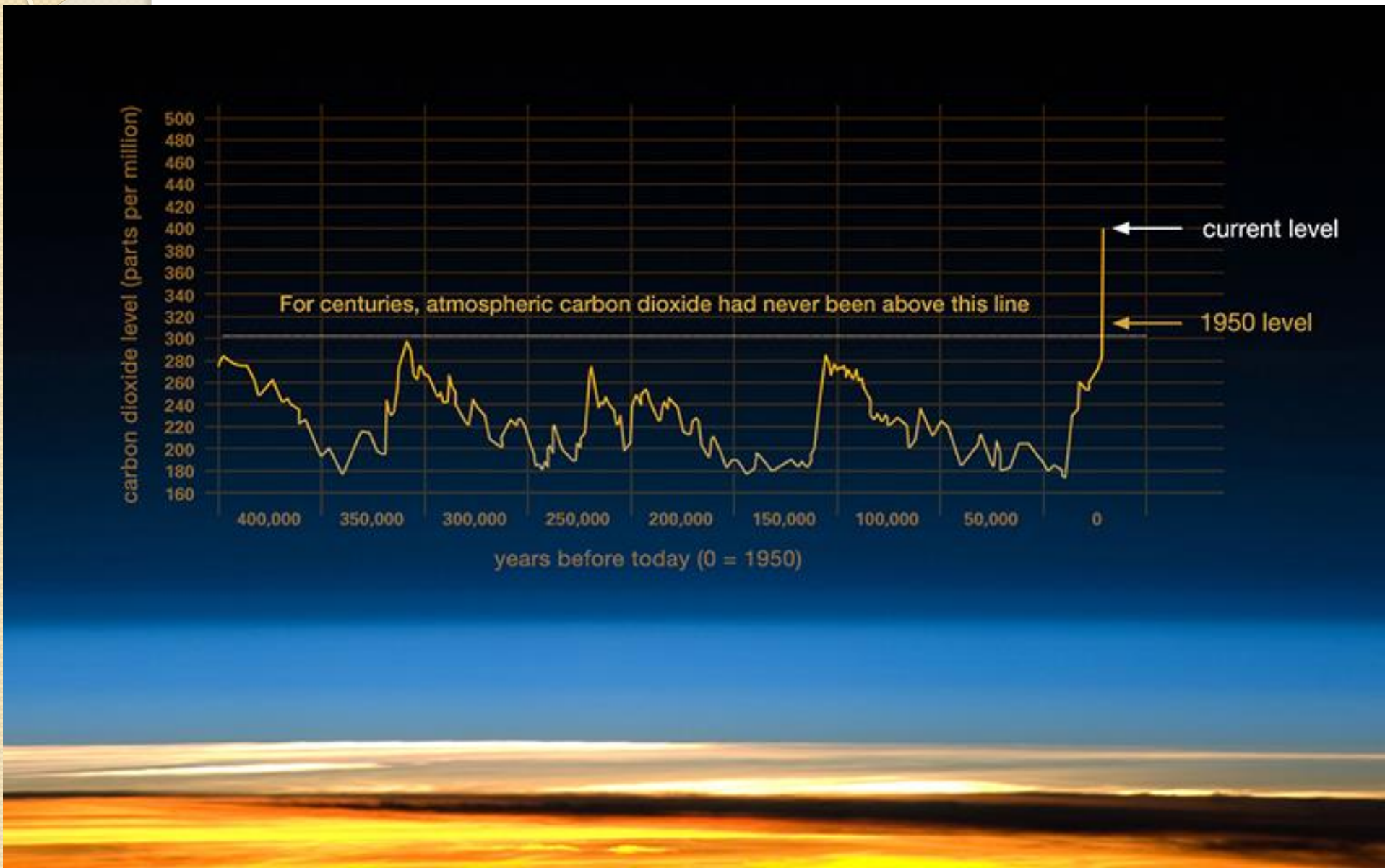
Human Health in the Anthropocene epoch
(Rockefeller/Lancet Commission on Planetary Health 2015)





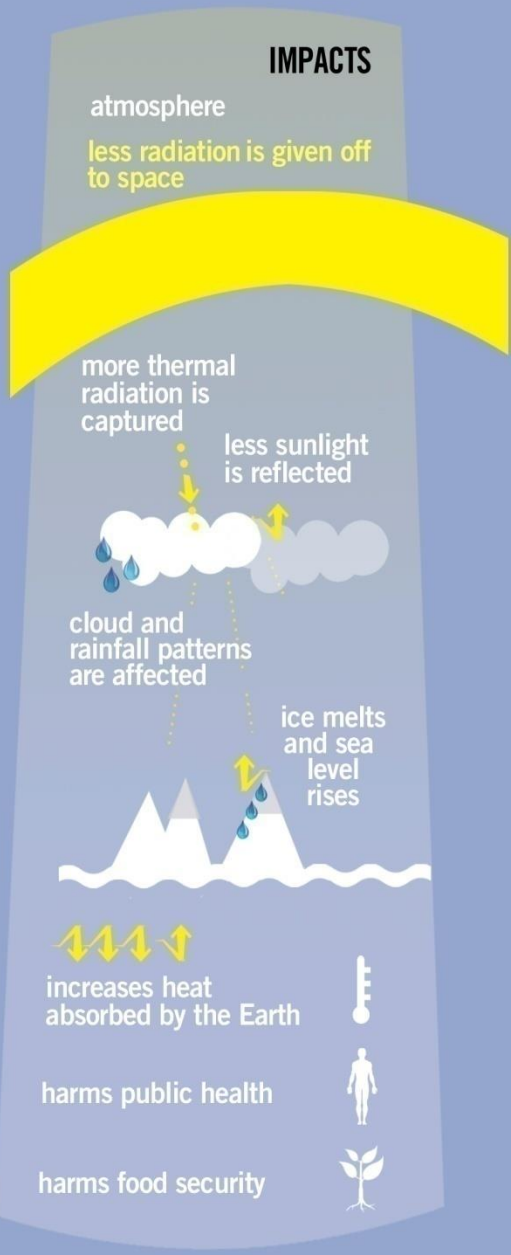


Carbon dioxide trends



What are Short-Lived Climate Pollutants (SLCPs)?

SLCPs	ANTHROPOGENIC SOURCES	IMPACTS/MITIGATION RESPONSE LOCAL ● GLOBAL ◉	LIFETIME IN ATMOSPHERE	CURRENT RADIATIVE FORCING
Near term response to mitigation				
Black Carbon (BC)			days	0.64 Wm^{-2}
Methane (CH_4)			12 years	0.48 Wm^{-2}
Tropospheric Ozone (O_3)			weeks	0.40 Wm^{-2}
Hydrofluoro-carbons (HFCs)			15 years (averaged by weight)	0.02 Wm^{-2}
Long-lived Pollutants				
Longer term response to mitigation				
Carbon Dioxide CO_2	Deep and persistent cuts in CO_2 and other long-lived greenhouse gases are necessary to stabilize global temperature rise through 2100 and beyond		Up to 60% <100 years Up to 25% >1.000 years	1.82 Wm^{-2}



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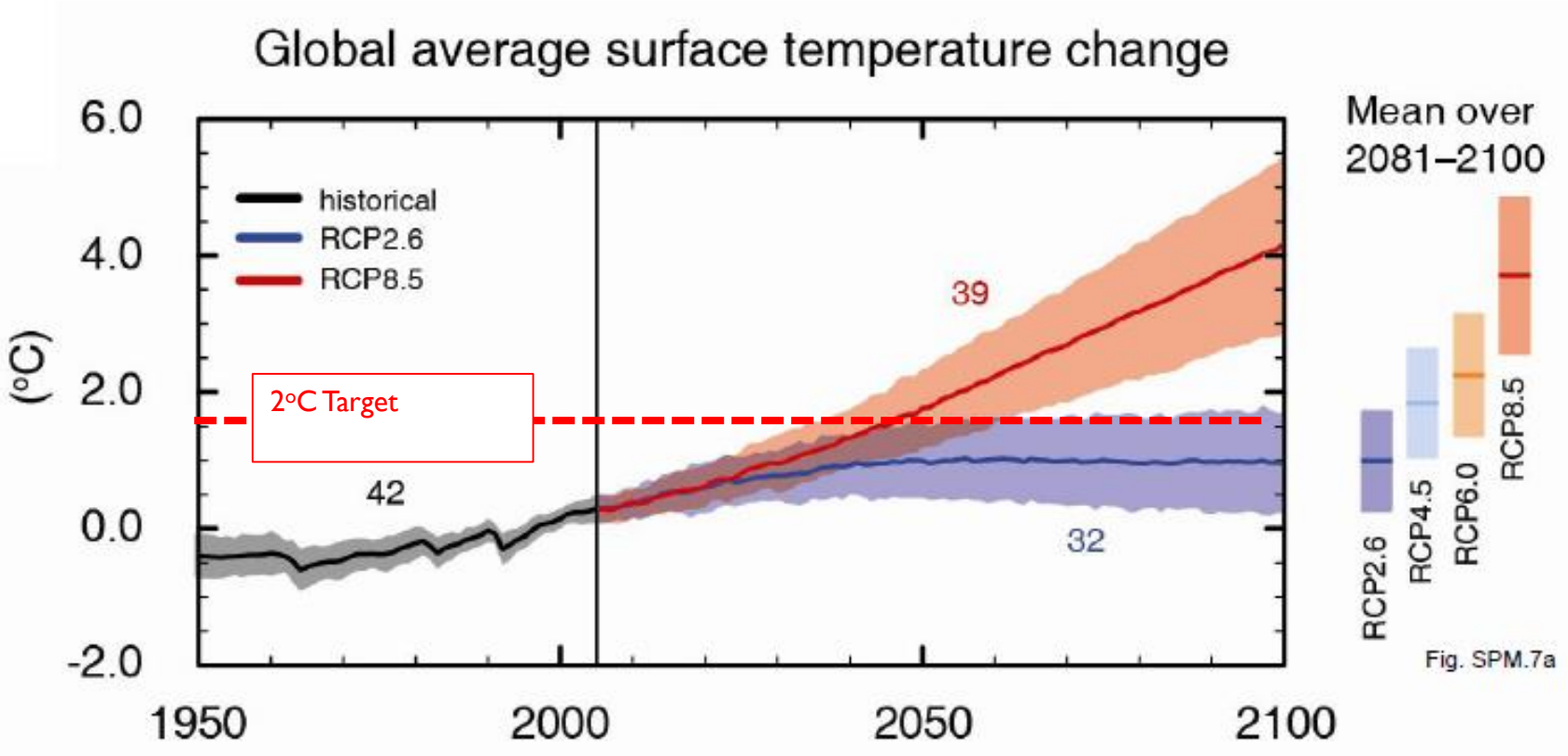
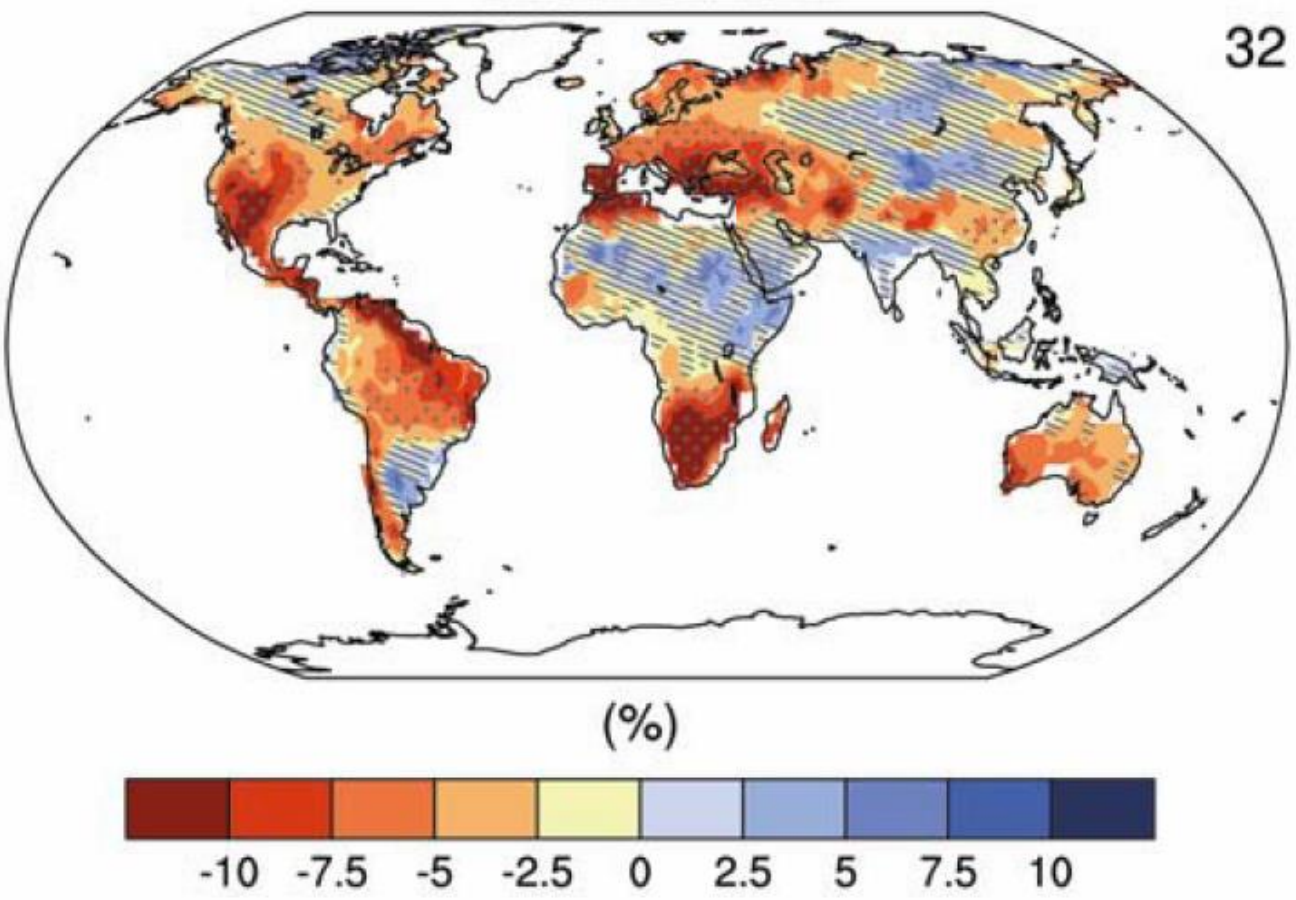


Global surface temperature change for the end of the 21st century is *likely* to exceed 1.5°C relative to 1850 for all scenarios

Projections of soil moisture change 1986-2005 to 2081-2100 for high emission scenario

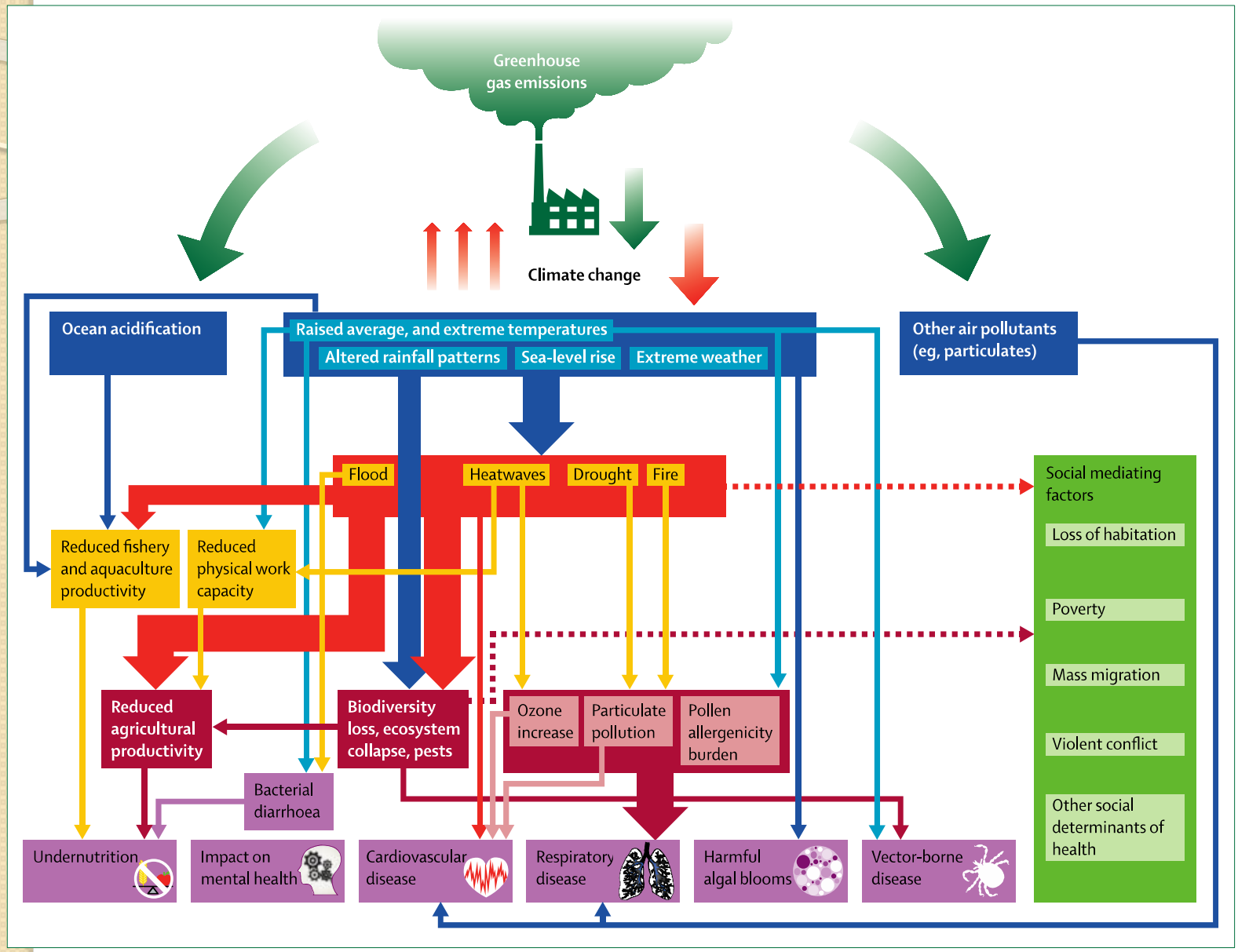


IPCC AR5

The availability of water will be different in a climate changed by our emissions

Just how different depends on how quickly we move to a low-carbon world

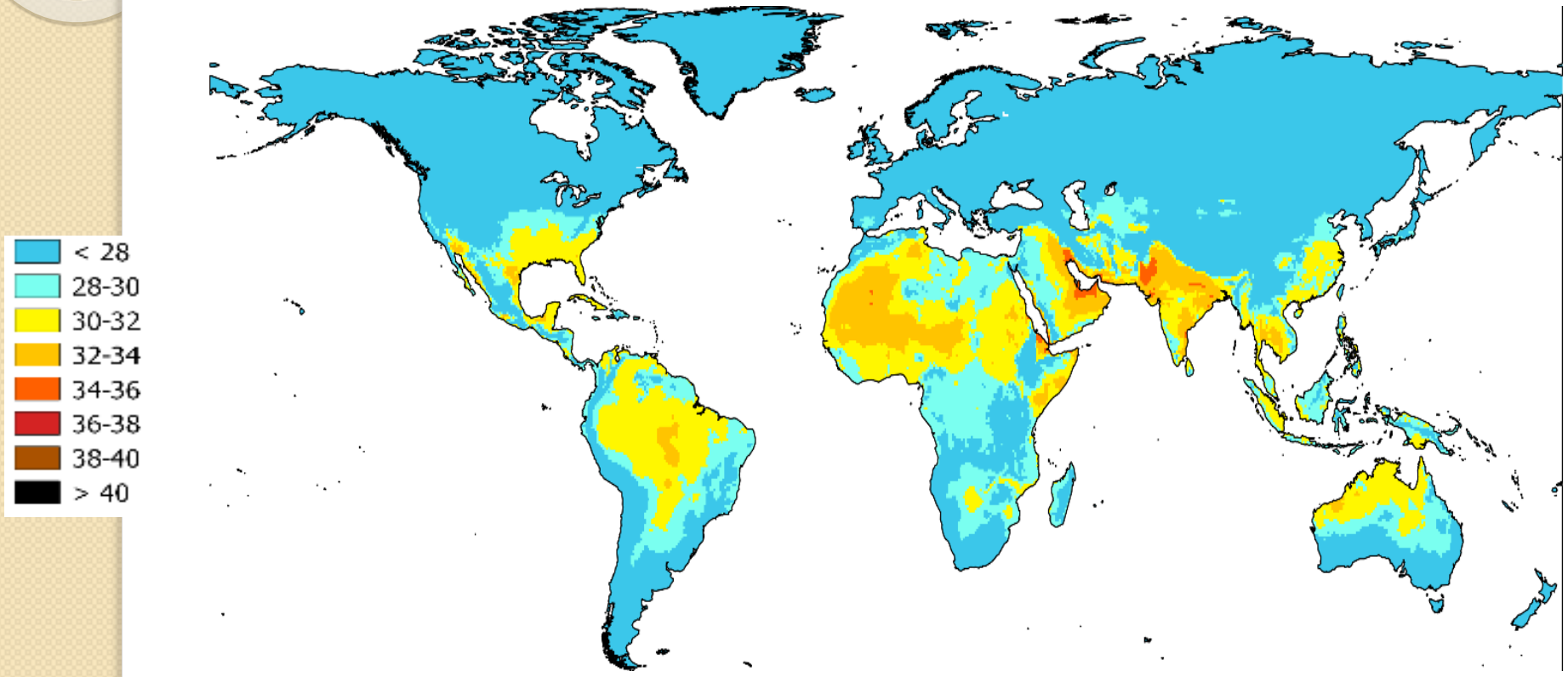
Risk Underestimate? (Lancet Climate Change Commission 2015)



Exposure to thermal stress (monthly mean Wet Bulb Globe Temperature hottest month) late 21 st century

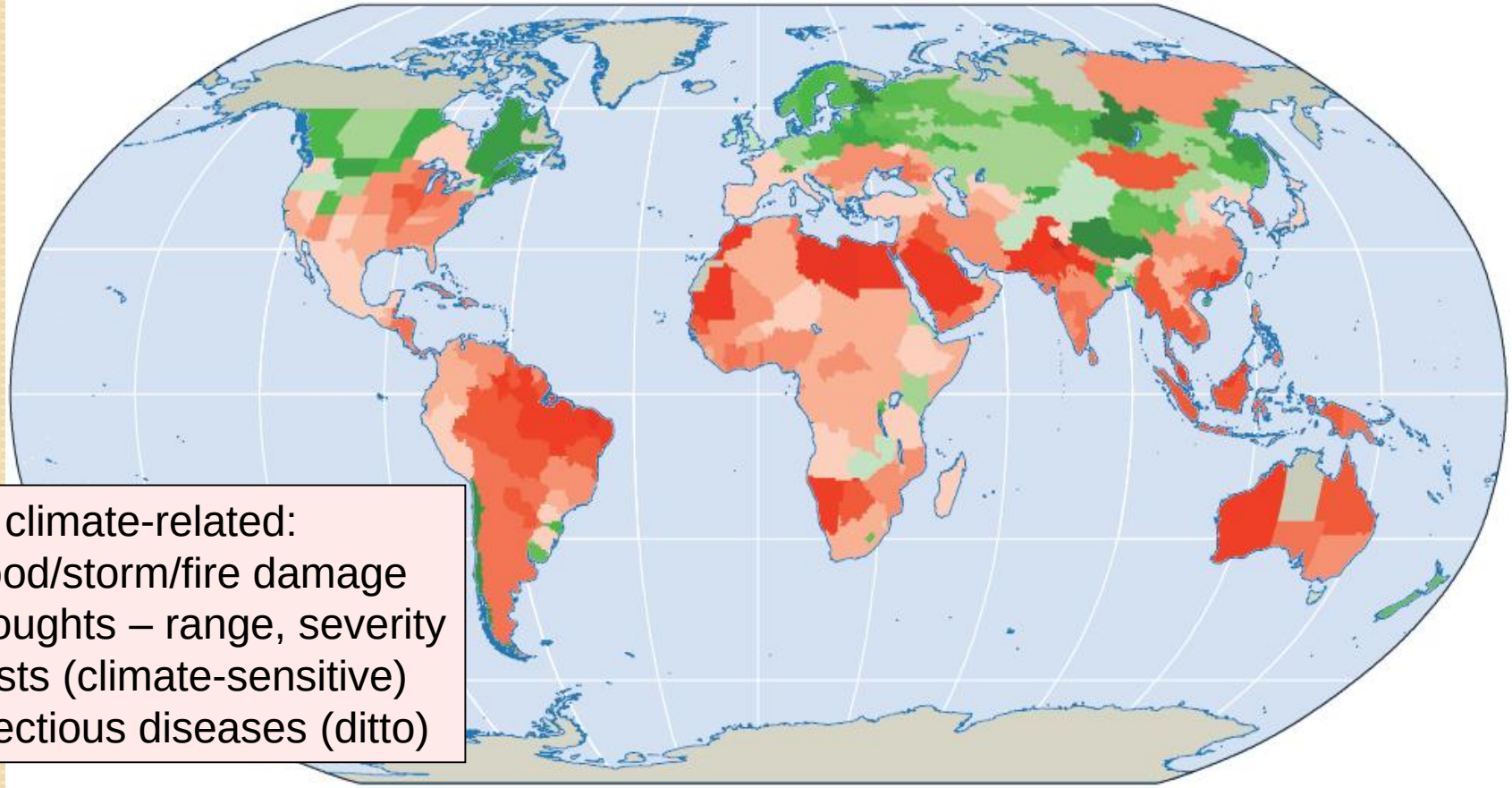
(RCP 6.0 emissions pathway HadGEM2/GFDL midpoint)

Kjellstrom T, Lemke B, Le Quéré C, Otto M, Briggs D, Freyberg C, Haines A unpublished



CLIMATE CHANGE: Poor Countries Projected to Fare Worst

MODELLED CHANGES IN CEREAL GRAIN YIELDS, TO 2050



Plus climate-related:

- Flood/storm/fire damage
- Droughts – range, severity
- Pests (climate-sensitive)
- Infectious diseases (ditto)

UN Devt Prog, 2009

Many millions more people are projected to be flooded every year due to sea-level rise by the 2080s

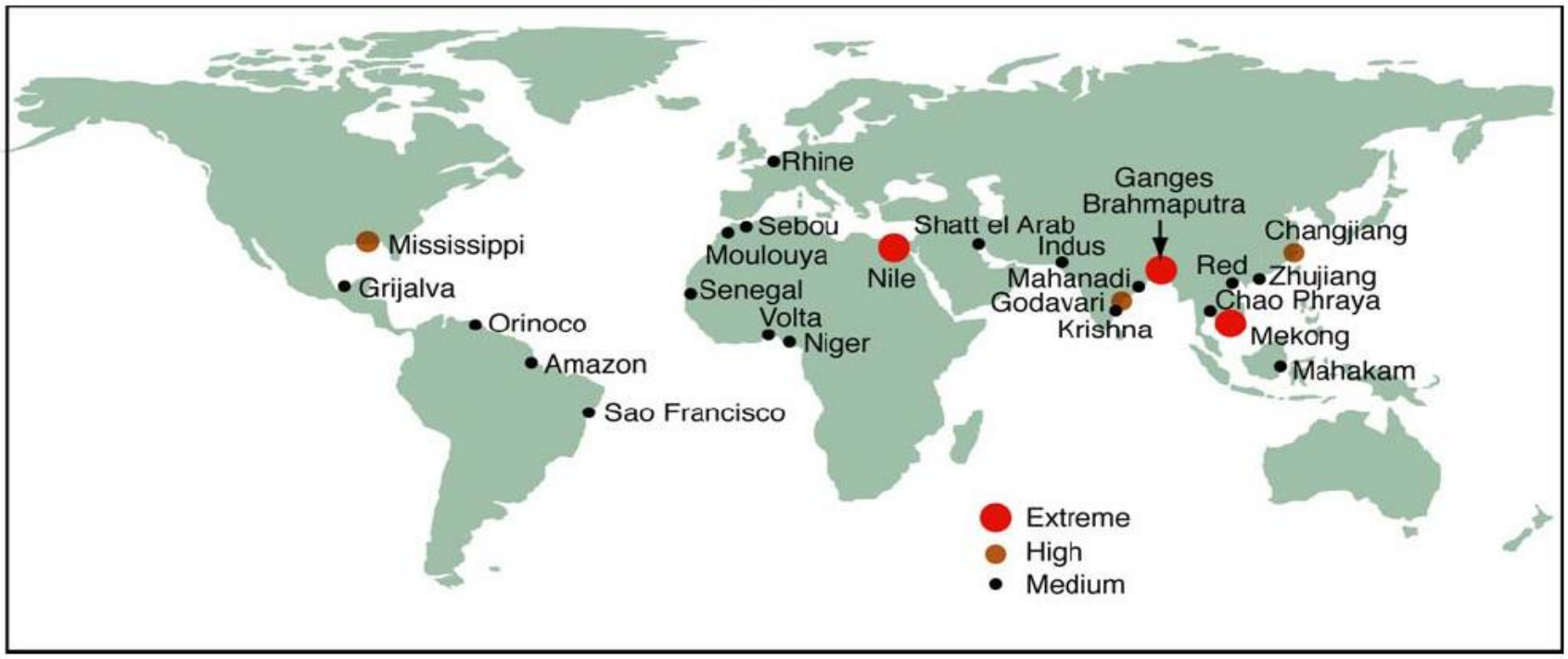


Figure TS-8: Relative vulnerability of coastal deltas as indicated by the indicative population potentially displaced by current sea level trends to 2050 (Extreme ≥ 1 million; high =1 million – 50,000; medium 50,000 – 5000 [B6.3]. Climate change would exacerbate these impacts.

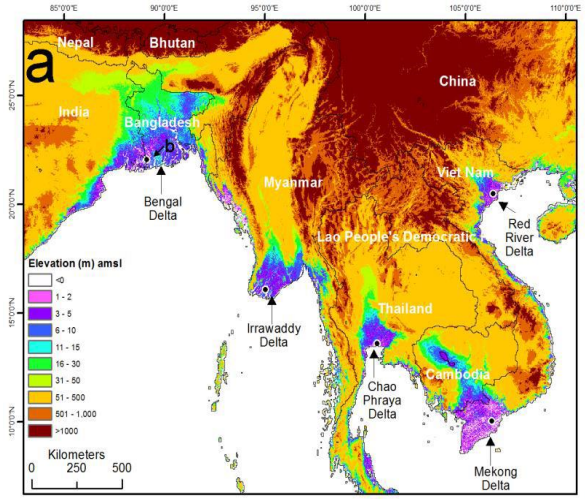
Source: IPCC Wg II, TSI 2007.

Health effects of saltwater intrusion in coastal Bangladesh

Khan *et al* 2014 PLoS One; Scheelbeek *et al* 2016, EHP

- **Unusually high incidence of pre-eclampsia in coastal pregnant women: Significant association with drinking water sodium**
- **Significant reduction in blood pressure, when changing from saline drinking water source, to low-saline (rainwater based) alternative**
- **Odds of hypertension <u>16% lower</u> for each 100mg/l lower sodium concentration in drinking water**

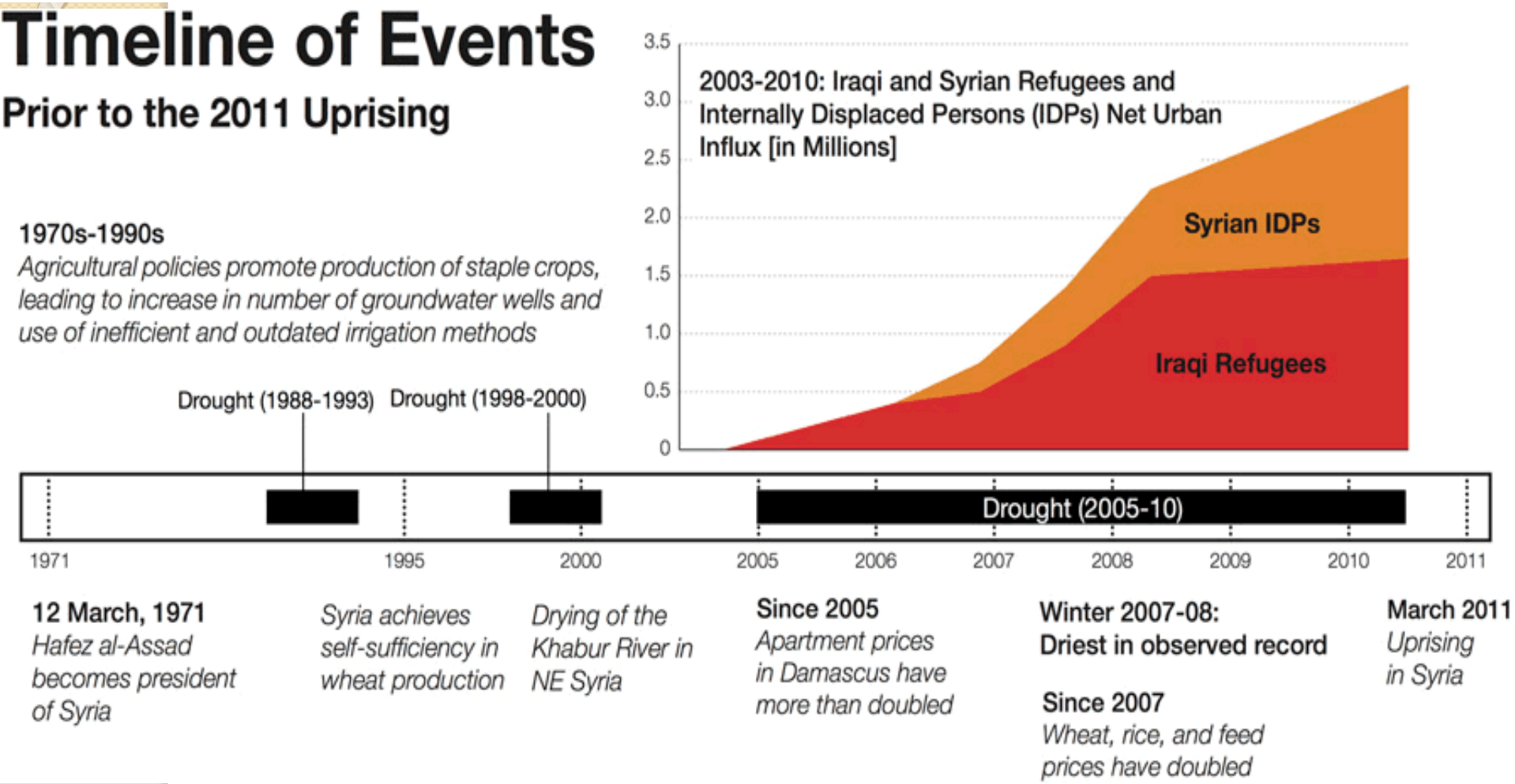
Coastal populations relying on surface/shallow ground water sources



Low-lying coastal areas in South-east Asia, vulnerable to climate change

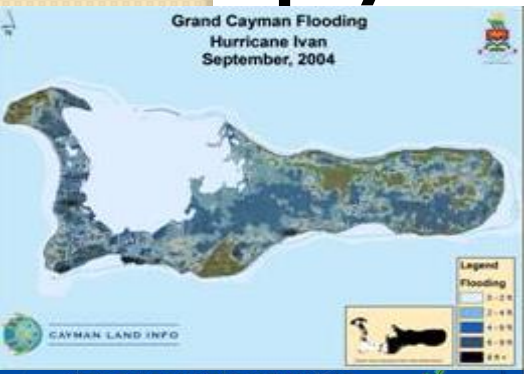
Coastline of Bangladesh

Record drought in Syria – risk more than doubled by climate change



Kelley et al., PNAS 2015

What are the physical, behavioural and technological limits to how much we can adapt- who should pay ?



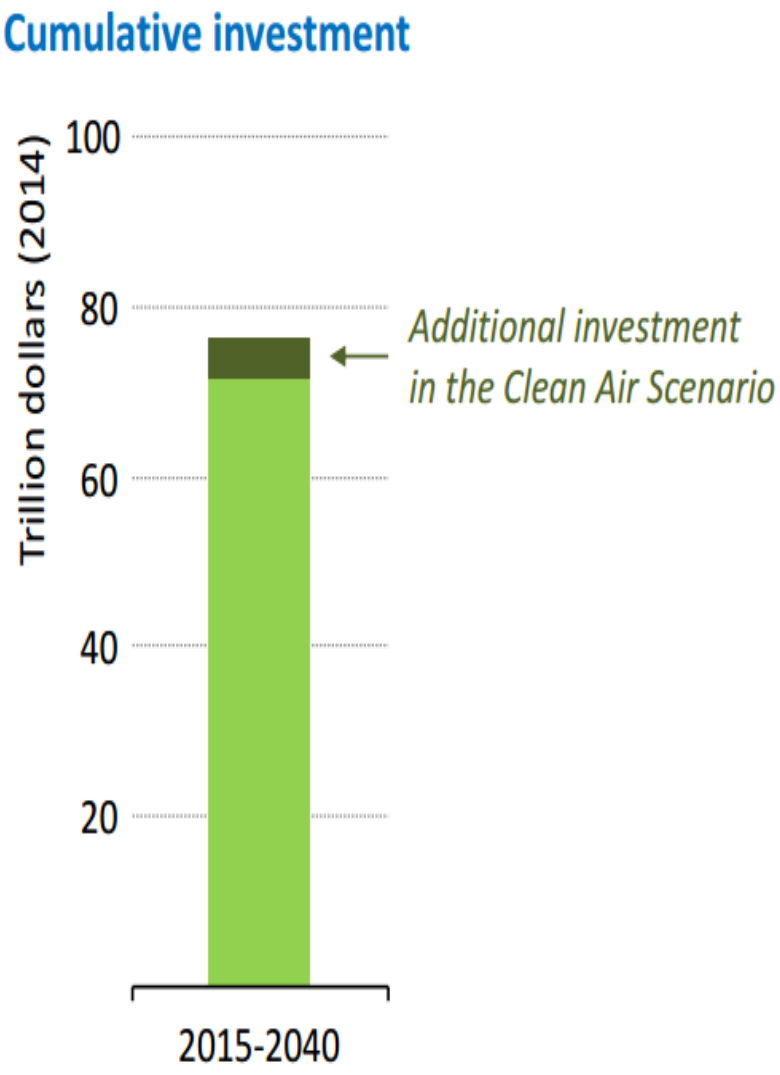
- Physical limits: small low lying islands e.g. Cayman Islands
- Behavioural limits: influence where we live and why, e.g. New Orleans
- Technological limits: e.g. to the flood defences

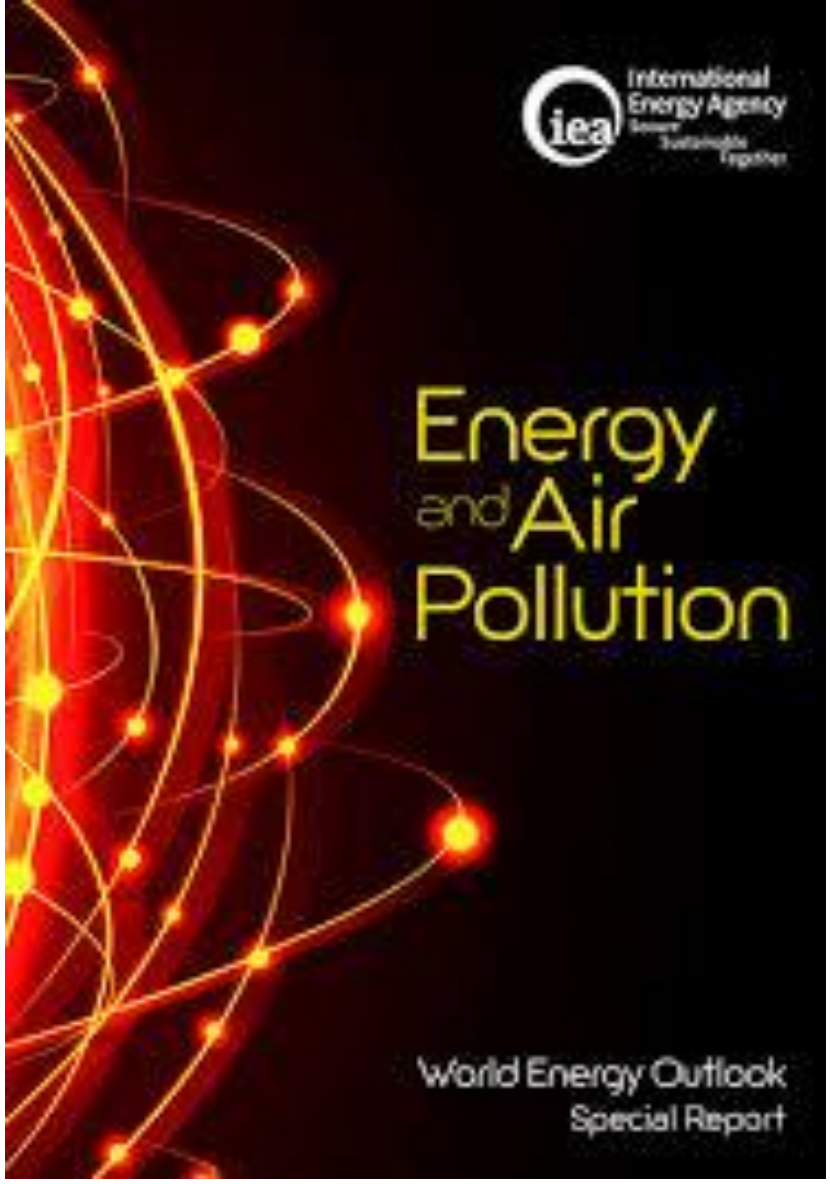
Health co-benefits from the 'low-carbon' economy (avoiding harms)

Through policies in several sectors

e.g.

- **Housing**
- **Transport**
- **Food and agriculture**
- **Electricity generation**





A 7% increase in investment can save over 3 million lives in 2040, while providing energy access for all, lower energy import bills and leading to a peak in CO_2 by 2020

Health Economic Benefits of reducing air pollution through low carbon policies

- **Marginal benefits of avoided mortality $50-380/tCO2 -exceed abatement costs** (West et al Nature Climate Change 2014)

- **Global Fossil fuel subsidies**
- **$5.3 tn. annually (IMF 2015)**

Addressing coal combustion is a priority

Reducing black carbon emissions could prevent 2.4 million (0.7-4.6m) premature deaths annually by 2030 especially in Asia (UNEP2011)

Improved biomass stoves

Modern coke ovens

Remove big smokers / DPF

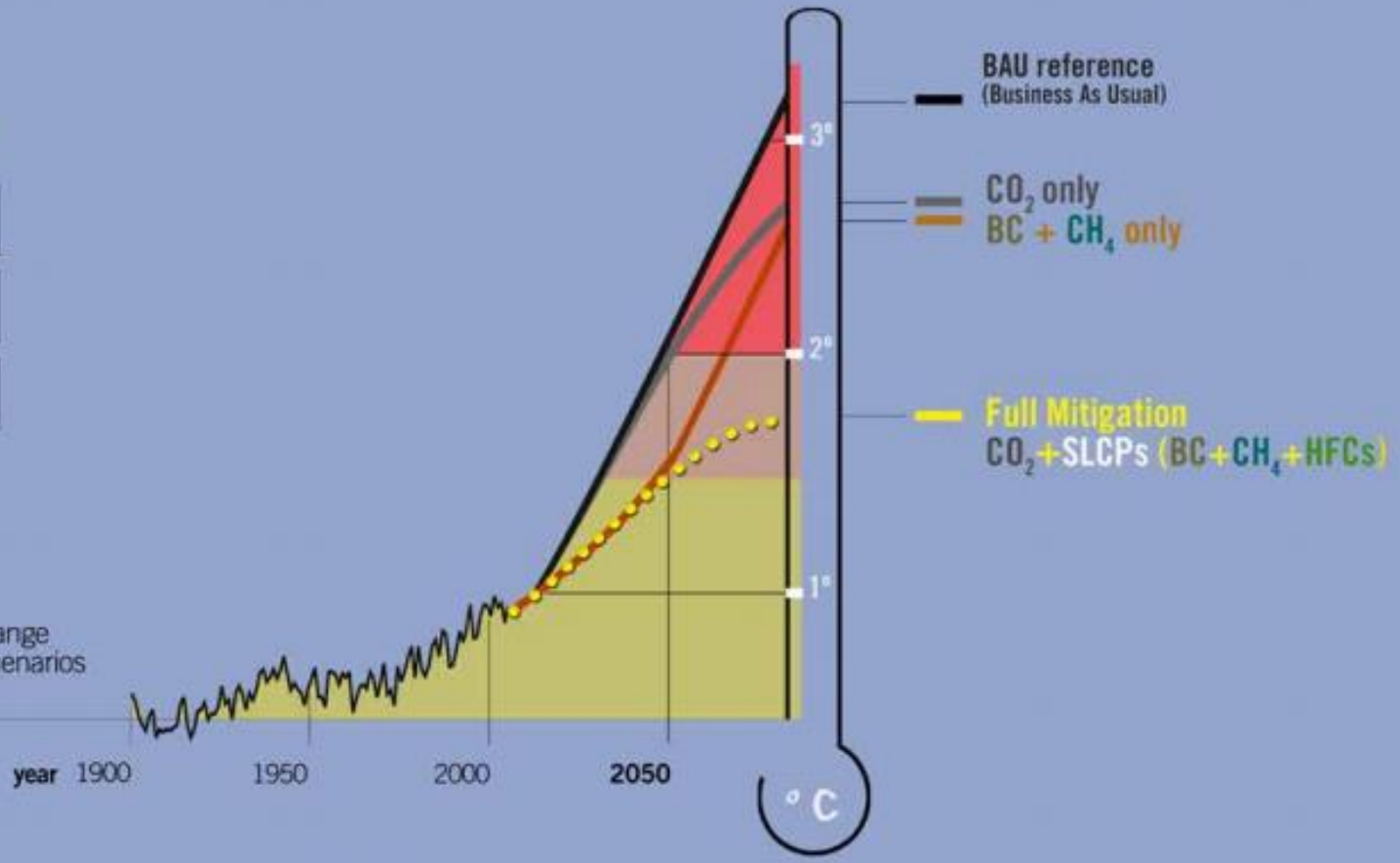
Cooking with clean fuel

Improved brick kilns

SLCP Climate Benefits Avoided global warming

Rapid implementation of SLCP mitigation measures, together with measures to reduce CO_2 emissions, would greatly improve the chances of keeping the Earth's temperature increase to **less than 2°C** relative to pre-industrial levels.

AVOIDED GLOBAL WARMING	by 2050
BC + CH_4	0.5°C
HFCs	0.1°C
SLCPs	0.6°C

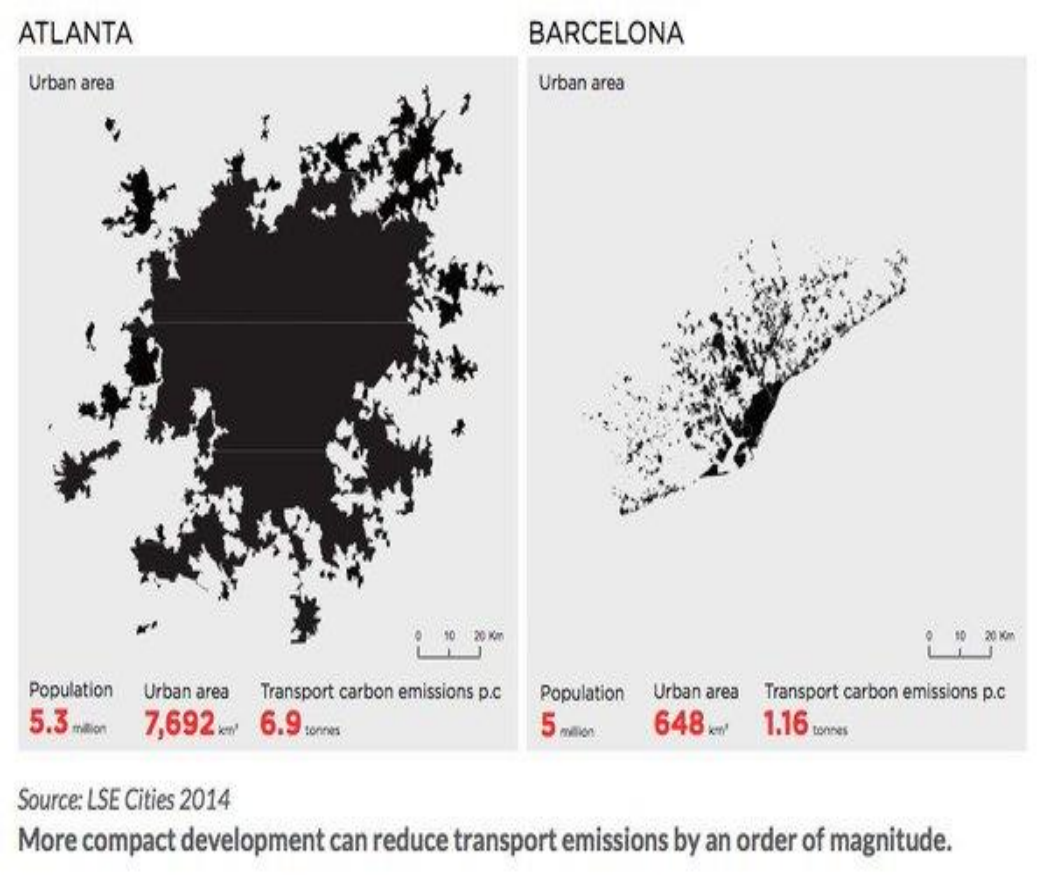


Simulated temperature change under various mitigation scenarios
CO_2, BC, CH_4, HFCs

The Future of Planetary health will depend on cities

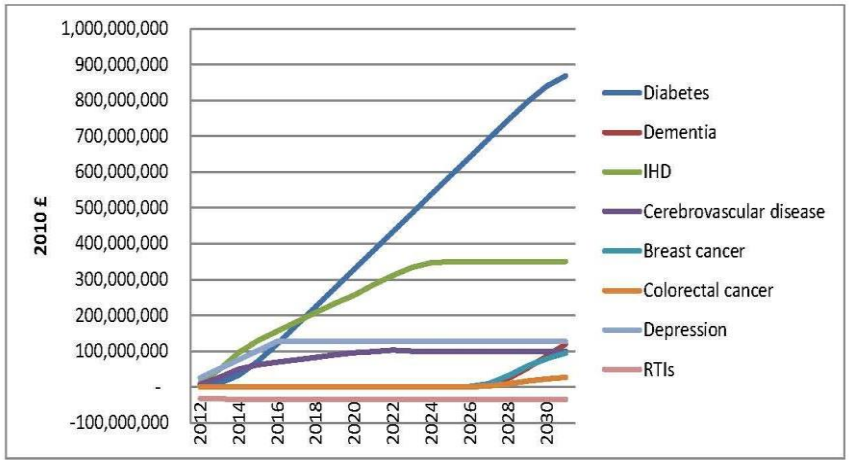
Cities responsible for ~ 85% of global GDP in 2015 and 71–76% of global energy-related greenhouse gas (GHG) emissions.

Newclimateeconomy.report/workingpaper_cities_final_web.pdf 2015



Health benefits of increased active travel and low carbon transport in London, Delhi and São Paulo (Woodcock et al 2009, Jarrett et al 2012 de Sa et al submitted)

Figure 1: Potential annual NHS expenditure averted by year and health outcome from Increased Active Travel scenario



What could cities do for climate change mitigation and adaptation?

Accessible efficient public transport and active travel

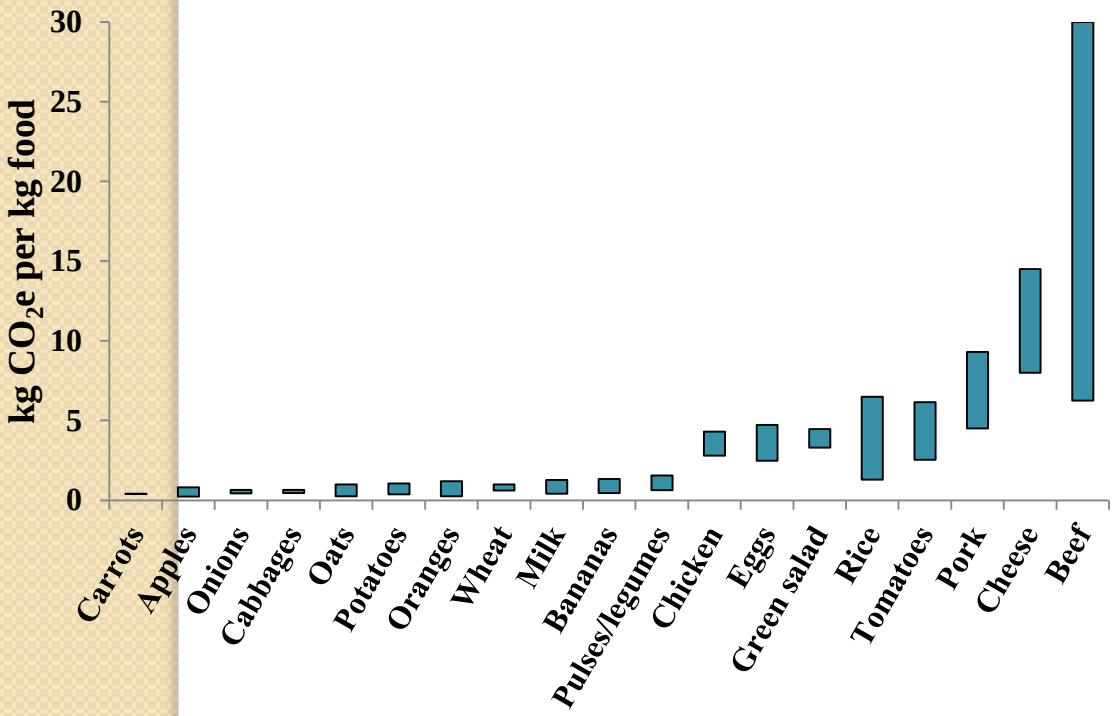
Universal access to clean low carbon energy

Safe access to green spaces and ecosystem strategies for resilience

Housing Improvements Water and Sanitation

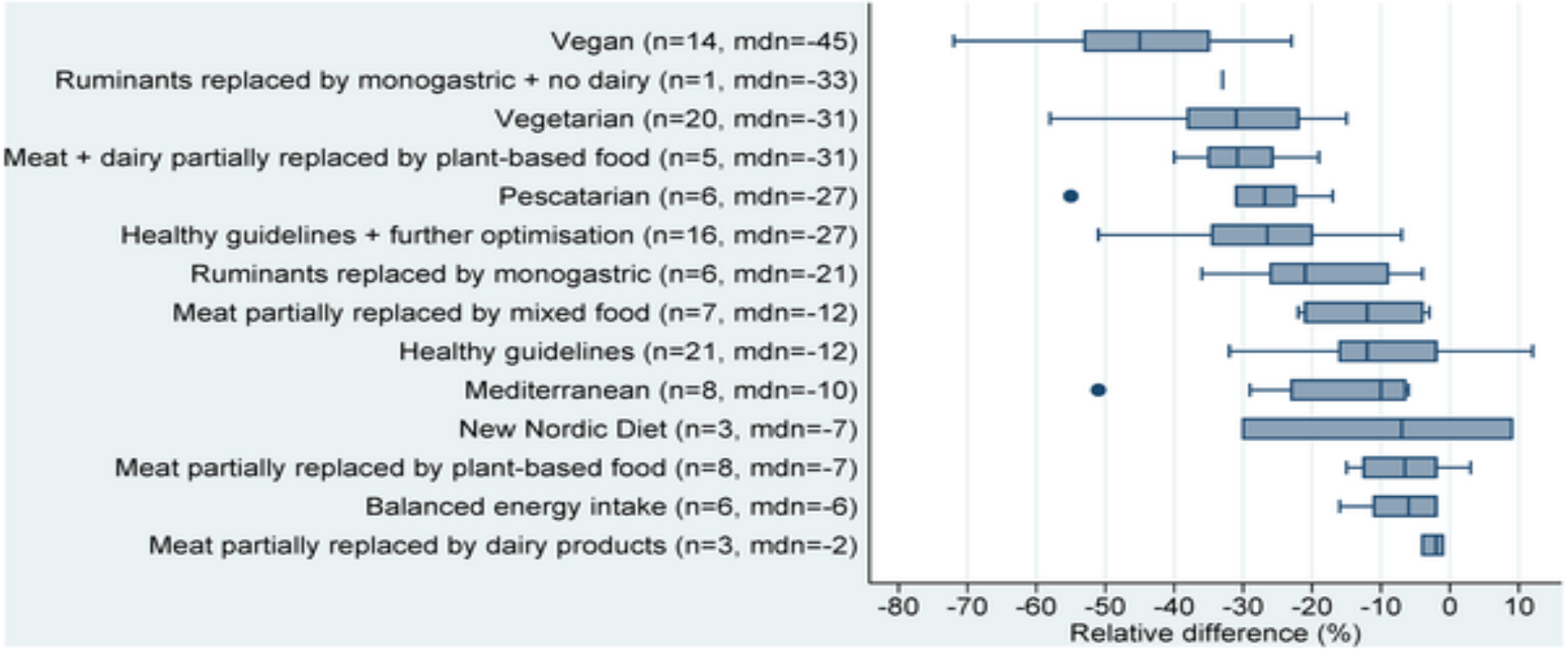
FOOD & AGRICULTURE

Mitigation action	SLCP-related climate benefit	Potential health benefit	Main health benefit(s)	CO_2 reduction co-benefit
Promoting healthy low-GHG (plant-based) diets	High	High	Reduced diet-sensitive chronic diseases	Medium-high
Reducing food waste	Medium-high	Low-medium	Reduced food insecurity/undernutrition	Medium-high



Greenhouse gas emissions from various diets

Fig 2. Relative differences in GHG emissions (kg CO2eq/capita/year) between current average diets and sustainable dietary patterns.



Aleksandrowicz L, Green R, Joy EJM, Smith P, Haines A (2016) The Impacts of Dietary Change on Greenhouse Gas Emissions, Land Use, Water Use, and Health: A Systematic Review. PLoS ONE 11(11): e0165797. doi:10.1371/journal.pone.0165797
http://journals.plos.org/plosone/article?id=info:doi/10.1371/journal.pone.0165797

PLOS ONE

Climate change has far reaching and potentially catastrophic impacts but many 'low carbon' policies can improve health and the economy.