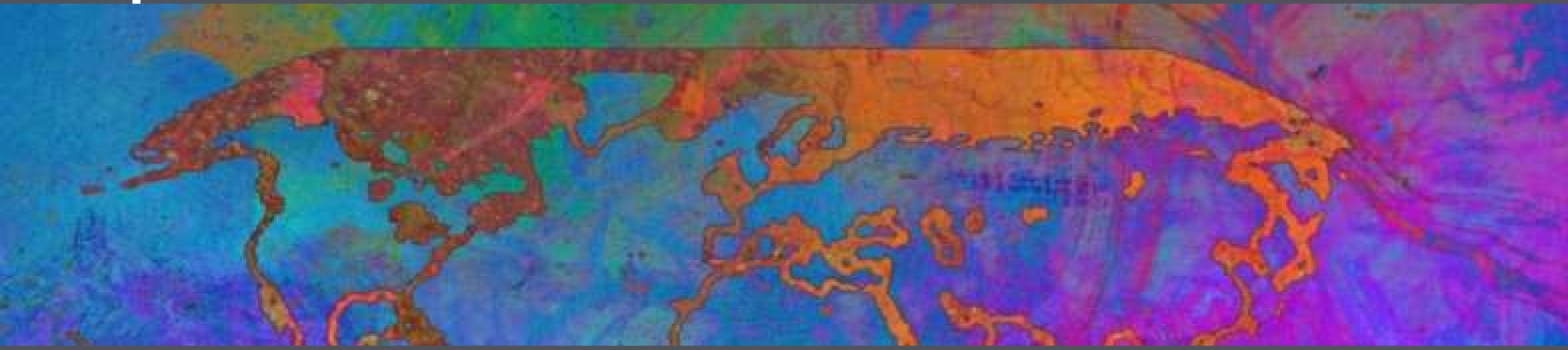
Department of Meteorology
and School of the Build Environment

University of Reading

Highlights from the latest IPCC climate change report and local solutions



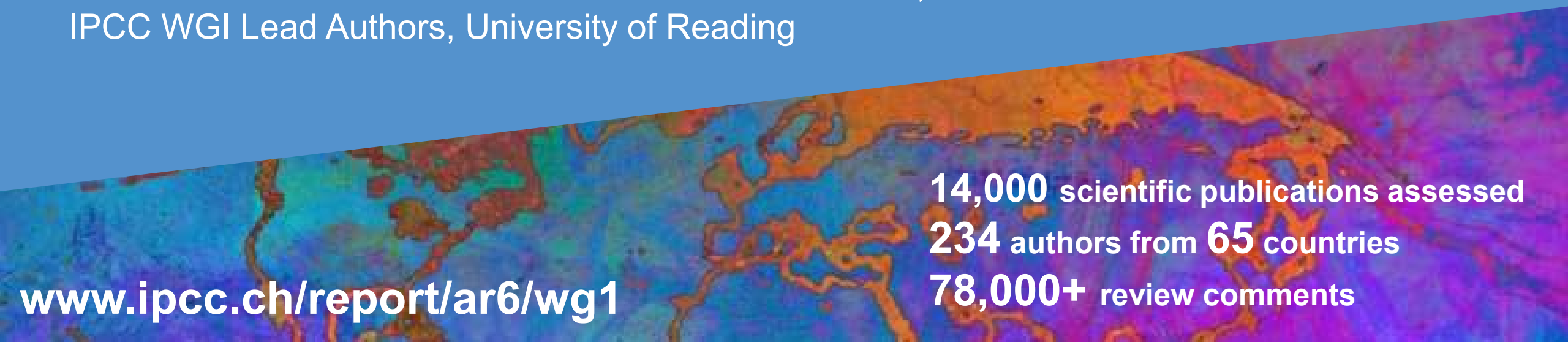
Professor Richard Allan, Professor Nicolas Bellouin and Professor Tim Dixon
University of Reading

SIXTH ASSESSMENT REPORT
Working Group I – The Physical Science Basis

ipcc
INTERGOVERNMENTAL PANEL ON climate change
WMO UNEP

Highlights from the IPCC 2021 climate report

Professor Richard Allan and Professor Nicolas Bellouin,
IPCC WGI Lead Authors, University of Reading



14,000 scientific publications assessed
234 authors from **65** countries
78,000+ review comments

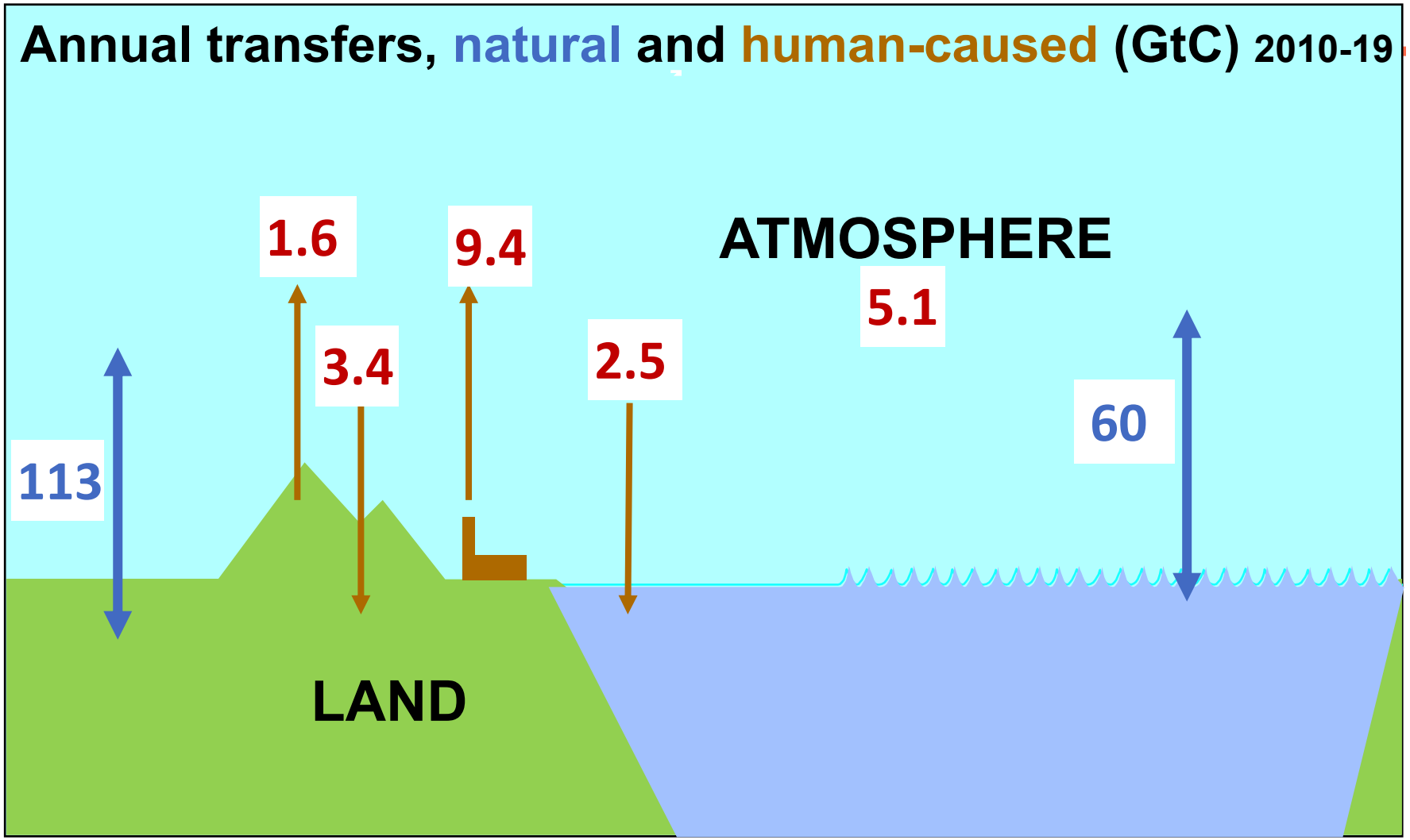
www.ipcc.ch/report/ar6/wg1

Introduction

- Earth's climate has always varied but it is an established fact that human activities are now driving climate change
- Recent changes in climate are widespread, rapid and unprecedented in thousands of years.
- Human activities are intensifying extreme climate events, including heat waves, heavy rainfall, and droughts
- Every bit of global warming increases the magnitude of warming and the severity of climate extremes
- Limiting warming to 1.5°C requires immediate, rapid, and large-scale reductions in greenhouse gas emissions

Natural & human-made carbon cycles

University of Reading

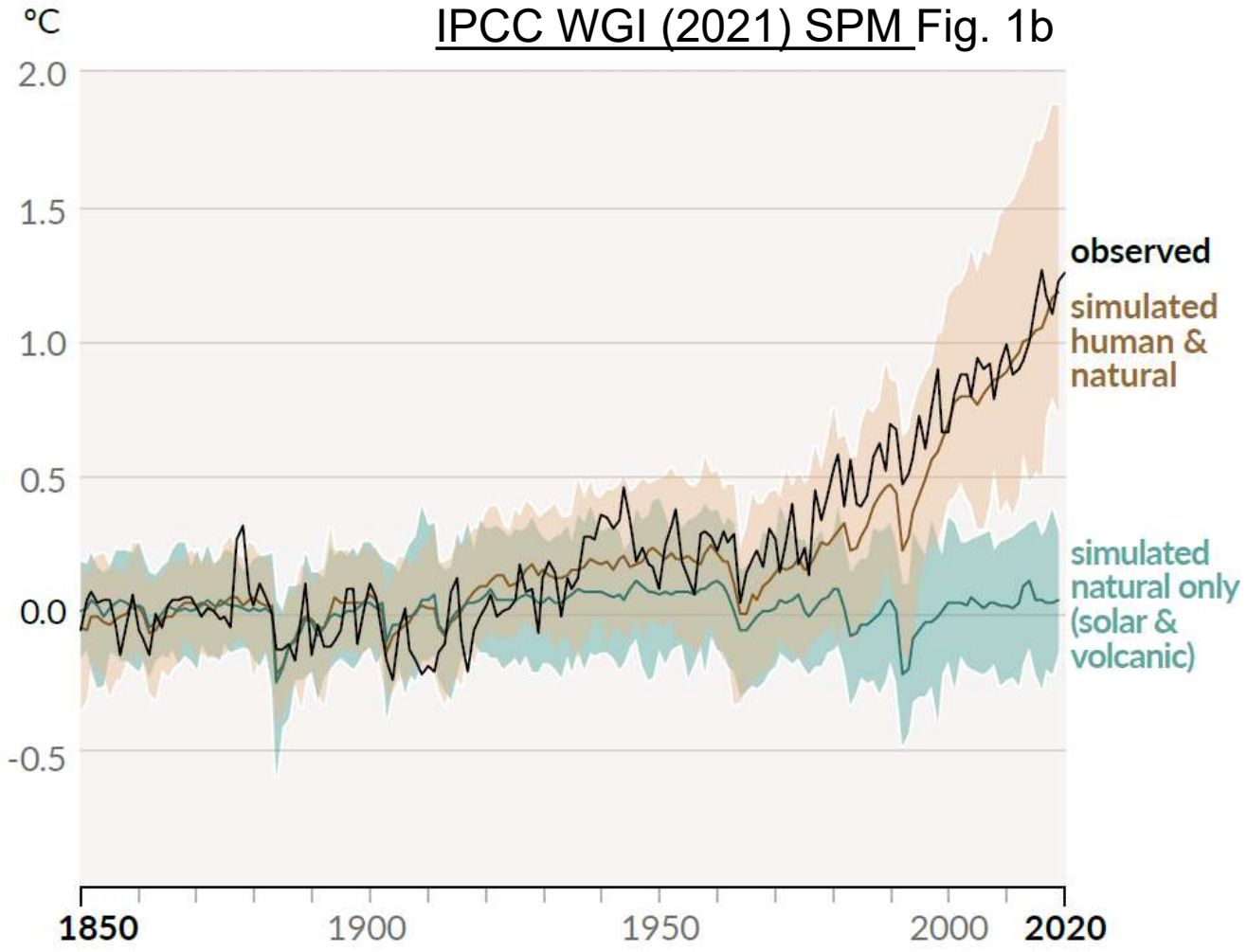


- Human activities have tipped the natural carbon cycle out of balance
- This is driving increases in atmospheric CO_2 concentrations
- CO_2 concentrations highest in at least 2 million years

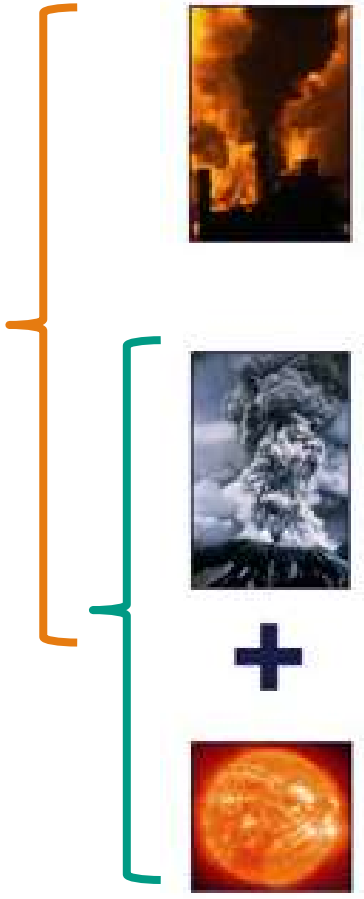
Values in billions of tonnes of Carbon per year from IPCC (2021) Ch5

Warming is caused by human activities

University of Reading



IPCC WGI (2021) SPM Fig. 1b



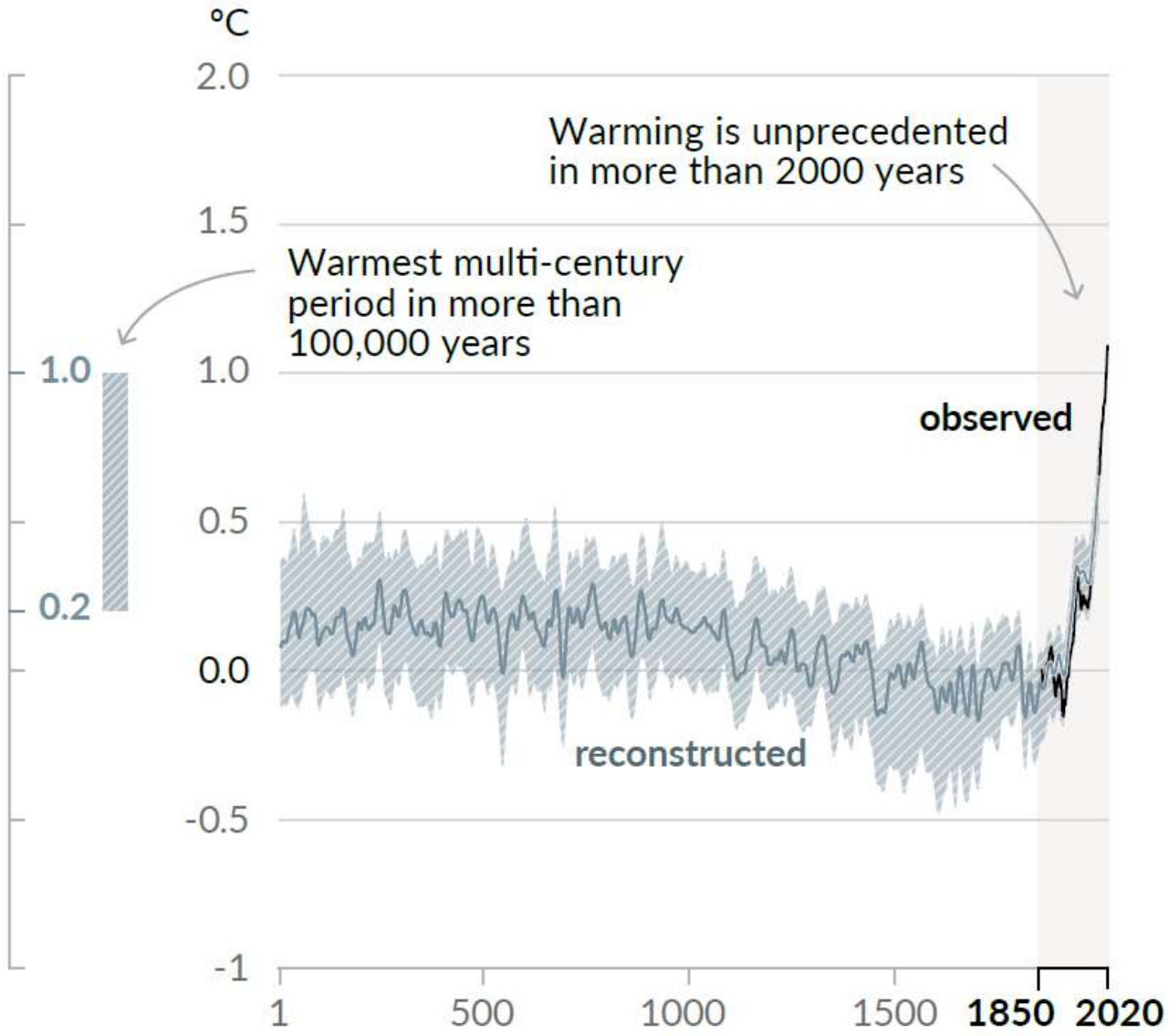
► Warming of climate is driven by human caused greenhouse gas emissions

► Warming is amplified by feedback loops involving ice, water vapour & clouds

► Some of warming has been masked by aerosol particle pollution

► Natural factors cannot explain warming over past 5 decades

Warming is unprecedented in millennia



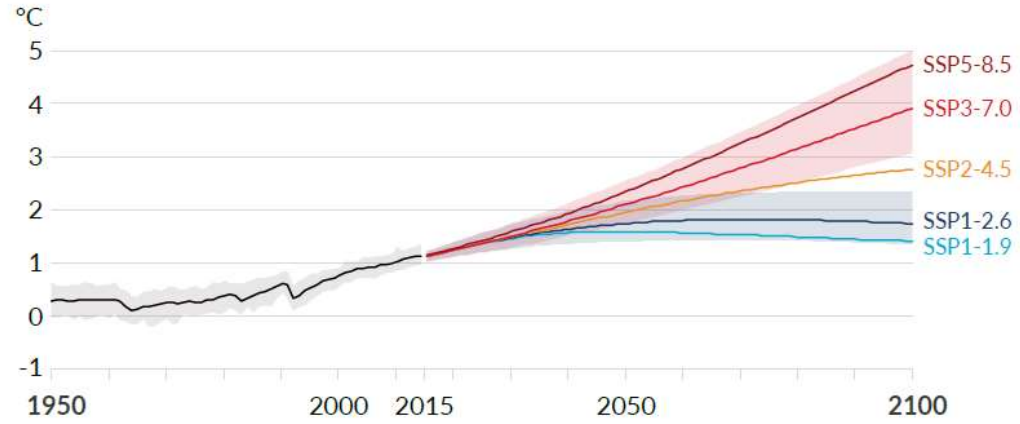
- Global mean surface temperature increased faster since 1970 than in any other 50 year period over at least the last 2000 years
- Warmth of past decade comparable to last interglacial 125,000 years ago (when peak sea level was 5-10m higher than today)

[IPCC WGI 2021 SPM]

FUTURE PROJECTIONS

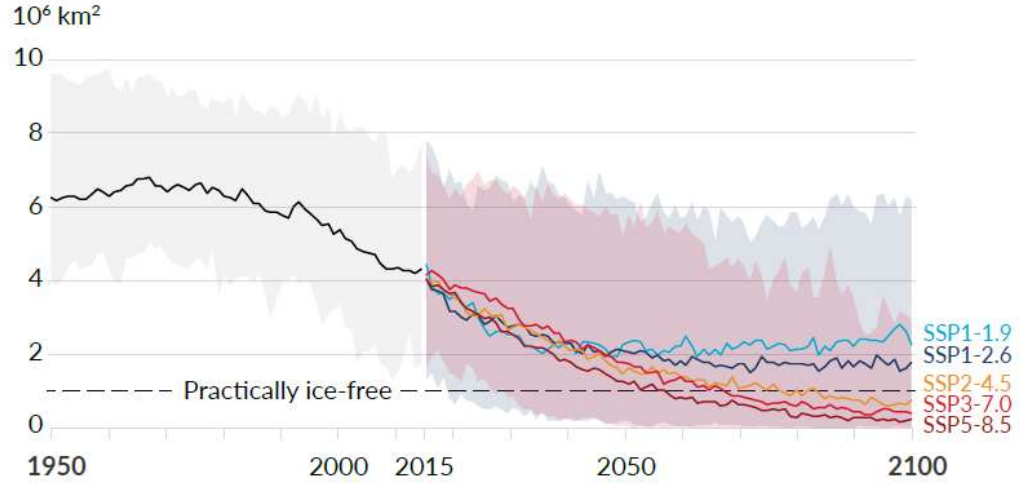
High emissions
Low emissions

a) Global surface temperature change relative to 1850-1900

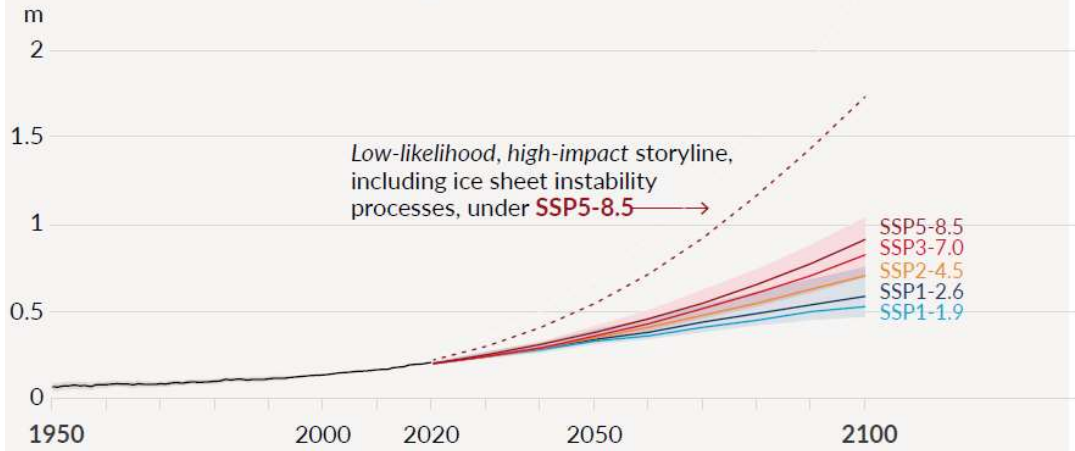


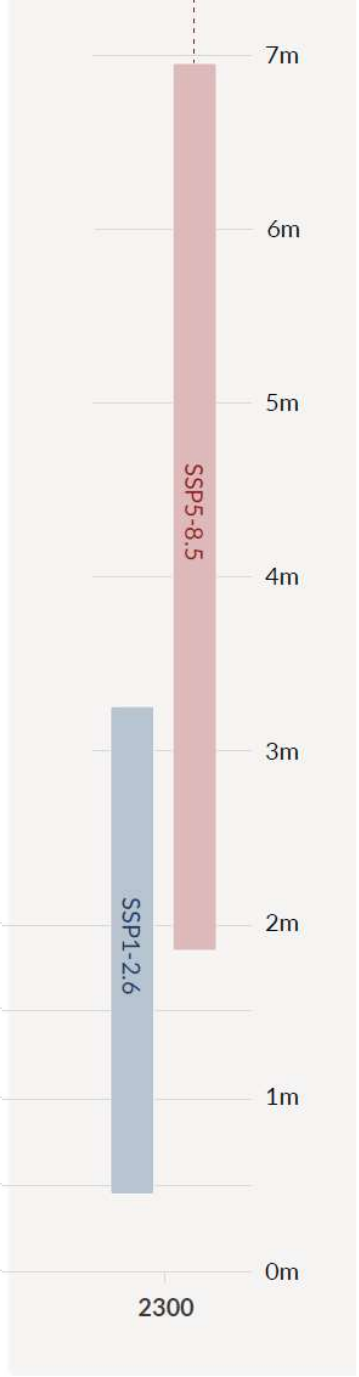
Global warming of 1.5°C and 2°C will be exceeded during the 21st century unless deep reductions in CO_2 and other greenhouse gas emissions occur in the coming decades
[IPCC (2021) WG1 SPM]

b) September Arctic sea ice area



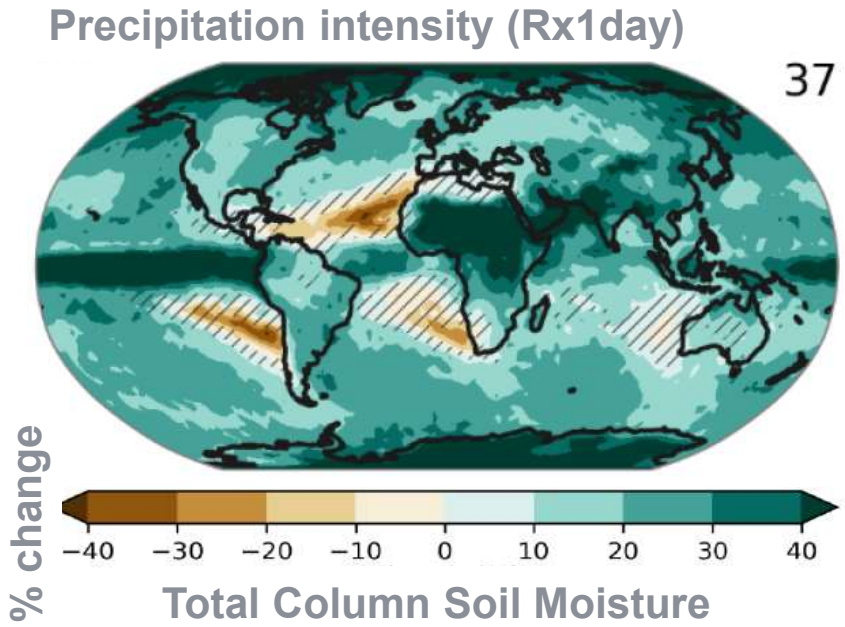
d) Global mean sea level change relative to 1900



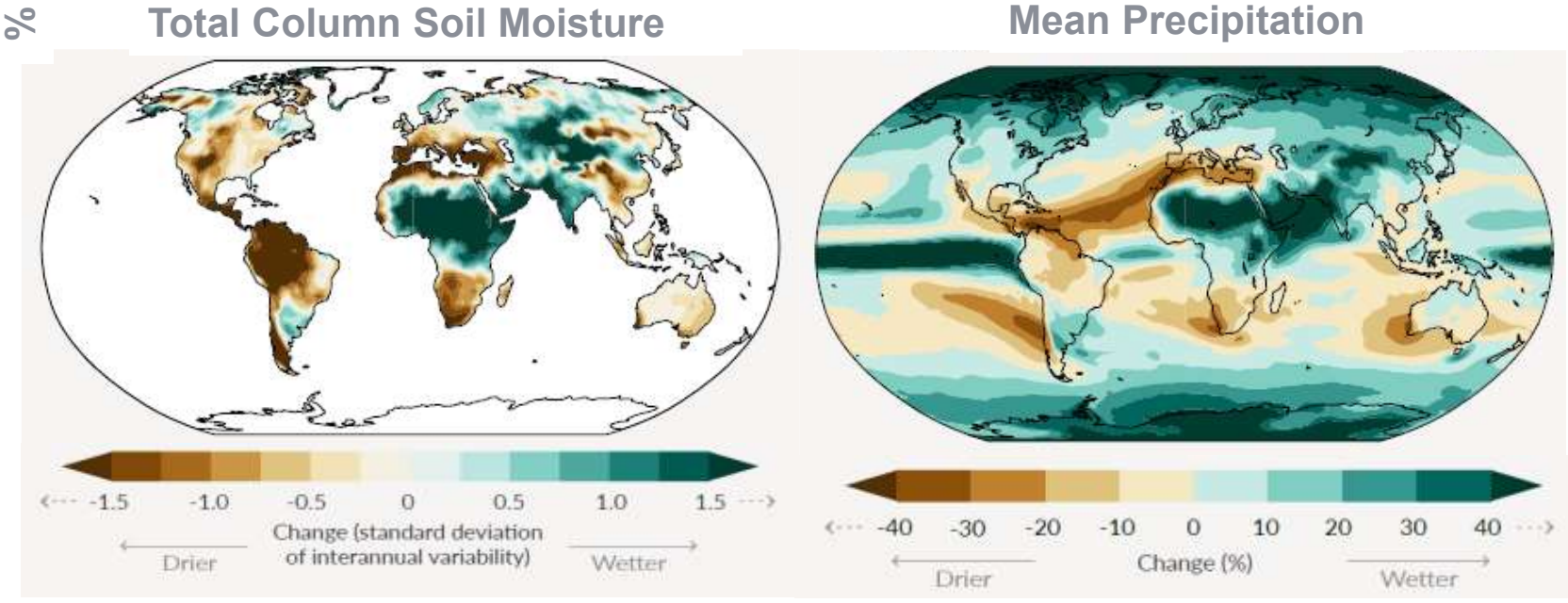


Water cycle changes at 4°C warming

University of Reading



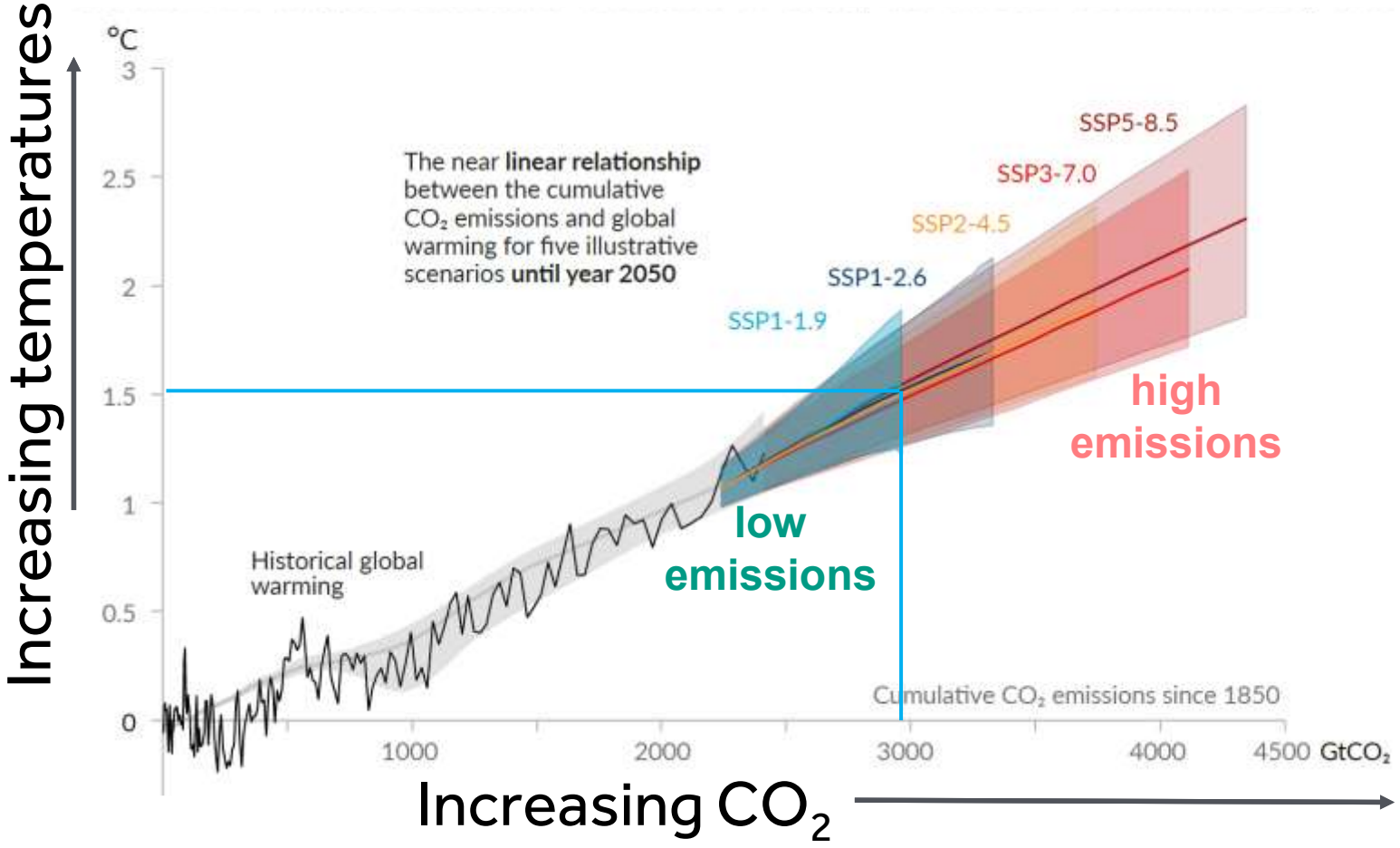
- The water cycle intensifies with warming
  - More intense rainfall
  - More severe droughts (and hot extremes)
  - Wet events wetter, dry events drier
  - Increased variability (day to day, year to year)



IPCC WG1 (2021)
Chapters 11, 4, 8 and SPM

Mitigation of Climate Change

Each 1000 billion tonnes of CO_2 emission increases global temperature by about 0.5°C [IPCC WGI 2021 SPM]



- Act now

  To keep future options open

- Act everywhere

  Efforts in all sectors are needed to reach global zero CO_2 emissions

- Act thoughtfully

  Develop strategies maximising synergies and taking into account the local context, use a wide array of measures and actions

- Act jointly

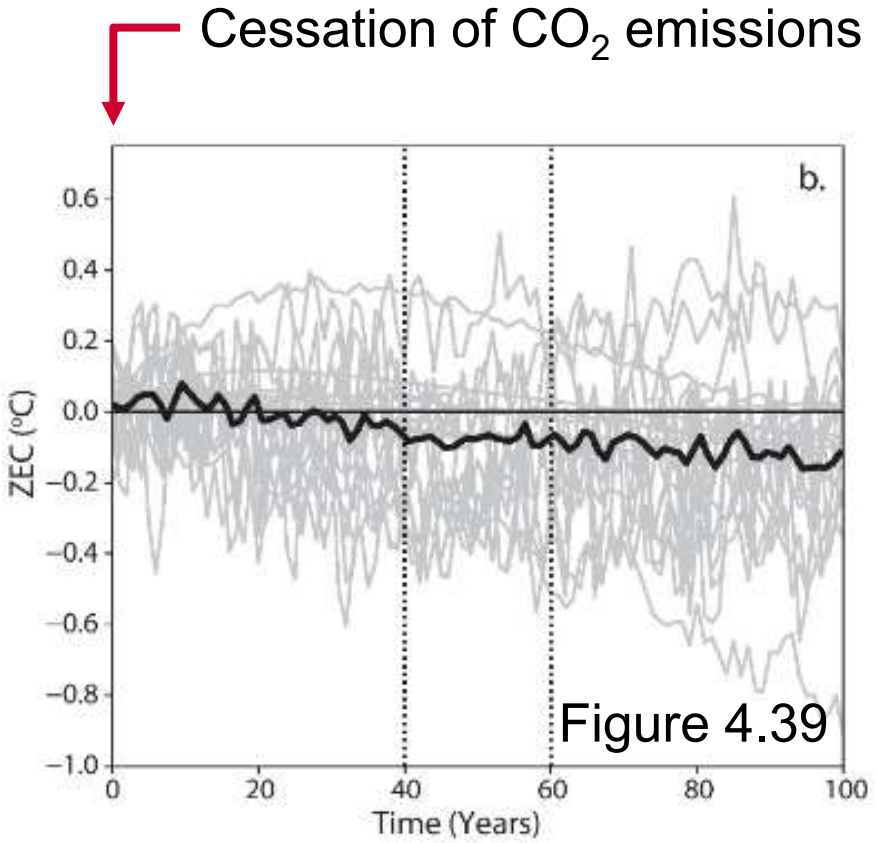
  Collaboratively and including national and sub-national authorities, civil society, the private sector and local communities

Joeri Rogelj (IPCC AR6 & SR1.5 author)

Positive news on committed warming

- The AR6 estimate confirms the estimate made in the Special Report on 1.5°C of no further CO_2-induced warming or cooling once global CO_2 emissions reach and stay at next zero.

- But past greenhouse gas emissions have committed the global ocean to future warming and global mean sea level will continue to rise for thousands of years, even if future CO_2 emissions are reduced to net zero and global warming halted.



Depends on balance between ocean heat uptake and uptake of carbon dioxide by land and ocean.

Positive news on pathways to 1.5°C

It is advisable to limit global warming to 1.5°C

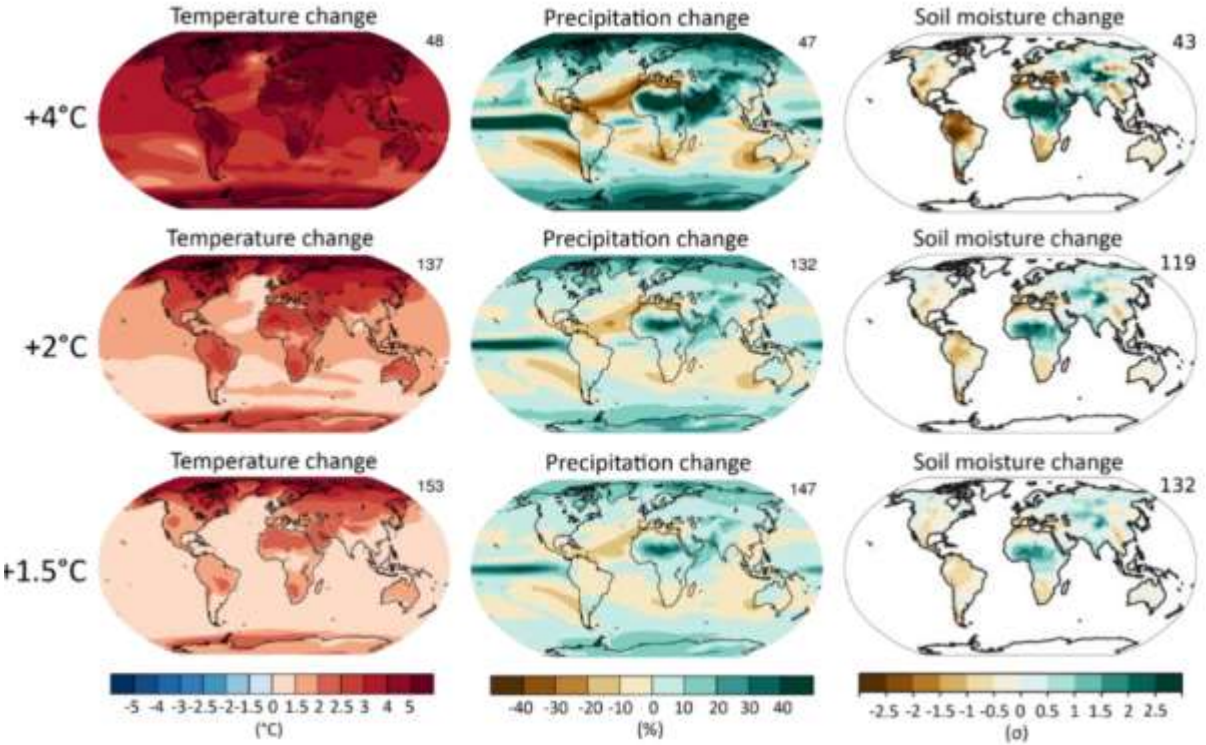


Figure TS.5

Five future emission scenarios: some of the many possible choices we can make now.

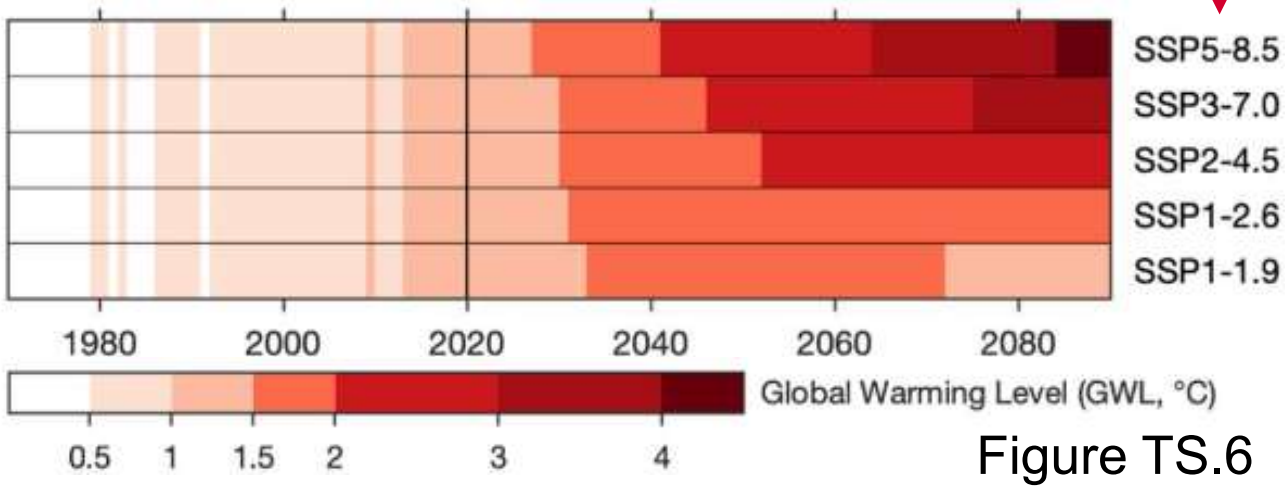


Figure TS.6

It is still physically possible to limit global warming to 1.5°C, but that requires deep reductions in CO_2 and other greenhouse gas emissions in the coming decades.

Positive news on climate feedbacks

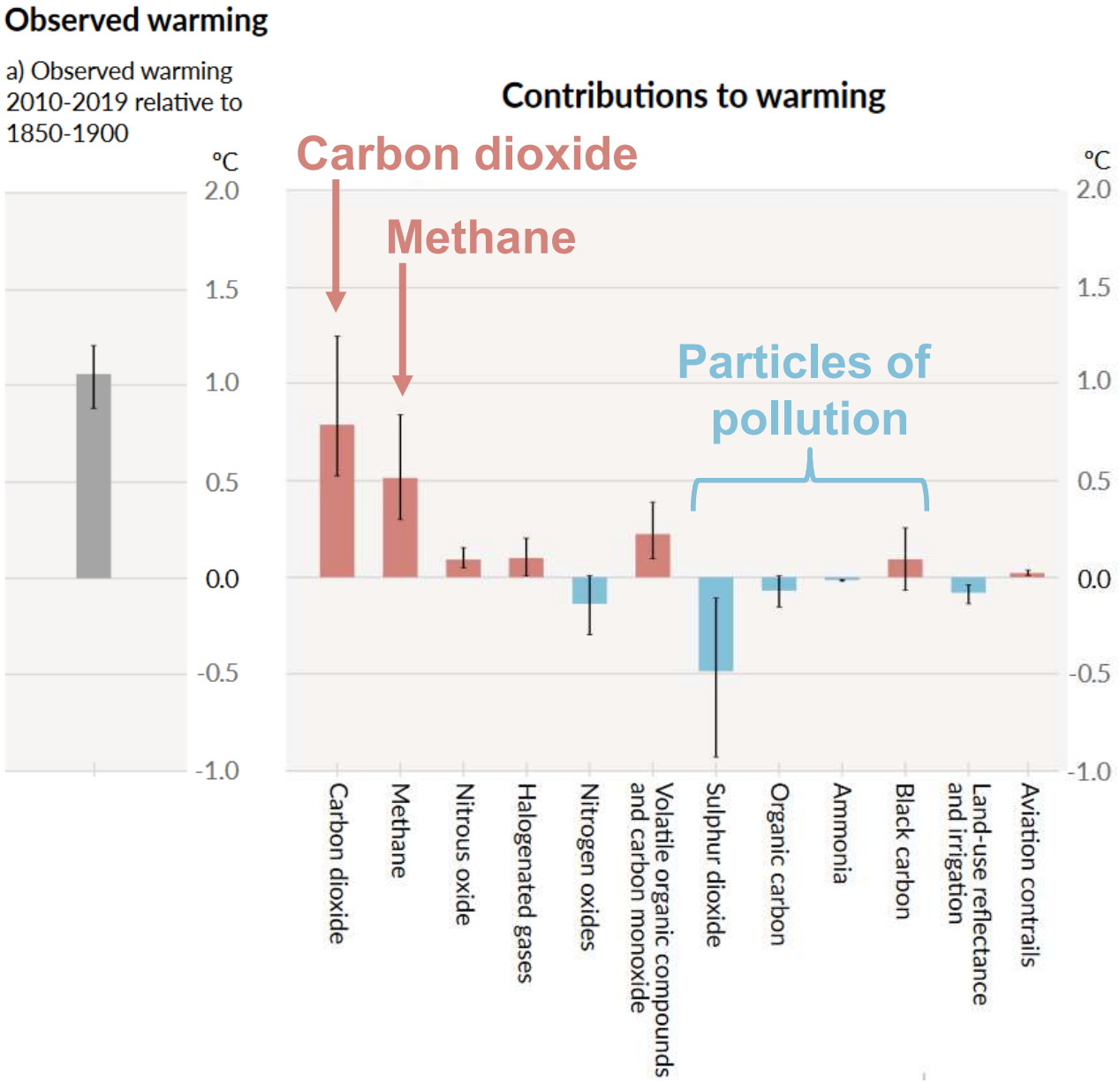
University of Reading

- Since the year 1850, human activities have emitted 2390 ± 240 billion tons of carbon dioxide. In 2019, we emitted just under 40 billion tons.

- To have two out of three chances to stay under 1.5°C of global warming, we cannot emit more than 400 extra billion tons of CO_2.

- That carbon budget has been reduced by “only” 26 ± 97 billion tons by natural climate feedbacks.
  - Methane release from permafrost thaw and ocean clathrates
  - Carbon dioxide and methane release from increased wildfires activity
  - Many other smaller mechanisms involving ozone, methane, and particulates
- But there is low confidence in the strength of those feedbacks, which becomes larger and more uncertain with high carbon dioxide emissions.

Positive news on methane



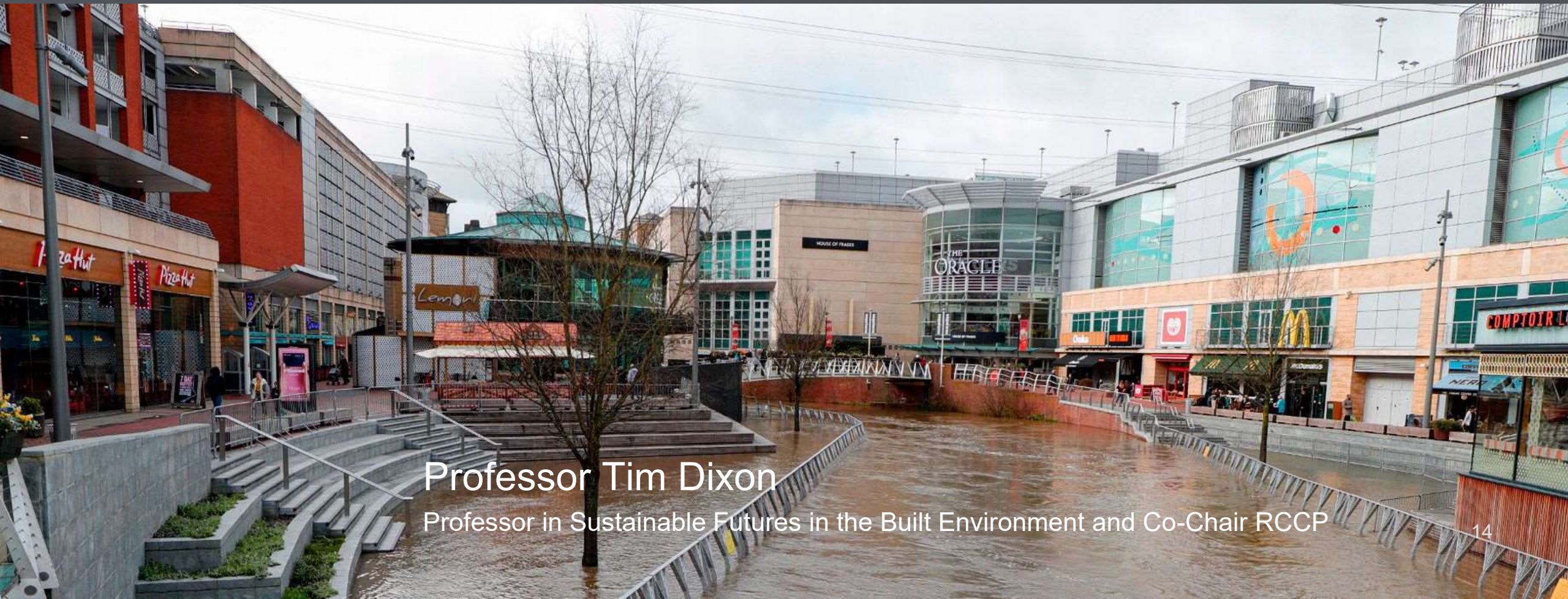
- Strong, rapid, and sustained reductions in methane emissions would limit the warming effect resulting from declining particulate pollution and would improve air quality.

- But only sustained reductions in carbon dioxide allow long-term climate stabilisation.

School of the Built Environment

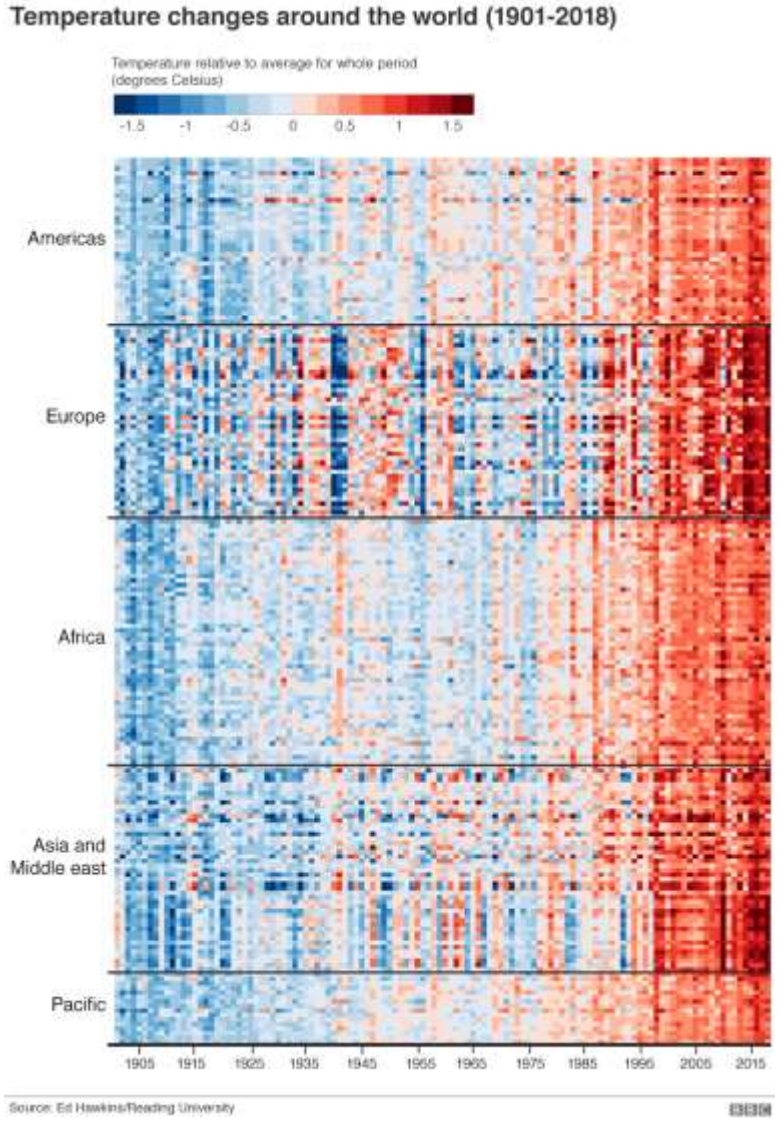
University of Reading

The local response to climate change: What strategies are in place and how can we all make a difference?

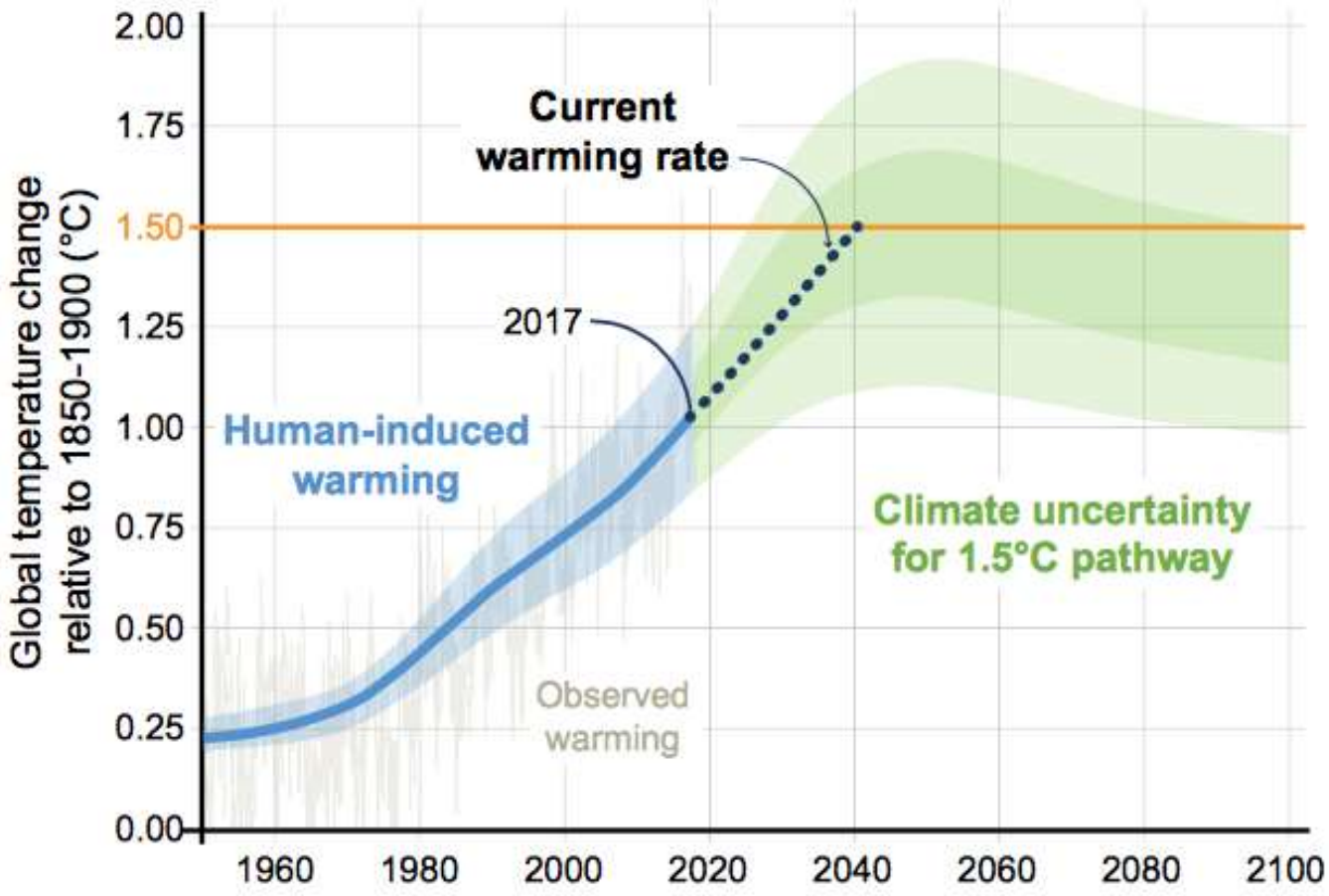


Professor Tim Dixon

Professor in Sustainable Futures in the Built Environment and Co-Chair RCCP

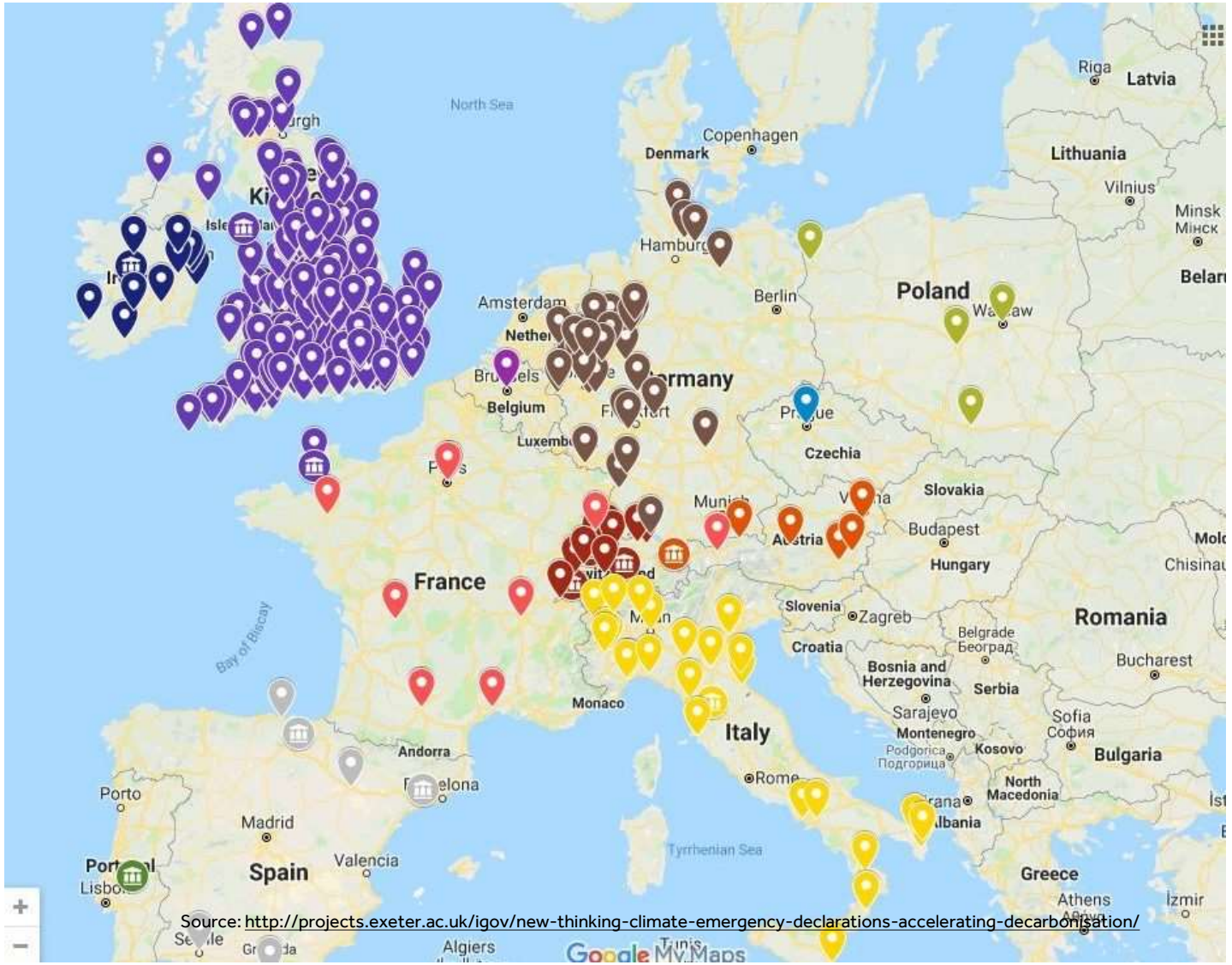


University of Reading



How close are we to 1.5^0 C? (IPCC, 2018)

- 'Acting on the science…'
- Evidence-based
- Winning the argument
- Not if, but how soon can emissions be cut?



Source: http://projects.exeter.ac.uk/igov/new-thinking-climate-emergency-declarations-accelerating-decarbonisation/

Climate Emergency Declarations

- Climate emergency declarations in 1,840 jurisdictions and local governments cover 820 million citizens

Berkshire: Climate Change Strategies

Unitary authority	Climate Emergency Declaration?	Target	Year	Strategy/ Action Plan?
West Berks	Yes	'Carbon neutral'	2030	Yes (Environment)
Reading	Yes	'Net zero'	2030	Yes
Wokingham	Yes	'Net zero' (carbon neutral)	2030	Yes
Slough	Yes	'Net zero'	2040/ 2030	In progress (council operations)
Windsor & Maidenhead	Yes	'Net Zero'	2050	Yes
Bracknell Forest	No –but motion on climate change	'Carbon neutral'	2050	In progress

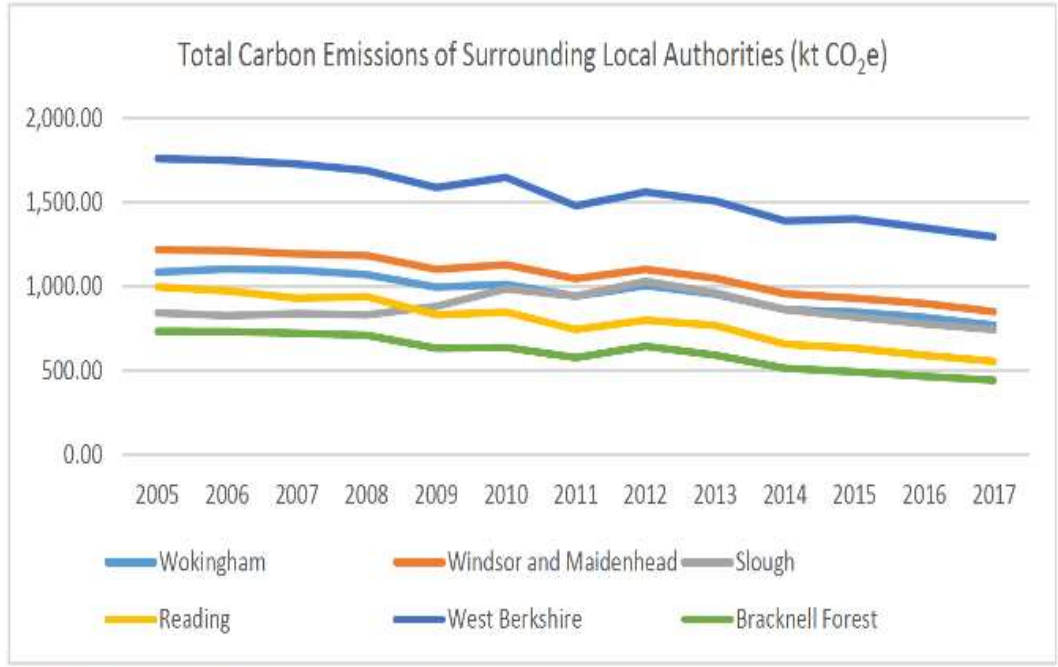


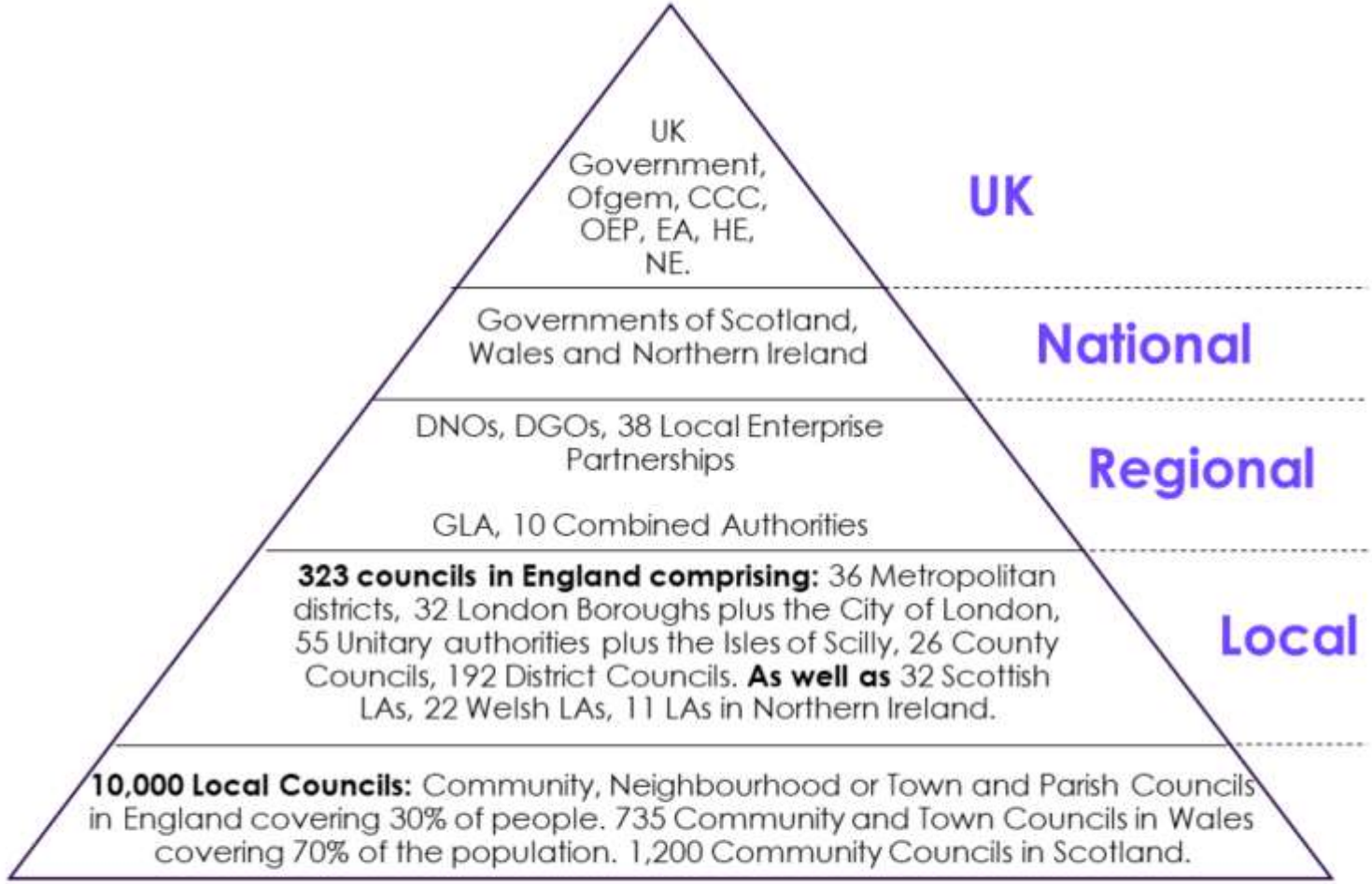
Figure 3 Total Carbon Dioxide Emissions of Surrounding Local Authorities (kt CO_2)

Source: Wokingham BC

New opportunities post-COVID?

- ‘Climate positive’ behaviour
- Cycling lanes
- Improved air quality
- Pedestrianisation
- Redesign of city economies
- 15 minute city?

Multi-level governance: net zero & climate change



Notes: OEP: Office for Environmental Protection; EA: Environment Agency; HE: Highways England; NE: Natural England. These organisations all play a key role in the ability of local areas to deliver on Net Zero.

Source: CCC, 2020

What can councils do?

- Energy and carbon efficiency of council's own estate
- Electricity generation and grid (and green electricity purchase)
- Low carbon EVs
- Active mobility
- Procurement
- Tree planting, biodiversity and woodland management
- Waste management
- Area-wide leadership/partnership: direct & indirect influence

Source: https://www.bracknellnews.co.uk/news/18309136.bracknell-forest-council-climate-change-five-things-learnt/

Take the pledge and get involved!

Source: BBC

What can we do?

- Use less heat
- Only switch on appliances when we use them
- Take a shower instead of a bath
- Wash all our clothes at 30 degrees on a full load
- Choose tap water, and a reusable water bottle
- Eat more fruit and vegetables, and have more vegetarian meals
- Change to a green renewable energy supplier
- Recycle more
- Walk, cycle or scoot for all short trips
- Buy less ‘stuff’
- Choose products without plastic packaging whenever possible
- Write to your MP about climate change
- Plant trees

Source: RCCP

Community Energy and Green Finance: Reading and West Berkshire

Reading Climate Change Partnership

- Formed in 2009
- Multi-stakeholder partnership – volunteer Board, supported by part-time co-ordinator
- Runs on sunshine (from solar feed-in-tariff income)!
- Hosted by Reading Borough Council
- Links with Reading 2050 Vision (https://livingreading.co.uk/reading-2050)

All RCCP/RCAN slides permission of RCCP

University of Reading

ReadingCAN
Climate Action Network

www.readingcan.org.uk

Communities and organisations coming together in Reading to tackle climate change

Strategy vision: a climate-resilient, net zero town by 2030

Target audience: everybody who lives, works or studies in Reading

The pathway to a Net Zero Reading by 2030

Transport: reducing traffic and the need to travel by more polluting modes of transport, promoting walking, cycling and public transport, and phasing out petrol/diesel in favour of electric vehicles

Renewable energy: generating more energy from renewable sources

Consumption and waste: buying and using less 'stuff', reducing waste and developing Reading's 'circular economy'

Housing: retrofitting and building new homes and other buildings to low/zero carbon standards

Nature-based solutions: working with nature to help tackle climate change, in terms of measures to reduce emissions, capture carbon and to help us adapt to climate impacts

University of Reading

Help Reading reach net zero by 2030

Join us now to take action!

Visit www.readingcan.org.uk

ReadingCAN
Climate Action Network

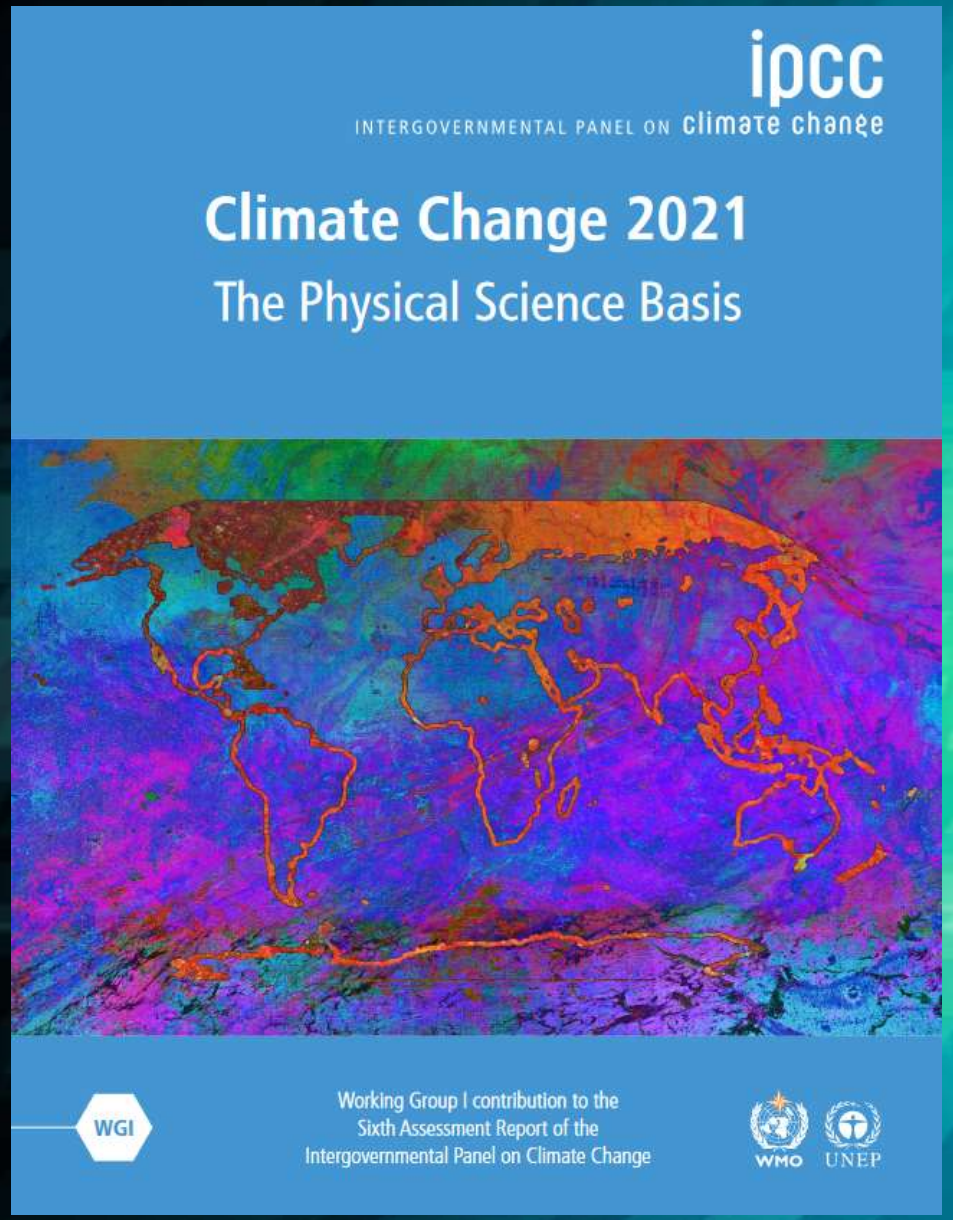
@ReadingCAN

readingcan

ReadingCAN

Source: Sky News

Climate change: education, advocacy, action and leadership



https://www.ipcc.ch/report/ar6/wg1/

Thank you!

- r.p.allan@reading.ac.uk
- n.bellouin@reading.ac.uk
- t.j.dixon@reading.ac.uk