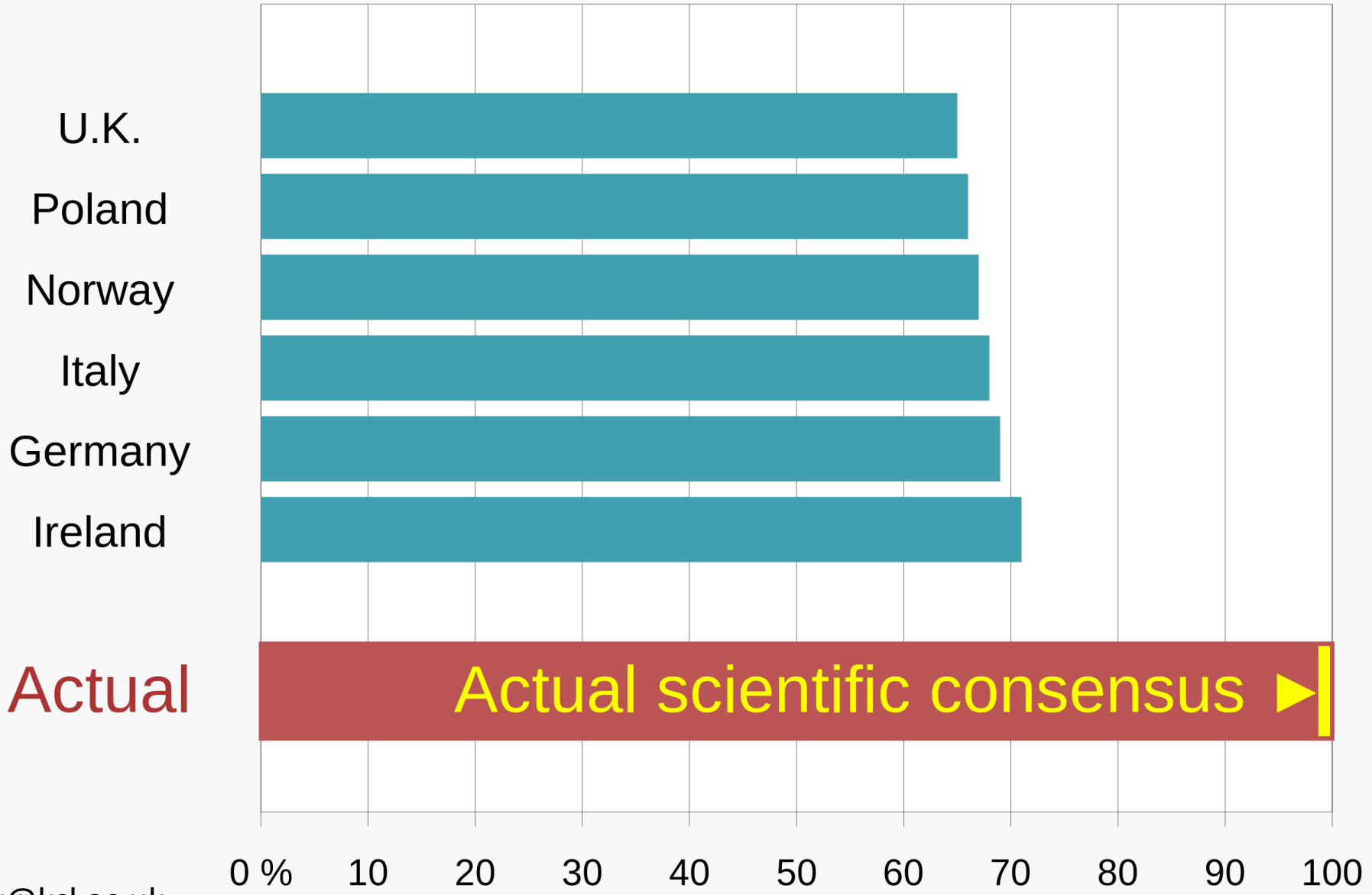
Sustainability discussion:
Current challenges in accelerator technologies and future sustainability

Public estimates of scientific consensus on climate change



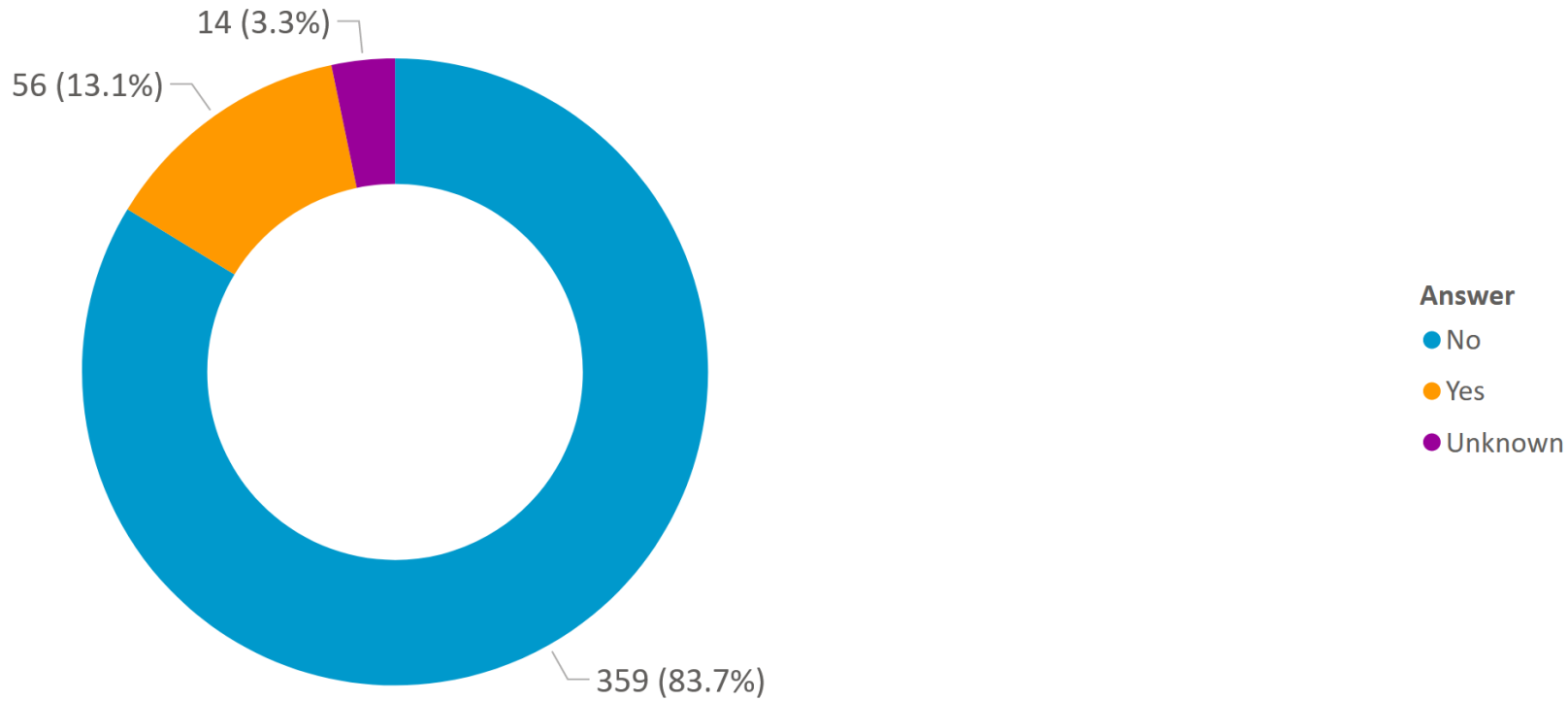
Source: bobby.duffy@kcl.ac.uk

Physics, climate change and sustainability

Physics and physicists are playing a vital role in helping meet the challenge of climate change. Find out how the IOP is involved, including through our flagship 2023 project, Physics Powering the Green Economy.

IOP Member Survey: Considering current levels of investment in technologies related to the green economy, do you think the UK will achieve net zero by 2050?

Survey Respondents (exc. Ireland):	% Who don't think UK will achieve Net Zero by 2050	Gender	Location	IOP Member
429	84%	◉ All ○ Female ○ Male	○ All (UK & International, excl. Ireland) ◉ UK	◉ All ○ Yes



Secretary General of the UN:

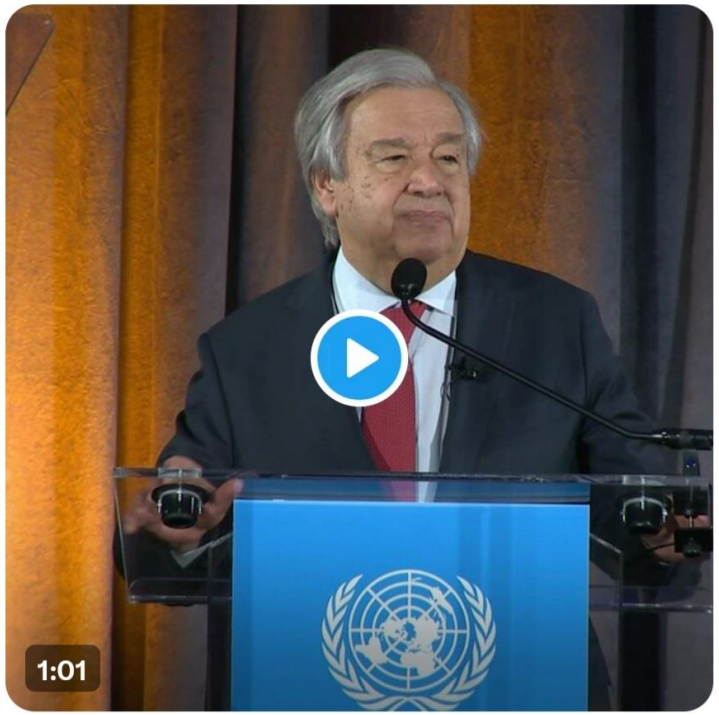
António Guterres @antonio... · 11h

We need an exit ramp off the highway to climate hell.

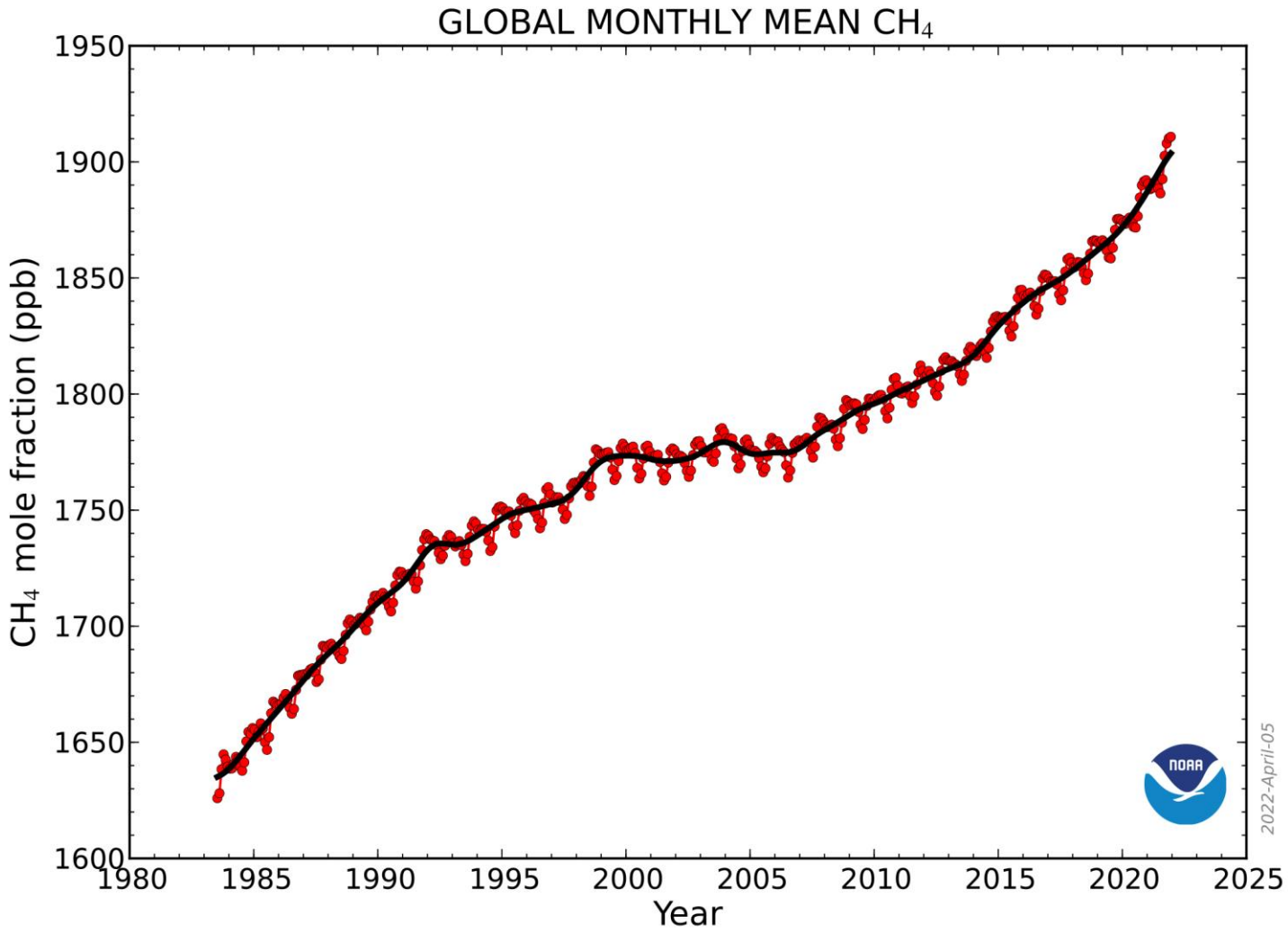
We have control of the wheel.

The 1.5 degree limit of global warming is still just about possible.

But we need to fight harder. Now.



Atmospheric CO_2 levels reached an all-time high in May 2024



Ralph Keeling/Scripps Institution of Oceanography

Credit: Daniel Wood/NPR

Met Office

Global mean temperature difference from 1850-1900 (°C)

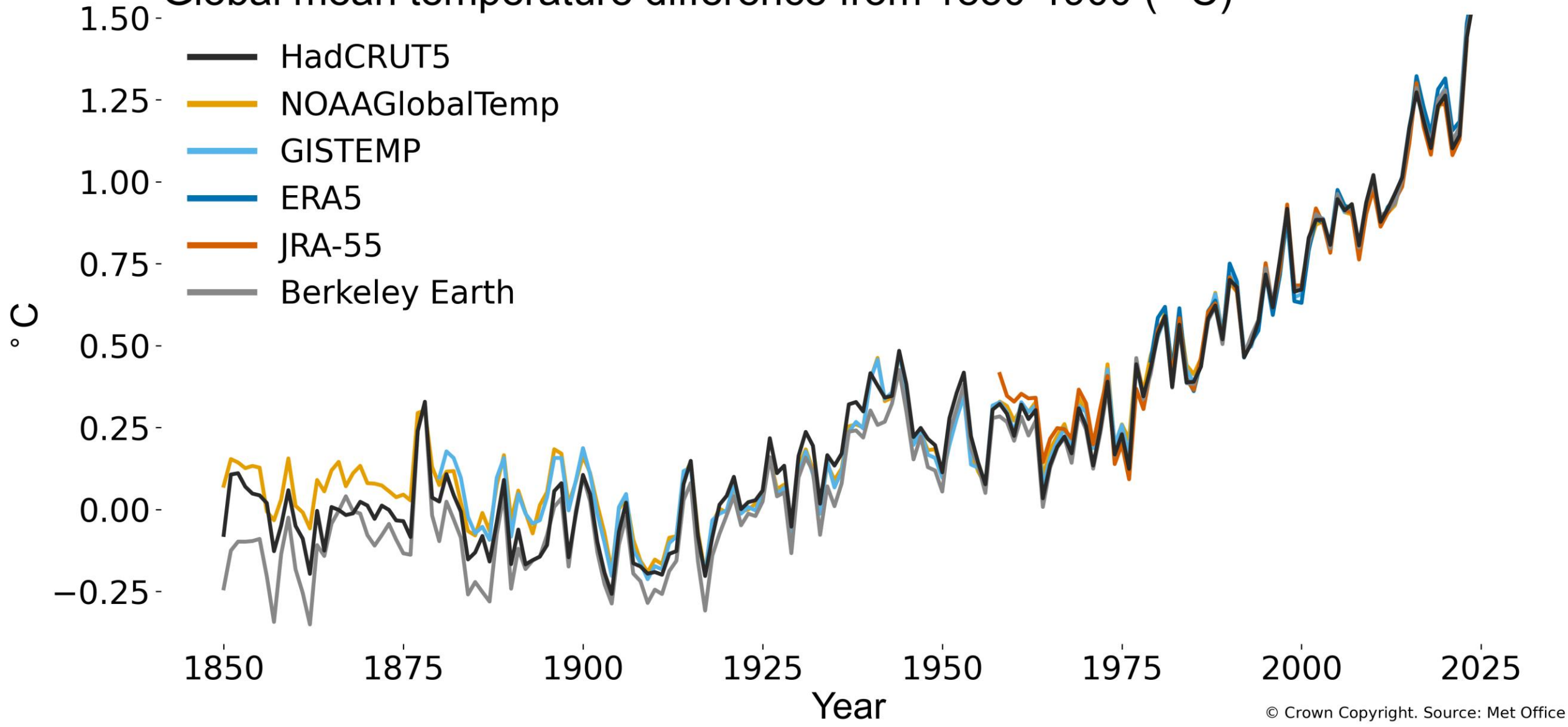
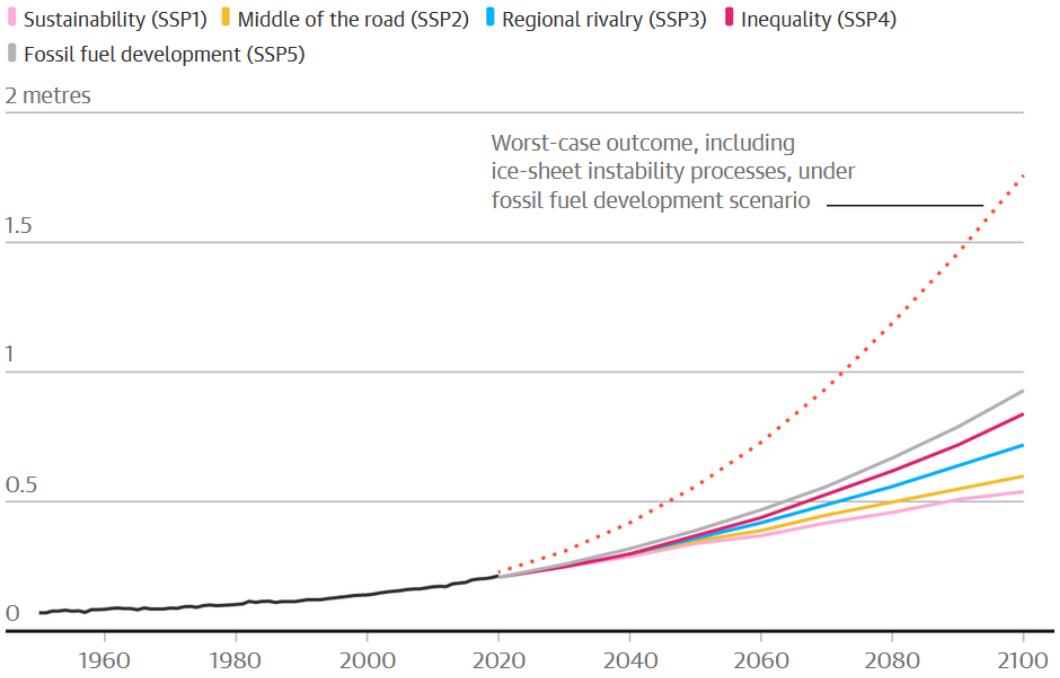


Figure updated: 29/05/2024

How various warming scenarios could affect sea levels

Global mean sea level change, relative to 1900, under CO2 emissions scenarios within shared socioeconomic pathways (SSPs)

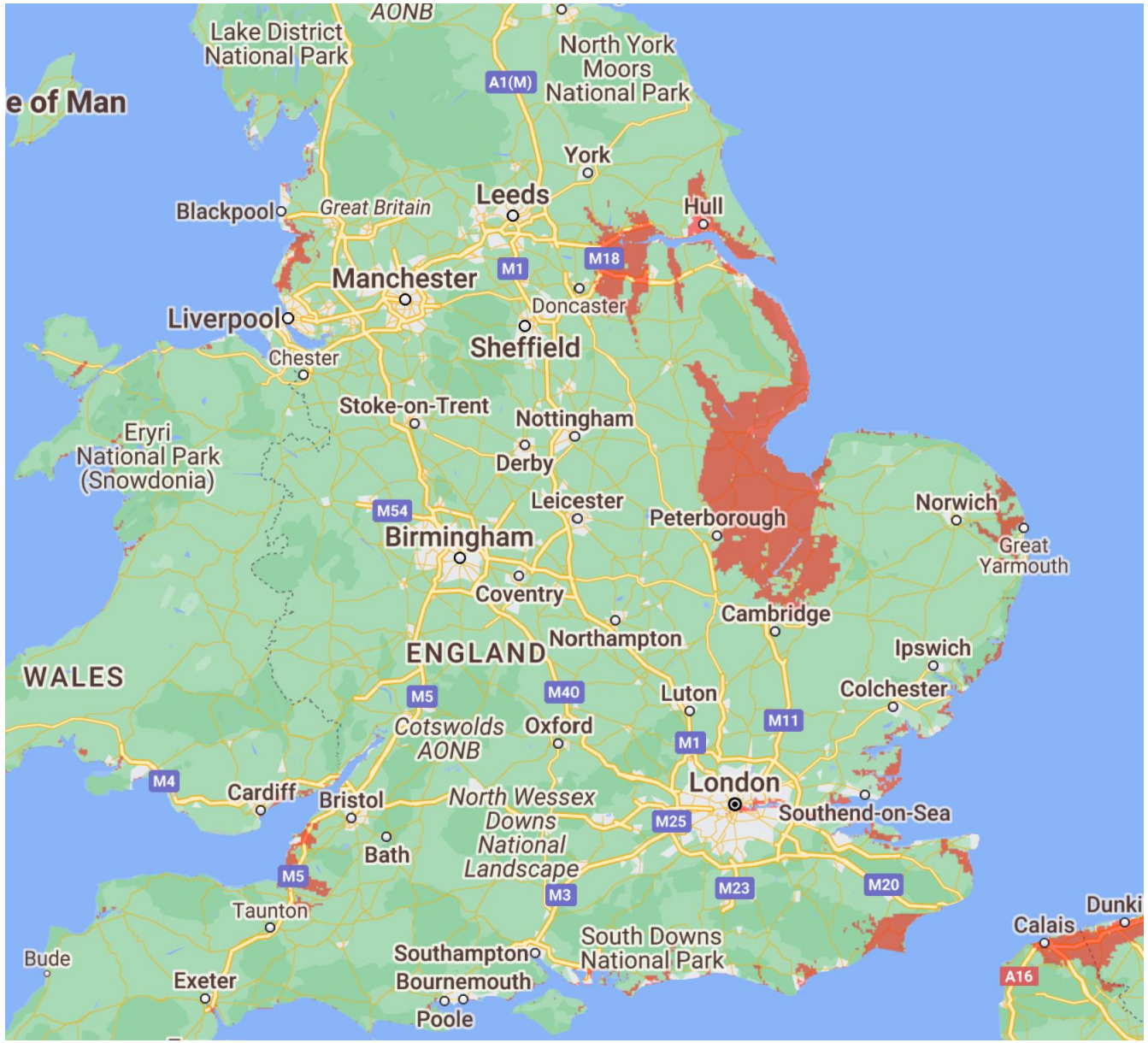


Guardian graphic. Source: IPCC Sixth Assessment Report. Note: scenarios are visions of future human development, ranging from optimistic or positive, where the environment is taken into account, to pessimistic, where development is based on fossil fuel development

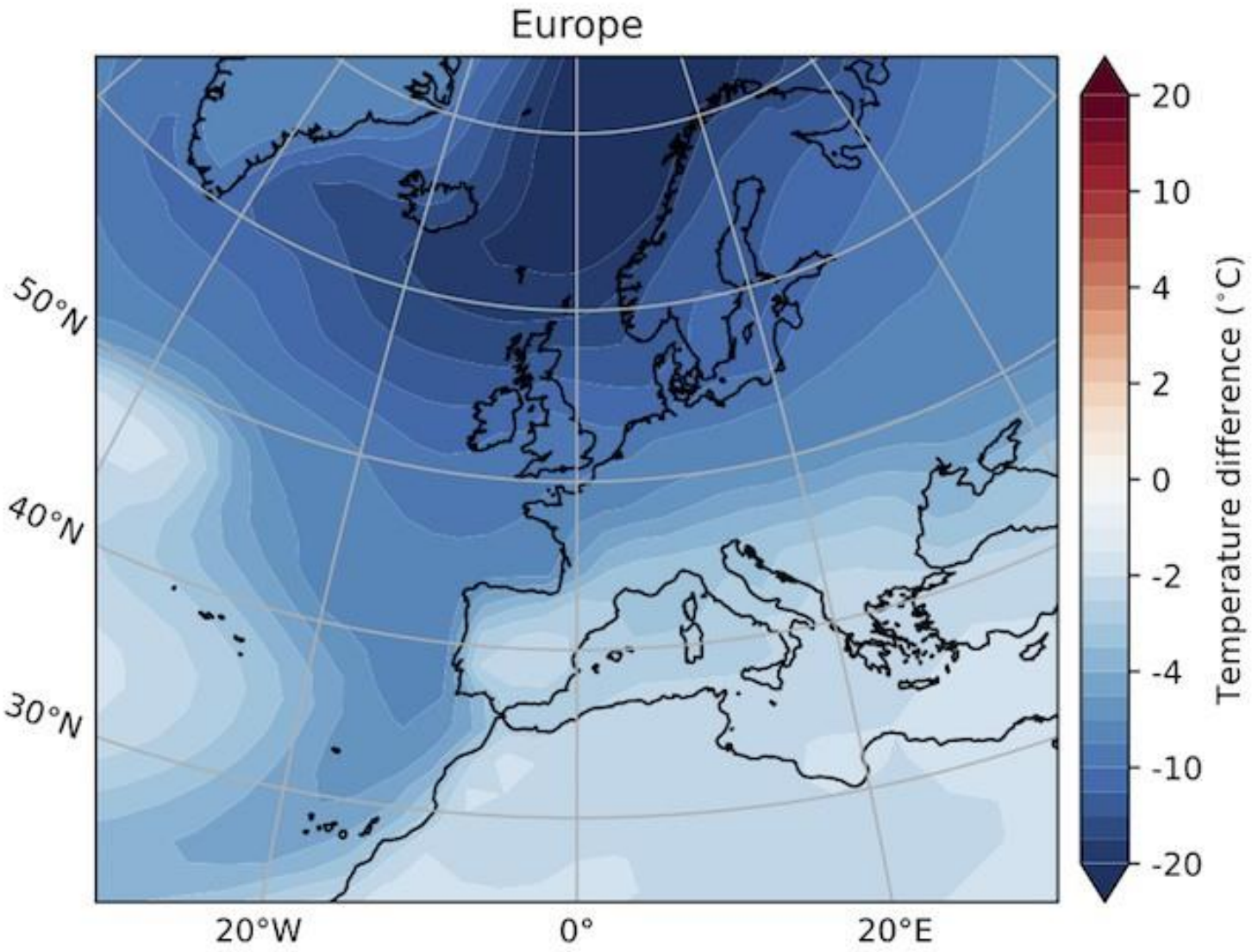
"The worst case we're looking at is something like more than 2 metres in a century," Bamber says.

"To put that in context, 2 metres of sea level rise would displace, or would affect or flood on an annual basis, approximately a 10th of the planet's population, so about 790 million people." (In 2020, 896 million people lived within the "low elevation coastal zone - a figure probably rising to 1 billion people by 2050.)

Sea level rises by 2050? (From: Climate Central)



Atlantic meridional overturning circulation (AMOC)



Potential Sustainability Solutions - examples

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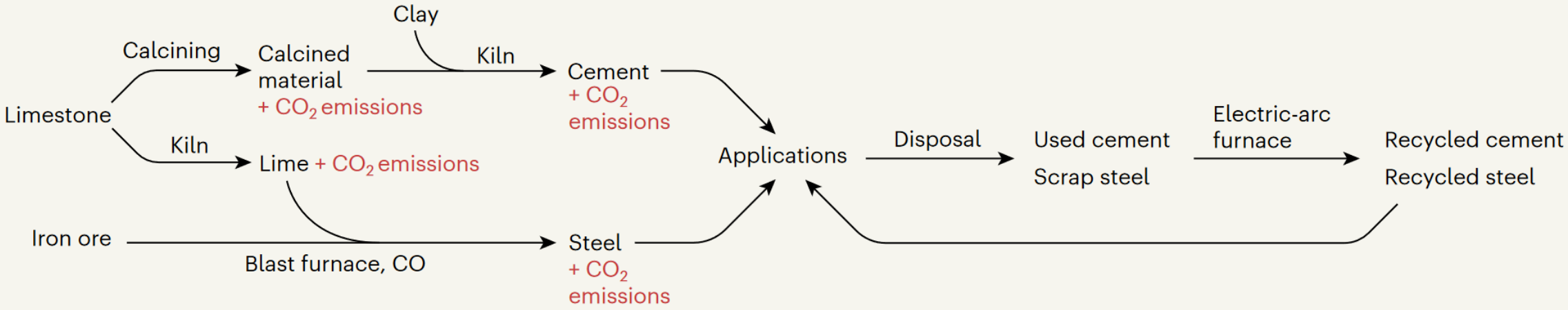

Figure 1 | Recycling of cement in partnership with steel manufacturing. **a**, In conventional cement manufacture, limestone is heated (calcined) and then mixed with silica-rich clay in a kiln. In conventional production of new steel, iron oxide is chemically reduced by carbon monoxide in a blast furnace, and lime (made from limestone in a kiln) reacts with compounds in the ore that would otherwise lower the quality of the steel. The manufacture of cement, lime and steel directly produce carbon dioxide (in addition to the CO_2 emitted if fossil fuels are burned to heat the kilns and furnaces). Scrap steel can be recycled in electric-arc furnaces (which heat materials electrically), but methods for recycling cement have been lacking. **b**, Dunant *et al.*[3] report that used cement can partly substitute for lime when steel is recycled in an electric-arc furnace. The lime and used cement is converted into a 'slag' material that can be used as a recycled cement. The process avoids many of the CO_2 direct emissions shown in **a**.

By Sarah Collins
Published 22 May 2024

Construction workers pouring concrete. Credit: Jung Getty via Getty Images

UK XFEL Townhall - Energy, Environmental and Climate Technologies

4 Jun 2024, 10:25 → 5 Jun 2024, 17:00 Europe/London

Dept. of Chemistry (University of Sheffield)

Paul Aden (STFC)

Description

The UK XFEL Conceptual Design team are hosting a townhall meeting in collaboration with University of Sheffield. This will be an exciting opportunity for anyone interested in the possible technologies and applications of a UK XFEL to come and hear and discuss topics surrounding 'Energy, Environmental and Climate Technologies'. The townhall is being organised by our Chemical science sub team: *Julia Weinstein (Sheffield), Russell Minns (Soton), Sofia Diaz-Moreno (Diamond), Alex Baidak(Manchester), Andrew Burnett (Leeds), Tom Penfold (Newcastle), Rebecca Ingle (UCL), Mark Brouard, Claire Vallance (Oxford)*

The event will take place over two days with a multiple of speakers (to be announced) and breakout sessions for informal discussions.

Tickets available here: https://sheffield-ukxfel.eventbrite.co.uk/

More details about UK XFEL, including the science case, are availbe here: xfel.ac.uk

Paul Aden

paul.aden@stfc.ac.uk

☎ 01925603219

10:25 → 10:35 **Opening Address** 10m

Welcome by the local organising committee

10:40 → 11:40 **UK XFEL Conceptual Design and Options Analysis Project Overview** 1h

Speakers: Dr David Dunning (STFC), Paul Aden (STFC)

11:40 → 12:40 **Overview of the UK XFEL Science and Technology Case** 1h

Speaker: Prof. Jon Marangos (Imperial College)

12:40 → 13:30 **Lunch & Posters** 50m

13:30 → 14:00 **Excitonic up- and down-conversion for solar energy harvesting applications** 30m

Speaker: Prof. Jenny Clark (University of Sheffield)

14:00 → 14:30 **TBD** 30m

Speaker: Dr Rob House (University of Oxford)

14:30 → 15:00 **Non-linear Extreme Ultraviolet (EUV) to hard X-ray spectroscopy** 30m

Speaker: Prof. Majed Chergui (EPF-Lausanne)

15:00 → 15:30 **Tea & Coffee** 30m

15:30 → 16:00 **Non-precious metal catalysts investigation for hydrogen fuel cells.** 30m

Speaker: Dr Adrien Chauvet (University of Sheffield)

16:00 → 16:30 **Femtosecond Chemical and Biological Dynamics at the Alvra Endstation** 30m

Speaker: Dr Camila Bacellar (PSI)

16:30 → 17:00 **Opportunities for ultrafast gas phase photochemistry at an advanced XFEL** 30m

Speaker: Dr Thomas Wolf (Standford University)

17:00 → 17:30 **TBD** 30m

Speaker: Prof. Thomas Feurer (Eu-XFEL)

09:00 → 09:30	**Arrival: Tea & Coffee**		30m
09:30 → 10:00	**Li-ion batteries: picoseconds to years**	**Speaker**: Prof. Louis Frederick Piper (Warwick university)	30m
10:00 → 10:30	**Atmospheric chemistry from a computational and theoretical perspective**	**Speaker**: Dr Basile Curchod (University of Bristol)	30m
10:30 → 11:00	**Catching and steering electrons and atoms in action with light**	**Speaker**: Prof. Kiyoshi Ueda (Tohoku University, Japan)	30m
11:10 → 11:40	**Carrier capture at the active sites in metal-oxide photo-catalysts**	**Speaker**: Dr Soonam Kwon (POSTECH / PAL, Korea)	30m
11:40 → 12:10	**Investigating chemical reactions in solution with ultrafast X-ray spectroscopy methods**	**Speaker**: Dr Nils Huse (University of Hamburg)	30m
12:10 → 12:40	**Closing Discussions**		30m

Don’t forget, Accelerator technology can also help improve efficiency, and new methods, of energy generation!