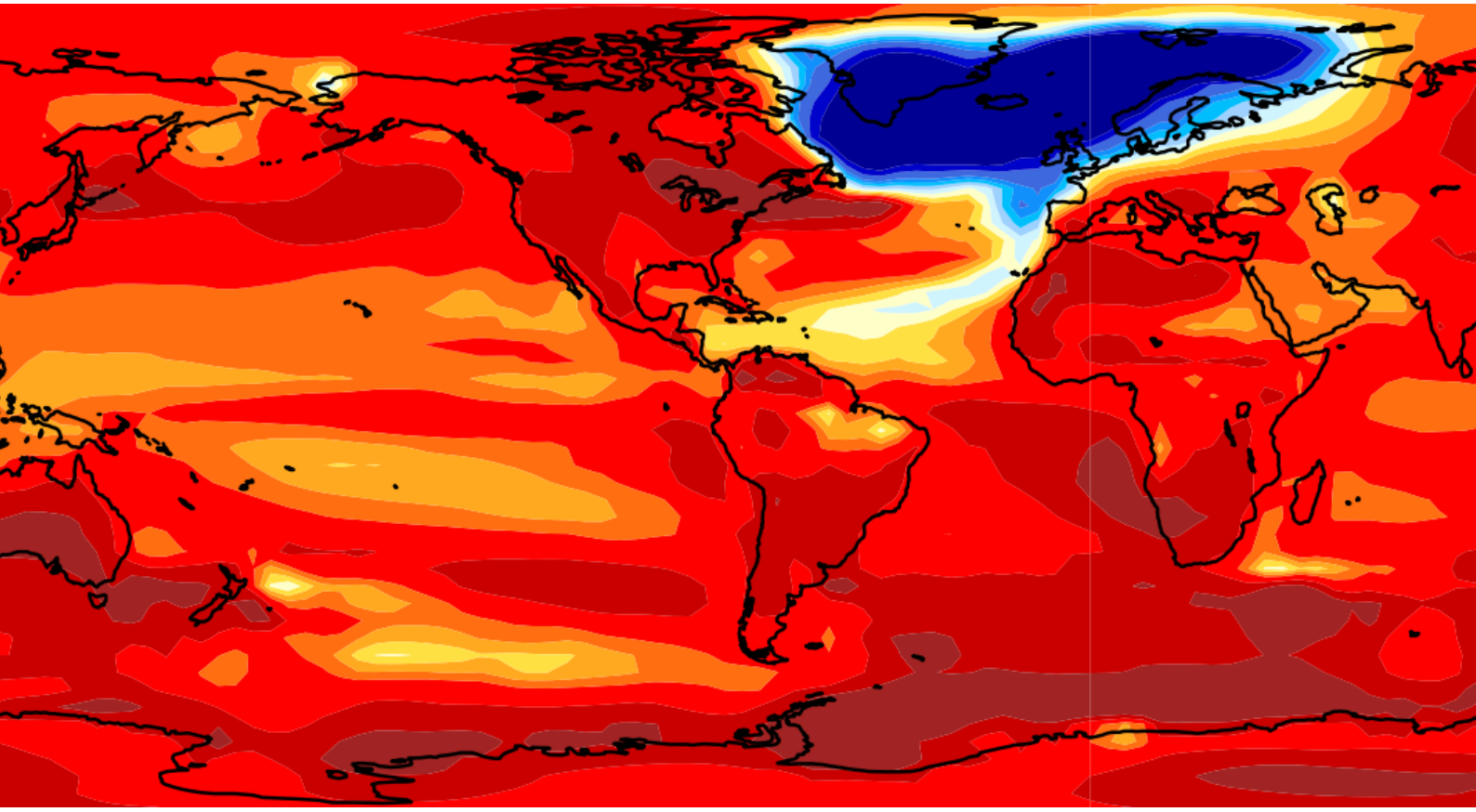

Cold Blob Climate Briefing

FINAL • DECEMBER 2024

LIVING STREETS SCOTLAND

NATUREBASED
WALKING - CYCLING - CLIMATE ACTION

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Definitions

AMOC – Atlantic Meridional Overturning Circulation
IPCC – Intergovernmental Panel on Climate Change

***** content warning *****

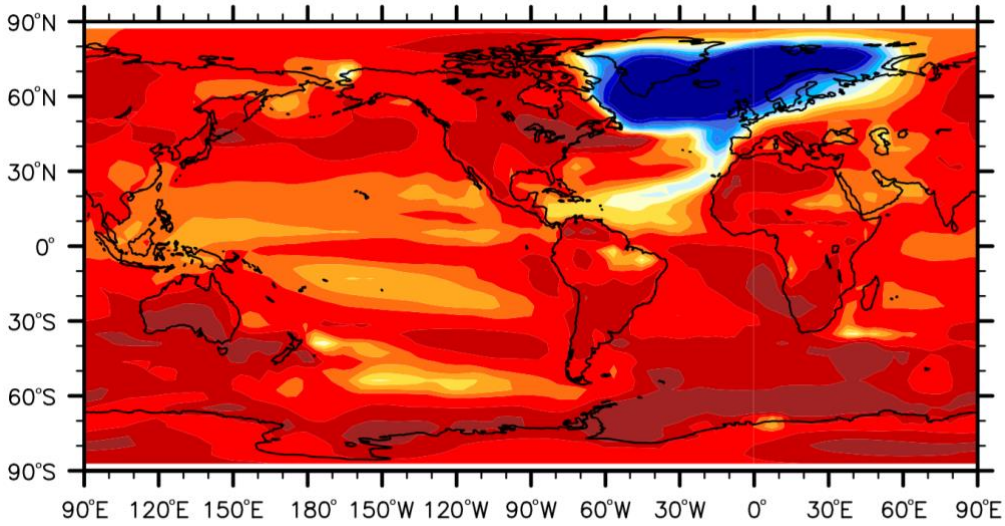
This briefing note includes distressing content. Please identify suitable emotional support and resourcing to make reading this as safe and healthy as possible for you and others.

Quick Summary

Scotland and the UK are on track to tip suddenly into a one thousand year Ice Age by the early 2030s. This is due to an ecosystem tipping point, a collapse of part of the Gulf Stream causing a “cold blob” to shift over northern Europe. The “cold blob” Ice Age means crops do not ripen. High intensity winds are perishing. This occurs in a context of global warming where rainfall belts shift away from the Amazon and Congo rainforests, mainland Europe suffers under extreme heat and drought. There is global scale loss of food crops, mass migration and life collapse.

The risks are much higher than previously thought. The actions of the next few years determine whether this irreversible 1000 year “cold blob” Ice Age occurs in the early 2030s or sooner.

Temperature model shows the cold blob in northern Europe resulting from collapse of part of the Gulf Stream and $C0_2$ doubling with global warming. From Liu et al. (2017)



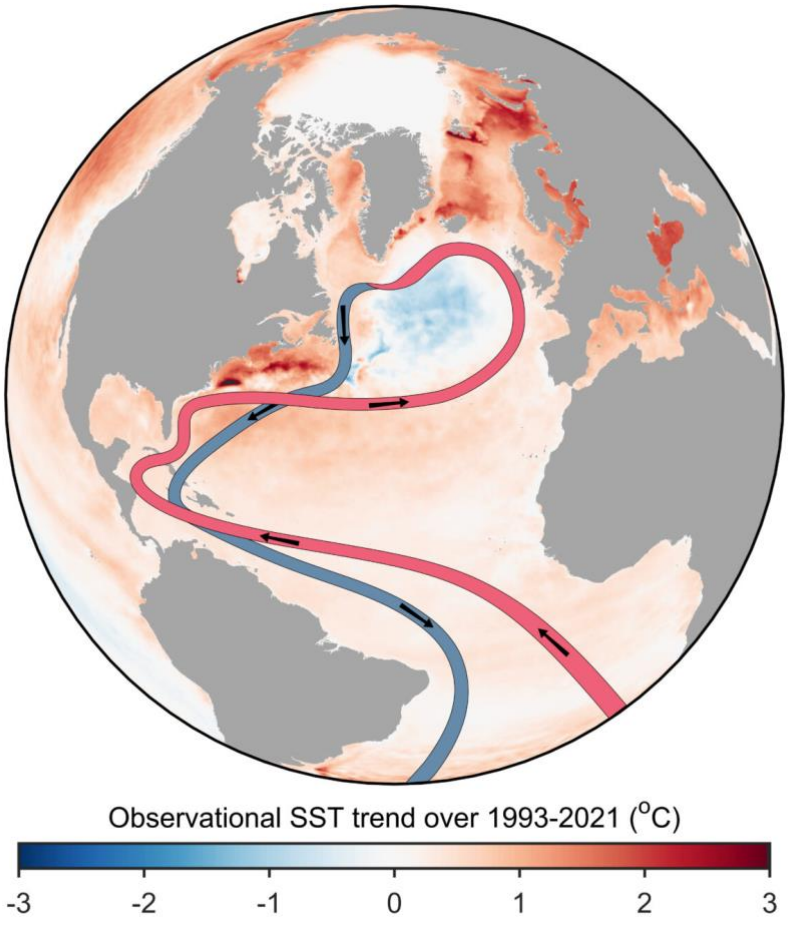
Transport is a super leverage domain. To avoid the catastrophic risk of the “cold blob” Ice Age to northern Europe, transport needs to decarbonise rapidly within the next four to five years. This means putting transport (and other sectors) onto an emergency rapid decarbonisation footing, similar to Covid but better.

Walking as a mode of transport has been marginalised over the past 80 years – it is time to turn this around. Walking as a mode of traffic has powerful systems value across transport, health, environment, the economy and community. As the lynch pin of integrated transport, walking needs to be at the heart of rapid decarbonisation.

Call to Action

- We need to reduce the risk of a “cold blob” Ice Age at all costs
- We need to place transport and other sectors onto an emergency decarbonisation footing – now. We have 12 months to prepare, and then four years to deliver this
- This means we need to double walking traffic across Scotland, and the UK within the next four to five years
- We need to resource ourselves emotionally to face a challenge far greater than both World Wars combined
- We need to communicate honestly about how bad the situation is, that we already have solutions, and that we can thrive in a rapid decarbonisation world

Figure 1. A simplified graphic showing the Atlantic Meridional Overturning Circulation as a heat and salt exchange system bringing warm water to Scotland and returning cool water to the west Atlantic and southern hemisphere. Image credit Ruijian Gou



NARRATIVE SUMMARY OF SUPPORTING EVIDENCE

The Presumed Perspective

There is high quality publicly available climate information which describes that the weather in Scotland has already changed, and the outlook is for further change. The key climate projections are for:

- Warmer and significantly wetter winters
- Dryer summers
- More intense rainfall and storm events in both summer and winter e.g. "cloudburst" rainfall events
- More intense flooding, including catastrophic combinations of higher sea levels, higher river flooding, and heavy rainfall events
- Generally, more variability

Who is saying this?

Sniffer (2021) Climate Projections for Scotland. Available at: https://www.adaptationscotland.org.uk/why-adapt/climate-trends-and-projections

Sniffer is a trusted source, and the Adaptation Scotland is a programme funded by Scottish government.

Why Question This?

Conversations with trusted others have led me to dig deeper and question the picture projected by Sniffer and UK government. Other perspectives explored include a random conversation with the Professor for Climate Change at the University of the Highlands and Islands (UHI) in August 2023, BBC coverage of the melting glaciers in the French Alps (https://www.bbc.co.uk/sport/av/winter-sports/68208553), conversations with friends who have lived in the Alps for 50 years about how quickly the glaciers are retreating, and finally reading the book "Ice – Tales from a Disappearing World" which is about 24 hours on the Greenland ice with the polar scientist Marco Tedesco.

What Marco Tedesco describes based on his personal experience studying the ice in Greenland over decades is how suddenly ice melts happen, like pulling a plug out of bathtub. There are tipping points that - once tipped - accelerate change exponentially.

Tipping Points

The evidence for tipping points is highly compelling. Tipping points are a natural phenomenon in nature. These are familiar to all of us for example when rain suddenly does turn to snow. And the proverbial last straw that broke the camel's

back. We experience tipping points as humans when we manage lots of stress and difficulty and then one final small thing – the final straw - comes along and causes us to flip our lids or collapse into illness.

Tipping Points are looked at in detail in the Global Tipping Points Report which was launched at COP28 on 6 December 2023. Global Tipping Points is led by Professor Tim Lenton from the University of Exeter's Global Systems Institute with the support of more than 200 researchers from over 90 organisations in 26 countries. To copy and paste their description of what the report is: the report is an authoritative assessment of the risks and opportunities of both negative and positive tipping points in the Earth system and society. Just picking the headlines from this report include statements like:

> "Harmful tipping points in the natural world pose some of the gravest threats faced by humanity."
>
> "…the collapse of the Atlantic Ocean's great overturning circulation combined with global warming **could cause half of the global area for growing wheat and maize to be lost**. Five major tipping points are already at risk of being crossed due to warming right now and three more are threatened **in the 2030s** as the world exceeds 1.5°C global warming."
>
> "…the threat posed by the climate and ecological crisis is far **more severe than is commonly understood and is of a magnitude never before faced by humanity**."

These are hard to read sentences, and this is just from the narrative summary (p.3). The University of Exeter is a highly trustworthy UK institution, leading research in many areas including active travel and environmental health. It looks like what they are saying is not only are tipping points real, but we are already in an extremely high risk situation. **The "cold blob" represents only one of five major tipping systems. Tipping is irreversible. Tipping systems will likely chain. The scale of devastation is unimaginable.**

The report states clearly that we are not on track for climate safety, and the risks are much higher than previously thought as stated in the summary:

> **"These threats could materialise in the coming decades, and at lower levels of global warming than previously thought."**

Who is saying this?

Timothy M. Lenton et al. (2023) Global Tipping Points Summary Report. Available here: https://global-tipping-points.org/

A useful summary of key messages available here: https://global-tipping-points.org/summary-report/key-messages/

We are not on track, 1.5°C is not safe anyway

A number of trusted sources concur that the UK is not on track for its climate targets. The pathway to achieve the 1.5°C target is now very steep. We have already reached 1.3°C global warming. **We are currently on track to exceed 1.5°C within the next couple of years.** It is important to bear in mind that the 1.5°C limit is not safe. According to the IPCC, **< 1.5°C is moderate risk and > 1.5°C is high risk**.

Figure 2. UK carbon pathway assessment of "Insufficient" as rated by Climate Action Tracker

These numbers appear very small – from a human level we are used to temperatures shifting 10°C or 20 °C or at extremes even 40 °C in a single day. To be honest 1.5°C does not seem like a big deal. But these global average temperature numbers are different. These apparently small increases are global averages which have exponential impact and can trigger a cascade of global tipping points.

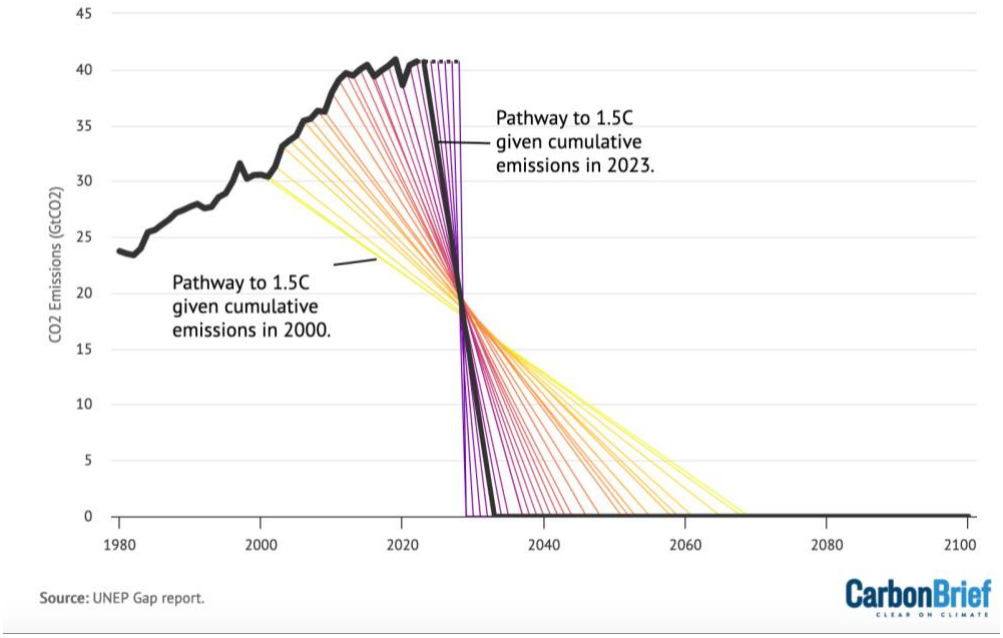


Figure 3. Graphic depicting the steep pathway of decarbonisation limit global warming to 1.5°C

Scientists are also reporting that more damage than expected is already occurring. The climate is changing faster than many models. The James Hutton Institute in Aberdeen has reported that Scotland's climate is changing faster than predicted, mirroring the global perspective. This all broadly aligns with the Global Tipping Point Report (2023) that lower levels of global warming than previously thought could trigger tipping points. Overall, **the message is that the risks are much higher than previously thought**.

There are also new sudden carbon burdens which are rapidly increasing the global carbon trajectory in the wrong direction. For example, googles' carbon footprint has increased 48% over the past year due to carbon hungry AI. The carbon impact of warfare is generally unreported as it is excluded from emissions reporting. Conflicts in the Ukraine and Palestine are adding significantly to the global carbon burden.

> **"There has never been a more important time to understand the scale of the threat and how fast we need to act."**
>
> Dr Mike Rivington, The James Hutton Institute, Aberdeen

Who is saying this?

Carbon Brief (2023) Available at: https://www.carbonbrief.org/unep-humanity-is-still-breaking-all-the-wrong-records-in-fast-warming-world/

IPCC (2018) Summary for Policymakers. In: Global Warming of 1.5°C**.** Available at: https://www.ipcc.ch/sr15/

Scotland's climate changing faster than predicted (2023) Available at: https://www.hutton.ac.uk/news/scotland%E2%80%99s-climate-changing-faster-predicted

Climate Action Tracker. Country Summary – UK, for September 2023. Available at: https://climateactiontracker.org/countries/uk/

Climate Action Tracker, 10 June 2024. The CAT guide to a good 2035 climate target. Available at: https://climateactiontracker.org/publications/the-cat-ndc-guide/

Forster et al (2023) Indicators of Global Climate Change 2023: annual update of key indicators of the state of the climate system and human influence. Available at: https://essd.copernicus.org/articles/16/2625/2024/#&gid=1&pid=1

BBC, 8 February 2024. World's first year-long breach of key 1.5C warming limit. Available at: https://www.bbc.co.uk/news/science-environment-68110310

Ed Hawkins MBE, Professor of Climate Science, Creator of Warming Stripes, MBE, National Centre for Atmospheric Science, University of Reading. https://www.linkedin.com/in/edhawkinsclimate/

BBC News, 3 July 2024. AI drives 48% increase in Google emissions. Available at: https://www.bbc.co.uk/news/articles/c51yvz51k2xo

Scientists for Global Responsibility, 8 July 2023. How big are global military carbon emissions? Available at: https://www.sgr.org.uk/resources/how-big-are-global-military-carbon-emissions

Collapse of the AMOC and Arrival of the "Cold Blob"

To really understand the imminent risk of climate collapse, let's take a brief dive into the Atlantic Meridional Overturning Circulation – AMOC for short. The AMOC is the temperature and salt regulating part of the gulf stream. Basically the part that blesses us in Scotland and the UK with a temperate maritime climate, one of the mildest climates in the world.

Professor Stefan Rahmstorf is an oceanographer who has been studying the AMOC for over thirty years. Professor Rahmstorf was recently awarded the Alfred Wegener Award by the European Geosciences Union. If you are interested to delve a little deeper into the science, it is really worth watching the Alfred Wegener Award lecture in full. The youtube and full article link are below.

Professor Rahmstorf cites the works of many others to make the case that there is evidence that the AMOC is weakening and that there is evidence that the AMOC has a tipping point. While there is a lot of uncertainty around this, there is a whole heap

of scientific data and modelling which shows that the risk of the AMOC tipping is horrendous – **collapse of the AMOC needs to be avoided at all costs**.

So what does the AMOC collapse mean? A group of scientists from the University of Utrecht were able to run an incredibly expensive model to find out. It fundamentally means a shift with the artic zone warming and **a "cold blob" shifting over northern Europe**.

The figures below show the monthly temperature trends for five difference cities as modelled in the University of Utrecht study. Edinburgh lies halfway between London and Bergen in Norway, on approximately the same temperature band as Reykjavik. Over one hundred years the average monthly temperature in Edinburgh in February will decrease by -25°C, so decreasing 2.5°C per decade. Remember - small changes have big impact. And once we have tipped into this "cold blob" scenario, it is here to stay for one thousand years or so.

Of note, is that this model does not include increases in carbon. A second study from the University of California explores collapse of the AMOC contingent with doubling of carbon.

In October 2024, a group of forty-four climate scientists from fifteen countries wrote *An Open Letter by Climate Scientist to the Nordic Council of Ministers* stating **"A string of scientific studies in the past few years suggests that this risk has so far been greatly underestimated. Such an ocean circulation change would have devastating and irreversible impacts especially for Nordic countries, but also for other parts of the world."**

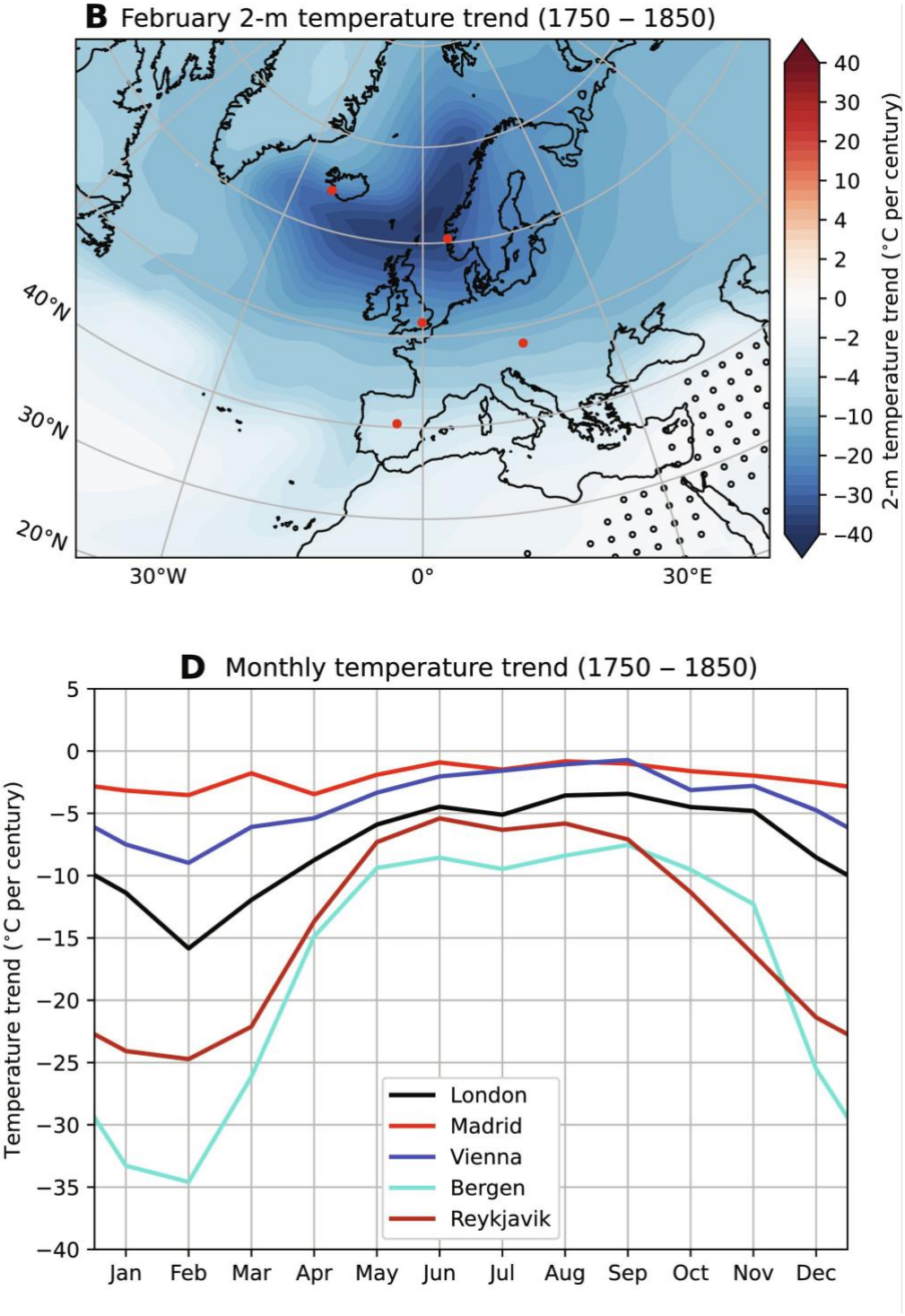


Figure 4. Graphic depicting the “cold blob” moving across northern Europe as a result of collapse of the AMCO. Graphic B shows averaged 2-m surface temperature trends over 100 years. Graphic D shows monthly temperature trends. From University of Utrecht Study, Van Westen et al (2024)

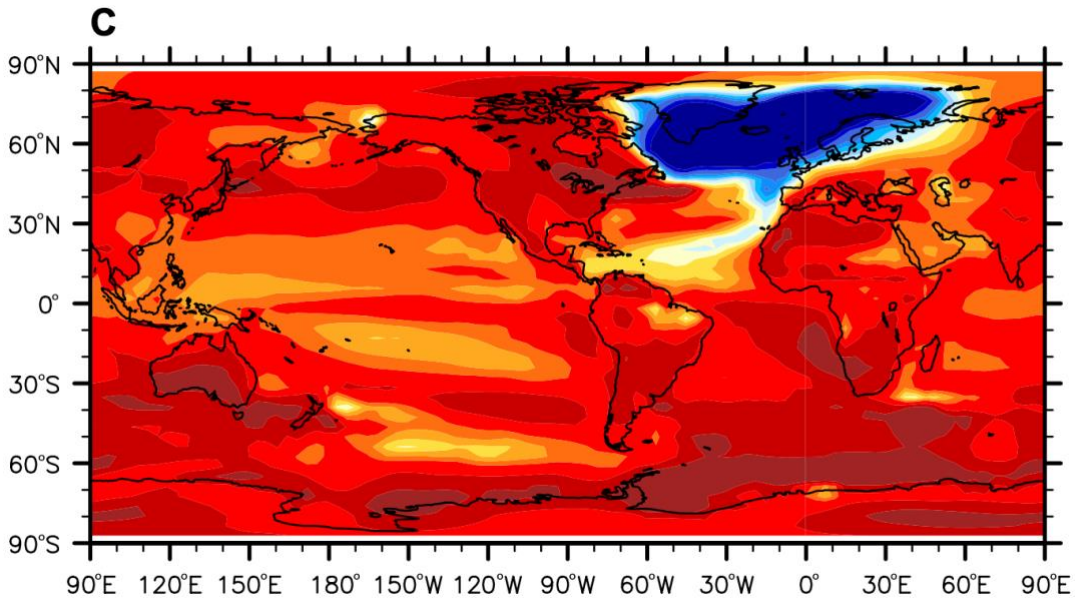


Figure 5. Modelling of the AMOC collapse with CO2 doubling. Graphic C shows the "cold blob" moving across northern Europe with temperature increases in Europe, Africa and much of the rest of the world. From University of California, Liu et al (2017)

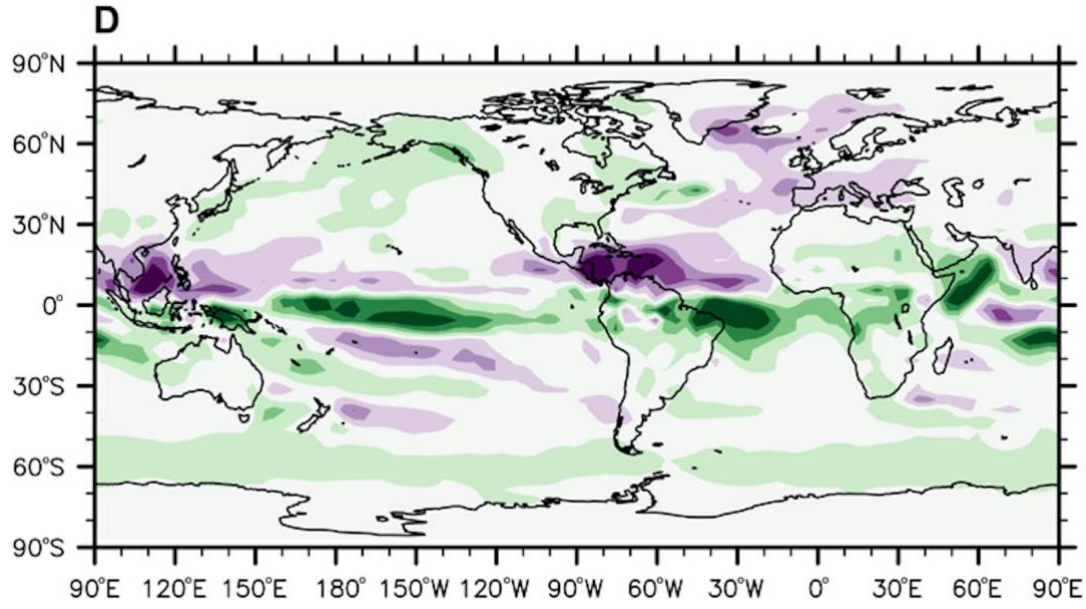


Figure 6. Modelling of the AMOC collapse with CO2 doubling. Graphic D shows shifts in rainfall, the purple indicates decreases in rainfall, green indicates increases in rainfall. Note the shift in the main rainfall belt above the Amazon. From University of California, Liu et al (2017)

Who is saying this?

Professor Stefan Rahmstorf, Potsdam Institute for Climate Impact Research
https://www.pik-potsdam.de/members/stefan/homepage

Rahmsdorf, Stefan (2024) Is the Atlantic Overturning Circulation Approaching a Tipping Point? Oceanography. Available at: https://tos.org/oceanography/article/is-the-atlantic-overturning-circulation-approaching-a-tipping-point

This is a 49 minute presentation:
Professor Stefan Rahmstorf, Alfred Wegener Medal Lecture, April 24, 2024 "Is the Atlantic Overturning Circulation Approaching a Tipping Point?"
Available at: https://www.youtube.com/watch?v=HX7wAsdSE60&t=190s

This is a shorter 35 minute presentation:
Professor Stefan Rahmstorf, May, 2024 "Tipping risk of the Atlantic Ocean Overturning circulation, AMOC." Available at:
https://www.youtube.com/watch?v=ZHNNW8c_FaA

Van Westen et al (2024) Physics-based early warning signal shows that AMOC is on tipping course. Available at:
https://www.science.org/doi/10.1126/sciadv.adk1189#tab-contributors

Liu et al (2017) Overlooked possibility of a collapsed Atlantic Meridional Overturning Circulation in warming climate. Science Advances. Available at:
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5217057/

Open Letter by Climate Scientists to the Nordic Council of Ministers (2024) Available at: https://lnkd.in/eVnkYuDw

What will this "Cold Blob" Shift Be Like?

A weakness of the scientific studies is that they can feel pretty tough to wade through and do not elaborate what the lived experience of the "cold blob" might be – arguably, communication with the general public is not the area of expertise of most climate scientists. A picture of the lived reality can be inferred from what they describe. To put it in a nutshell, **the "cold blob" means the collapse of life as we know it**. This will not be a slow steady shift that allows plants and animals (and humans) to adapt. This is **a catastrophic climate shift within a decade** such as:

- Trees, birds will die out because there will be no time to adapt
- There will be no summers, crops will not ripen
- There will be extreme winds – winds that make a short 20 minute walk life threatening
- Sea levels around Scotland will rise +1m in addition to other climate impacts – this means large scale devastation of coastal communities

- Mainland Europe will experience extreme heat - the sort that kills you within an hour of exposure
- Mainland Europe will experience drought – with the heat, crops will not ripen
- Globally, tropical rain belts will move e.g. rain will not fall on the Amazon, the Amazon rainforest will die

What are the IPCC and UN saying?

Frankly, understanding the detail of the science is beyond my comprehension. But reading across these sources has changed how I understand some of the key messages coming out from trusted sources such as the IPCC, the UN, Carbon Brief and Climate Action Tracker. Given the perspective that the above scientists feel the IPCC is underestimating the risk of tipping points, the IPCC Synthesis report from 2023 already states:

> **"There is a rapidly closing window of opportunity to secure a liveable and sustainable future for all" – high confidence this is the case**
>
> **"The choices and actions implemented in this decade will have impacts now and for thousands of years to come." – high confidence this is the case**

So this means we need to take action this decade, not some distance timepoint in the 2040s or 2050s.

This is echoed in a recent speech made by the UN Secretary General Antonio Guterres on climate change in June 2024, which has a new tone of urgency – did we even think that was possible?! Globally, carbon emissions are going up not down. **We are on track to exceed 1.5°C within the next couple of years**. **The decision making of the next 18 months is what is going to determine the viability of our planet.**

From a Scottish and UK perspective, the prospect of a cold blob ice age is very high risk – we need to take every step, every measure to avoid this.

Who is saying this?

The IPCC Synthesis report 2023 is available at: https://www.ipcc.ch/report/ar6/syr/

This article is a readable summary of the speech made by Antonio Guterres, Secretary General of the United Nations to the world "World must exit climate hell" 5 June 2024. Available at: https://news.un.org/en/story/2024/06/1150661

Walking is a Super Leverage Domain

We know that not taking action to stop or reduce climate collapse is very, very, very expensive. We know that transport is the largest contributing carbon sector in Scotland and the UK. We know that transport is a critical domain for health, community, environment, economy and fairness. **Transport is a recognised super leverage domain**.

As the ultimate carbon free and most equitable mode of transport, walking it itself is a super leverage domain.

It is absolutely clear that walking has been completely ignored by the transport sector over the past eighty years. Even to this day within the active travel movement, walking is marginalised. **This is an untapped potential – for the value of walking itself and because walking is the lynch pin of integrated transport**.

We need to rethink how investment in carbon free transport infrastructure can deliver wider services to community, nature and the globe. This could mean for example linking investment in walking infrastructure to the state pensions or community health bonds. And - to keep it simple - we need large scale investment in excellent walking infrastructure which links with outstanding carbon free transport across Scotland.

This means placing walking at the centre of an integrated transport approach, delivered on an emergency rapid decarbonisation footing – like Covid, but better.

Who is saying this?

Scottish Government (2023) Scottish Greenhouse Gas Statistics 2021. Available at: https://www.gov.scot/publications/scottish-greenhouse-gas-statistics-2021/

The Marmot Review "Fair Society, Healthy Lives" (2010). Available at: https://www.instituteofhealthequity.org/resources-reports/fair-society-healthy-lives-the-marmot-review

Kotz et al (2024) The economic commitment of climate change. Available at: https://www.nature.com/articles/s41586-024-07219-0

Read (2017) iWalk – innovations in inclusive walking to deliver co-benefits in transport and public health. Available at: https://www.2030.co.uk/iWalk.pdf

Walking Cycling Climate Action (2024) Community Street Audit Evaluation - Evaluating Sixteen Community Street and School Route Audits across Scotland - Final Road Safety Report. Available at: https://www.transport.gov.scot/publication/community-street-audit-evaluation-

evaluating-sixteen-community-street-and-school-route-audits-across-scotland-final-road-safety-report/

A useful short summary of this study from the Potsdam Institute for Climate Impact Research. Available at: https://www.pik-potsdam.de/en/news/latest-news/38-trillion-dollars-in-damages-each-year-world-economy-already-committed-to-income-reduction-of-19-due-to-climate-change

Deloitte (2022) Global Turning Point Report. Available at: https://www.deloitte.com/global/en/about/press-room/deloitte-research-reveals-inaction-on-climate-change-could-cost-the-world-economy-us-dollar-178-trillion-by-2070.html

World Resources Institute. Integrated Transport. Available at: https://www.wri.org/cities/integrated-transport

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