

Aviation's present-day contribution to human-induced global warming is 4% and will increase over the next 30 years should pre-Covid growth resume

Major new study reveals that aviation could consume up to one-sixth of the remaining temperature budget to limit warming to 1.5 °C

Aviation is responsible for more global warming than implied by its carbon footprint alone. According to new research published today, aviation could consume up one-sixth of the remaining temperature budget required to limit warming to 1.5 °C by 2050. The article, published in *Environmental Research Letters*, suggests that emissions produced by the aviation industry must be reduced each year if the sector's emissions are not to increase warming further.

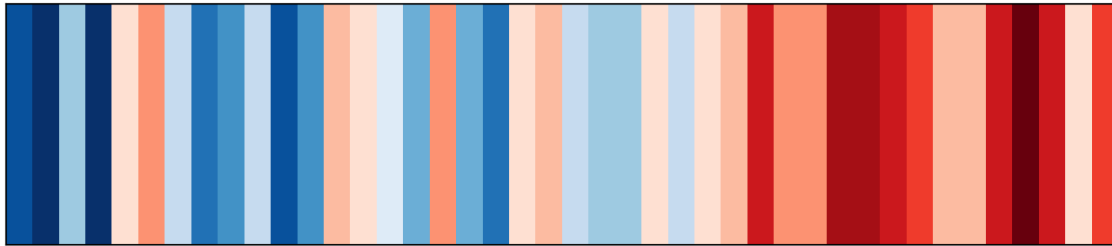
Given that aviation is widely recognized as a sector which is challenging to decarbonise, this research aims to inform the discussion about aviation's 'fair share' of future warming.

The researchers behind the study, based at the University of Oxford, Manchester Metropolitan University, and the NERC National Centre for Earth Observation, developed a simple technique for quantifying the temperature contribution of historical aviation emissions, including both CO₂ and non-CO₂ impacts¹. It also projects future warming due to aviation based on a range of possible solutions to the climate crisis.

Milan Klöwer, lead author of the study said: "Our results show that aviation's contribution to warming so far is approximately 4% and is increasing. COVID reduced the amount people fly, but there is little chance for the aviation industry to meet any climate target if it aims for a return to normal."

The authors show that the only way to 'freeze' the temperature increase from the sector is to strongly decline CO₂ emissions by about 2.5% per year; however, there is room for optimism as they also show that ensuring a 90% mix of low carbon sustainable fuels by 2050 would achieve a similar outcome, with no further temperature increase from the sector. But this relies on a sustainable production chain of low-carbon fuels that does not exist yet, as Milan Klöwer points out. "The aviation industry has to come up with a credible plan for a 1.5 °C world."

¹ Aviation contributes to global warming from its CO₂ emissions and a range of other non-CO₂ effects from e.g. emissions of nitrogen oxides, water vapour and particles, that alter the chemical balance of the atmosphere and affect cloudiness, which can increase the net warming signal from aviation, as previously quantified by the authors <https://doi.org/10.1016/j.atmosenv.2020.117834>



'Warming stripes of aviation, showing the percentage contribution to global warming from 1980 to 2021'²

“Any growth in aviation emissions has a disproportionate impact, causing lots of warming”, says Professor Myles Allen, co-author of the study. “But any decline also has a disproportionate impact in the other direction. So the good news is that we don’t actually need to all stop flying immediately to stop aviation from causing further global warming – but we do clearly need a fundamental change in direction now, and radical innovation in the future.”

Co-Author Professor David Lee, Manchester Metropolitan University, adds, “These are important results that show stylized pathways of how we can get to where we need to be with aviation emissions, robustly showing the different roles of CO₂ and non-CO₂ impacts. One of the important nuances is that the non-CO₂ impacts, like the formation of contrails and cloudiness, have been thought to dominate the total impact: this is true at present, but it’s not widely understood in the stakeholder community that if you take care of CO₂, the non-CO₂ fraction *decreases* in importance, even more so with sustainable alternative fuels that generate fewer contrails. This emphasizes the importance of tackling aviation’s CO₂ emissions.”

The aviation industry has only recently begun to tackle the warming effect of flying, and this study is timely for quantifying that impact. The solutions discussed in this study, such as moving to alternative fuels, present a clear pathway to minimising warming but these will take time to implement. In the short-term, there are actions that the industry can take right now. Dr Simon Proud, of the National Centre for Earth Observation and RAL Space, suggests, “A ban on fuel tankering - where aircraft carry more fuel than they need, and hence burn extra fuel, to save the cost of refuelling at the destination - would reduce CO₂ emissions in Europe alone by almost one million tonnes.” Other solutions, such as more efficient air traffic control and minimising holding patterns at airports would also reduce emissions and help keep future warming minimal.

The research paper can be downloaded from
<https://iopscience.iop.org/article/10.1088/1748-9326/ac286e>

Ends

² Developed as part of ongoing collaboration with the European Union Aviation Safety Agency’s environmental work (e.g. <https://ec.europa.eu/transport/sites/default/files/2019-aviation-environmental-report.pdf>)

Further information

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