



The flying less movement

First published March 2018. Updated May 2019.

Compared to the cacophony of disparate voices praising the virtues of driving, rethinking our flying habits have until recently been few and far between. Yet this has been steadily growing for more than a decade. As their voices begin to echo, what was until recently a rather niche debate into a movement reshaping the way we travel and what is their message?

First published March 2018. Updated May 2019.

The flying less movement has been energised by citizens making a consistent effort to achieve a low-carbon footprint through recycling, using more energy-efficient appliances, or driving less, but also in activities away from home that have often been work-related conferences and meetings. Although the size of the movement is not known, it involves a growing number of people from all backgrounds in every continent. Some of its most visible advocates are environmentalist Rob Hopkins, founder of the Transition movement, commentator and gold medal Olympian Bjorn Ferry, Swedish opera singer Malena Ernman and her daughter Greta Thunberg, founders of We Stay Grounded, and climate scientists such as Alice Larkin and Kevin Anderson in the UK, Peter Kalmus and others in the US.

Key strands of their message, as articulated by some of its most visible figures, can be succinctly outlined in the following sections.

Climate change is an urgent issue

We tend to think of climate change as a problem that can be addressed with incremental changes in technology and behaviour in a more or less distant future. Yet, what matters are not levels of technological efficiency in say 2080 but cumulative greenhouse gas emissions leading to a tipping point in climate dynamics. This means that we have a limited 'carbon budget' that must be adhered to if average global temperatures have been agreed as being a safe threshold ¹. The size of this budget depends on the probability of exceeding the 1.5 or 2 degrees Celsius dangerous climate change ². To meet the commitment of the Paris Agreement of keeping temperatures 'well below 2 degrees Celsius', we have a carbon budget of 655 billion tonnes of CO2 (from 2020), and at the current rate of emissions this budget will be exhausted by 2035. To honour the principle of equity enshrined in the Paris Agreement and make a greater mitigation effort, they have to cut emissions ³. The problem is that adapting everyday technologies to new energy systems can take decades, and therefore there is a need for immediate action ⁴. This means changes in lifestyles ⁵, and for those who have normalised high-carbon lifestyles this means flying less.

Climate change is about equity

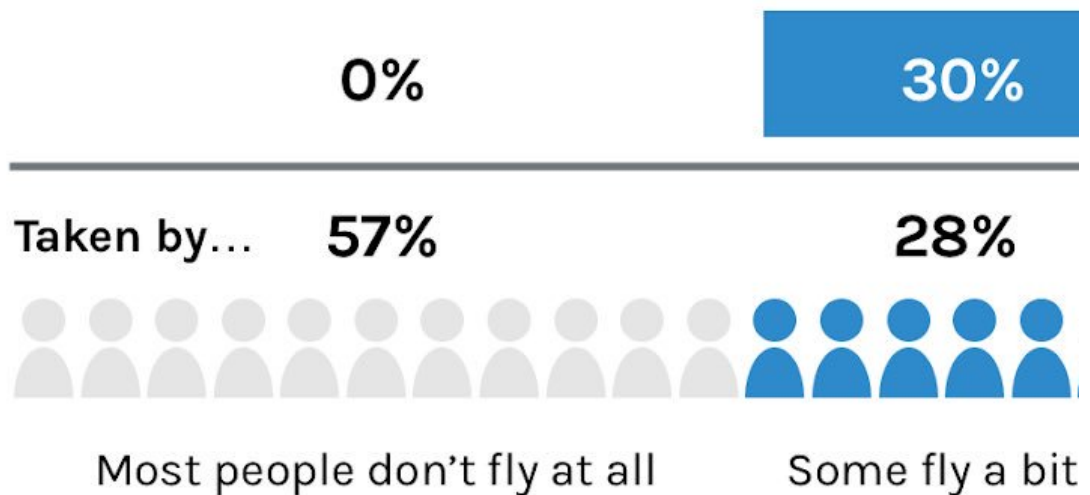
The notion of carbon budgets reframes climate change as a zero-sum game. The more carbon is emitted by some, the less is available for others. About the responsibility for reducing emissions have tended to focus on emissions by countries. Turning their focus to individuals, the French economists Lucas Chancel and Thomas Piketty have shown that the richest 10% of the global population is responsible for 50% of global emissions. Climate scientist Kevin Anderson has estimated that if this privileged group were to reduce its emissions to those of the average person, global emissions would be reduced by 33%, within one or two years ⁹. Poor people who will be most affected by climate change could be significantly improved with even modest increases in energy consumption. There is one pie for all but the rich are eating most of it while others pick at the crumbs that fall from the table.

Flying is not normal

In western societies affluent segments of the population have come to think of flying as a normal aspect of everyday life and certain jobs such as academic research. Yet, only 2-3% of the world's population flies internationally in any given year. Seen from a global perspective, flying is an elite form of transport. Even in some western societies, flying is the privilege of the few. In the UK, for example, flying is responsible for 70% of all flights ¹².

Who does most of the U flying?

Proportion of flights



Sources: YouGov 10:10 2018 polling, afreeride.org

Graphic 1. Most flights abroad in England are taken by a small, affluent part of the population. Credit afreeride.org

Flying is artificially cheap

Worldwide more than 420 new airports, 121 new runways, 205 runway extensions, 262 new terminals and 175 terminal extensions are under construction ¹³. The aviation industry expects the number of passengers to double to 8.2 billion in 2037 ¹⁴. But this growth is driven by free fuels ¹⁵ and a lack of regulation regarding carbon emissions – aviation has repeatedly been left outside international climate agreements. Current plans to offset aviation emissions after 2020 have fundamental flaws ¹⁶. The current system of mass air travel related policies can be changed ¹⁷. The expansion of aviation is not inevitable.

Beware of techno-optimism...

Despite claims by the aviation industry such rapid growth is not 'green' ¹⁸. There is no such thing as sustainable aviation

People claim by the aviation industry that electric planes are not green. There is no such thing as sustainable aviation. Polluting fuels are not enough to make aviation a clean mode of transport, especially considering the current and expected airport operator has noted that electric planes will be available by 2050 to operate short-haul flights²⁰. There are at least still has to be proved that large commercial electric planes will be available by then and that they will deliver what is being remember that in the early stages of development new technologies often go through a hype phase in which the technical while the potentials are overstated so as to attract investment. Secondly, even if commercial electric planes could work for in the UK accounts for around 72% of aviation emissions, would still operate with conventional fuel²². Thirdly, regardless then, the key concern is to reduce emissions as fast and as widely as possible within the next two decades so as to have change. Right now, the only way to reduce emissions significantly in aviation is by reducing demand. Finally, aviation will budget by 2050²³. In a 2015 report, the research organisation Öko-Institut warned the European Parliament that international share of 22% of global emissions by 2050. This share is greater in countries where aviation is more prominent. Projection government is committed to limiting global warming to 1.5 degrees 71% of the national emissions budget will be consumed other forms of commercially viable air travel such as air ships will emerge that will make low-carbon aviation possible²⁵ but for now avoiding dangerous climate change means reducing aviation demand and changing one's lifestyle accordingly.

... and don't sweeten the message

The need to address climate change has been discussed for three decades. During this time messages of hope have nurtured green-house emissions keep growing. Reporting clearly and bluntly about the serious risks ahead is more effective than change as recent research suggests²⁷.

Integrity matters

When communicating science, it is important to 'walk the talk'²⁸. If science says that current trends in aviation are incompatible with climate change, then it makes sense to act accordingly, otherwise one's talk may be interpreted by others as cheap virtue signalling. climate change and its effects on the planet and poor people while sitting on a plane will ultimately weaken trust in science.



Greta Thunberg  @GretaThunberg · May 26

Now I'm on my way through Germany to Vienna for the Summit.



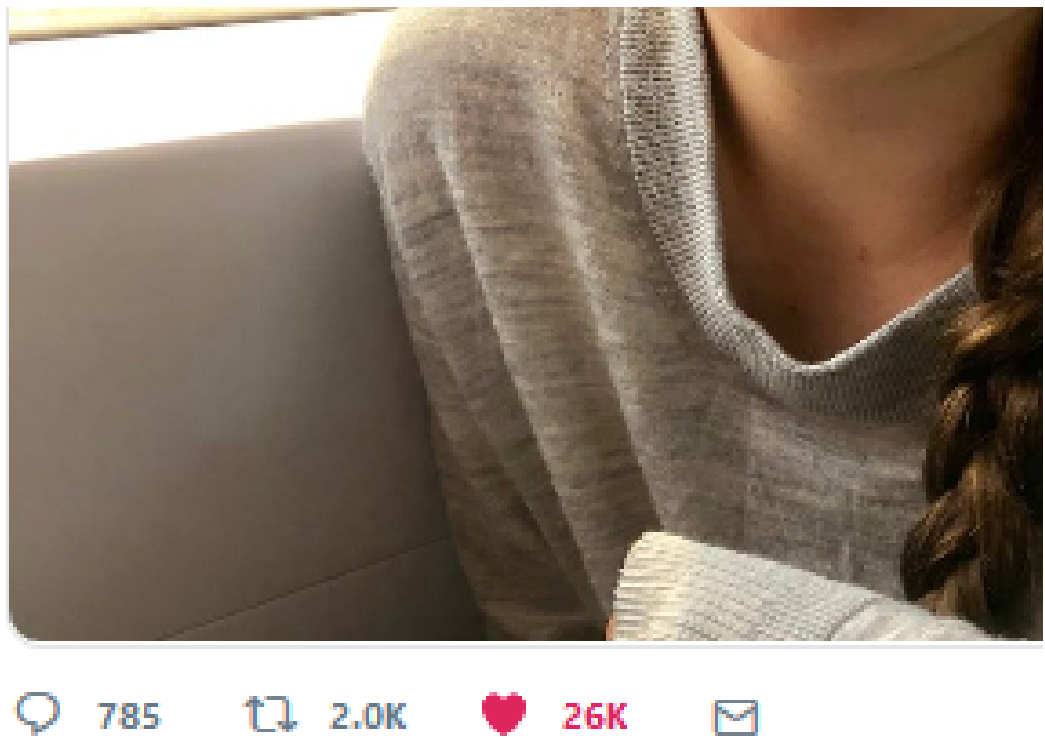


Image 1. Climate activist Greta Thunberg on the train, leading by example.

Individual versus collective action is a false dichotomy

Reducing emissions urgently requires decisive action by governments and big business to put in place regulations and i change their habits. However, the argument that a focus on individual action diverts attention from systemic change is p action does matter because it is a catalyst for collective action. Four interrelated issues to consider:

a) Never underestimate the power of small, peaceful minorities

Most probably only a small part of the population will willingly fly less or stop flying. But small minorities can be powerful especially when, as is often the case with frequent flyers, these people occupy influential positions and their voices can l actions of a small but visible segment of the population could be a symbolic but essential catalyst for wider cultural chang American civil rights movements initially made up of a small number of individuals committed to positive change?

b) If you decide to fly less you are inspiring others

People fly less when others around them, especially influential figures, fly less or stop flying. Research by Steve Westlake individual, around half fly less as a result, and around three quarters say knowing that person has changed their attitudes action of an individual sends ripples across the many social relations that each of us is part of – local communities, work and sports societies ³¹. The larger the number of these distinct settings where action is taken the more likely it is that opi decide to fly less, make sure others know about it.

c) ... and you are creating space for ambitious policies

'Political will' is needed to achieve radical mitigation in all sectors of the economy. But politicians cannot lead without fol 2018 by Rebecca Willis from Green Alliance on how climate change looks from the politician's point of view found that n to act on climate but it was not straightforward for them to do so. Reasons for this included the fact that climate change v mainstream politics and talking about climate could be a 'career-limiting move'. Another reason was that 'politicians feel change. They report limited interest from their constituents, and need to find ways to make climate action relevant to the Following the 'climate spring' of 2019 UK politicians now need to respond to higher levels of public concern. A key insight cannot exist without public consent, with your personal actions you are contributing to make ambitious policies possible

In a nutshell

Atmospheric scientist Peter Kalnus summarises the argument: 'Collective action enables individual action (by shifting s collective action (by shifting cultural norms). Visible, conspicuous individual action is also collective action. We won't get until the grassroots care enough about climate change ³³.'

Flying probably dominates your emissions

In 2016 the greenhouse emissions per capita in the European Union was 8.7 tonnes of carbon (measured in CO₂-equivalent) (London - New York) in economy / coach class produces 2.76 tonnes per passenger³⁵. So if flying is currently an integral part of your life, one of the most effective things you can do to prevent climate breakdown is to fly less.

Flying less is about living within planetary boundaries³⁶

The annual emissions budget per person per year required by 2050 in order to stabilize warming below 2 degrees is 2.1 tonnes³⁷. Since the world is decades away from viable clean flying technologies, flying as usual has no place in a liveable future.

Flying less is about positive change

Flying less is not about 'sacrifice' or limiting one's choice. Instead it should be seen as making a positive change in one's travel and simple living³⁹. Above all it is a commitment to 'live with the future', as if the climate mattered and as if we cared for the poor.

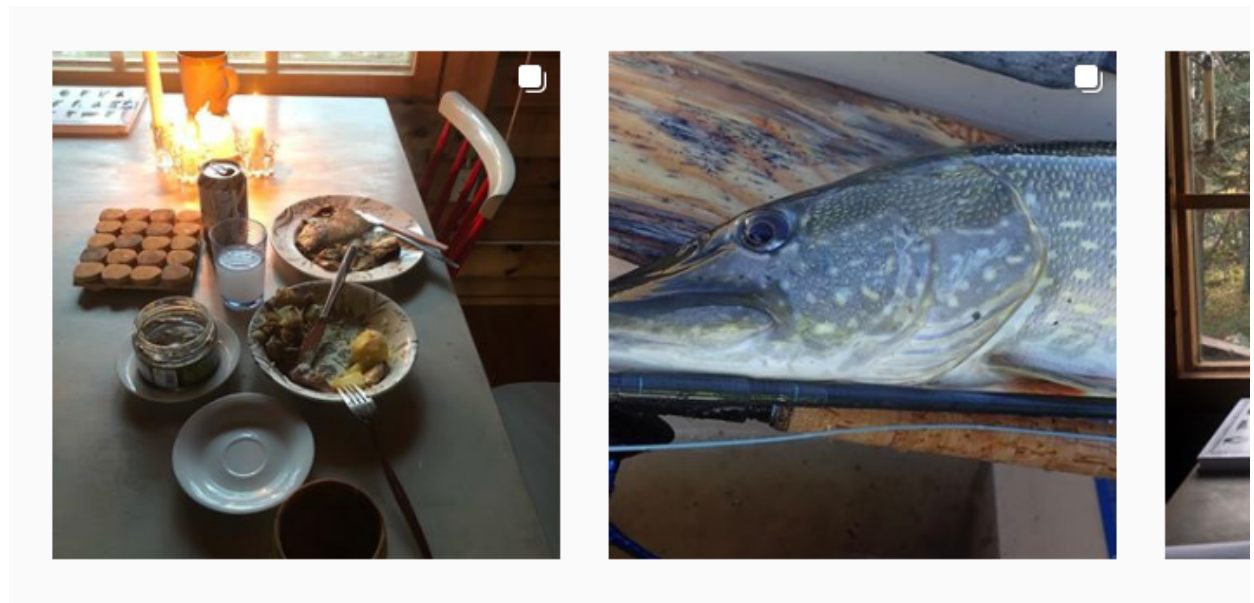


Image 2. Images of simple and fulfilling living from the Instagram account of Aarne Granlund, a sustainability researcher who travels in the coastal waters near Helsinki or in Lapland where he travels using extremely low-carbon methods.

Flying less is about exploring all available options

People who stop flying or begin flying less often talk about the pleasures of discovering that one's lifestyle can be re-set 'considered and that aviation is not as necessary as it may seem – even if you are a travel writer as Evelina Utterdahl has considered'. Many academics should take an opportunity to re-set their values and rethink why they fly and whether it is strictly necessary for a conference⁴³? Why not an on-line presentation? Would I attend it if it took place in a less attractive place? Am I really attending because of the tourism opportunities it provides? How much is flying related to status seeking in academia and other job research field by using the many on-line resources available? Is flying really unavoidable or is it that I am reluctant to change promoting a new culture of doing business and research. For example, the Tyndall Centre for Climate Change Research has asked its staff to consider every non-flying option possible⁴⁴. This is now being used by other institutions.

Flying less does not mean giving up holidays abroad

Although long-distance travel by train and ship does not currently receive the same support as airport expansion, in Europe these means of transport. The flying less movement hopes that enough people will demand and use lower carbon land and air becomes easier to visit distant places without jumping on a plane. This was the aim of Kate Andrews, co-founder of Low

becomes easier to visit distant places without jumping on a plane. This was the aim of Kate Andrews, co-founder of Book Your Mission is to make booking a train in Europe as easy as booking a flight. Many people plan their railway journeys with the

A growing movement

Flying is so engrained in the lifestyles of more affluent segments that the possibility that sometime in the near future people might find it implausible. Yet recent developments suggest that what we regard as normal in travel can change faster than some people have been taking place in mainstream media since January 2018 and is now part of everyday conversations. Celebrities such as TV presenter Björn Ferry and opera singer Malena Ernman, and ordinary citizens such as mothers Maja Rosén⁴⁷ and Lotte⁴⁸ Flight Free 2019 (Flygfritt 2019⁴⁸), have played a key role in raising awareness. According to Agence France-Presse⁴⁹, 'in 2018, a survey published in Sweden's leading travel magazine, Vagabond, said 64 per cent of the respondents had chosen to travel by rail rather than by air in order to mitigate their carbon footprint because of climate reasons.' A separate survey by Swedish Radio showed that the climate is the most important political issue for Swedes. The sustained growth in the number of airline passengers for almost ten years (from 31 million in 2009 to more than 39 million in 2018) slowed down in 2018 (from 9% to 4%) and there were fewer domestic and international charter flights than in the previous year. Problems faced by local budget airlines have been noted as plausible causes, data for the first quarter of 2019 show a continued decline (378,000 fewer passengers with respect to the same period in the previous year representing a 4.5% fall in demand⁵¹). It is likely that the 'Flight Free' movement introduced in April 2018 as well as the growing awareness about aviation's impact on climate may also explain this trend.



Image 3. Citizens in Sweden, United Kingdom, Denmark, Belgium, France, Germany and Canada are pledging to stay on

The debate about flying less has spread to Finland. According to sustainability researcher Aarne Granlund⁵³, the debate is taking place in a wide range of contexts from youth organisations, the church and the education system, to some political and sports world. A survey conducted in March 2019⁵⁴ shows that 'Four out of five Finns consider that urgent action is needed to reduce the population has calculated its own carbon footprint. Interestingly, 'About 40% of the Finns have reduced flying because the respondents intend to fly less within the next five years. A little less than half (45%) have travelled by air over the past year. The Finnish Environmental Federation, "matkustavat", connecting people committed to ground travel, has organised its own flying less travel fair.

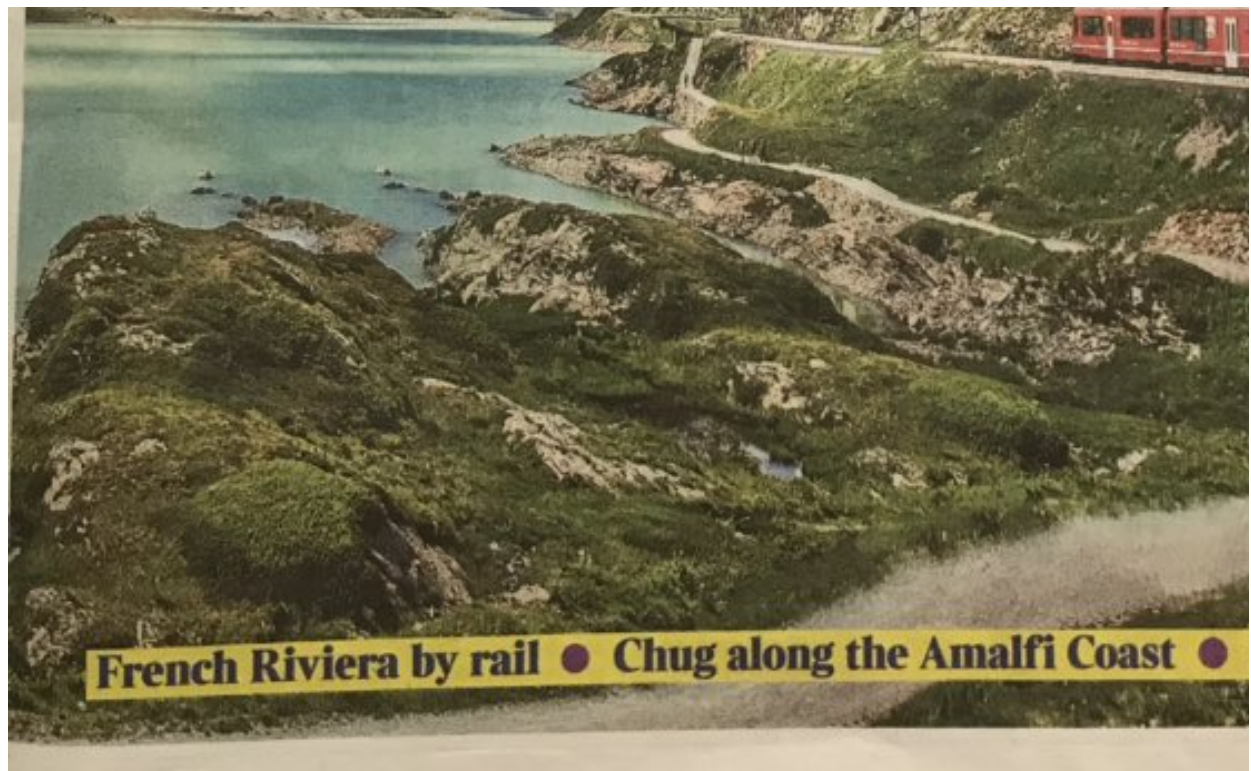


Image 4. The Times Weekend supplement from 1 June 2019 encouraging readers to enjoy low-carbon travel.

Flying less policies are beginning to be discussed and / or adopted by a growing number of European academic institutions: Edinburgh University, Lancaster Environment Centre, UK Innovation Agency, the Met Office, Lund University Centre for

On the other side of the Atlantic, for the first time the Biennial Conference of Cultural Anthropology took place online in 2020 to reduce emissions and to facilitate a broader participation from academics facing visa restrictions⁵⁸. Calls are being made for other anthropologists. Anthropologist Jason Hickel has called for an end of the annual meeting of the American Anthropological Association (AAA) due to climate change, unnecessary flights cannot be morally justified and go against the professional ethics code of the AAA which states 'we must do everything in their power to ensure that their research does not harm the safety of the people with whom they work'. He has urged forward and join others who are already working to create a low-carbon research culture: 'We as anthropologists – we as a discipline – must take this front, just as we led on anti-racism and anti-colonialism in the past. We can set an example that other disciplines can follow. Climate scientists are already taking this step. We should be right behind them. The ethical imperative is clear: it's time to form and come up with a safe, just, and sustainable alternative. (...) I have no doubt that this shift would attract landslide support and usher in a better world. Let's make it happen, starting in 2018. We have little time to lose.'

Negotiating inertias in work and travel cultures and infrastructures

Obviously attempts to significantly reduce one's carbon footprint face many constraints, as the guidelines to reduce working hours acknowledge. These constraints range from expectations at work places to spend a limited amount of money and time to the difficulty of travelling long distances with small children (for example, to visit relatives abroad). The inertias of the system are there counter to aspirations for low-carbon travel. The flying less movement places the emphasis on rethinking what is necessary and possible within these constraints, while at the same time supporting wider efforts for profound changes in working cultures and travel systems.

Acknowledgements

Aarne Granlund kindly provided information about developments in Finland. The online #flyingless community is a place

Appendix

These are some resources to learn more about the flying less movement. Please note that the list is not exhaustive.

Video with Kevin Anderson (<https://en.forumviesmobiles.org/video/2018/03/20/does-aviation-has-place-low-carbon-transport>)

Video about Peter Kalmus: find out how and why a climate scientist felt compelled to shrink his carbon footprint by 90%.

Video with Alice Larkin (<https://archleague.org/article/aviation-shipping-climate-change/>): Aviation, shipping and the I

Atypical Lifestyle Choices: an exploratory workshop (<https://en.forumviesmobiles.org/project/2017/02/02/atypical-lifest>

Petitions to support a low-carbon academic culture

International: Flying less: Reducing academia's carbon footprint (<https://academicflyingblog.wordpress.com/2015/10/17/professional-associations-to-greatly-reduce-flying/>)

Denmark: An open letter to Danish universities: Let us show the way towards a more ambitious climate agenda (<http://sc>
universities-let-us-show-way-towards-more-ambitious-climate-agenda)

Initiatives to reduce aviation

We Stay on the Ground (<https://westayontheground.blogspot.com/>)

Flight Free UK (<https://www.flightfree.co.uk/>)

A Free Ride: Campaign for a fairer way to fly (<http://afreeride.org/>)

No Fly Climate Sci (<https://noflyclimatesci.org/>)

Flying less: Reducing academia's carbon footprint (<https://academicflyingblog.wordpress.com/>)

Call on Universities and Professional Associations to Greatly Reduce Flying (https://www.change.org/p/universities-and-universities-and-professional-associations-to-greatly-reduce-flying?recruiter=294645973&utm_source=share_petition&

Stay Grounded (<https://stay-grounded.org/>)

Stay on the Ground (<http://www.stayontheground.org/>)

Proposal University Basel (https://www.swissinfo.ch/eng/society/university-policies_should-academics-be-taking-the

Reflections about flying less in academia

Anthropology: In an era of climate change, our ethics code is clear: We need to end the AAA annual meeting (<https://anti>
ethics-code-end-aaa-annual-meeting/)

Archaeology: Decarbonising archaeology (<https://decarbonisingarchaeology.wordpress.com/>)

Ethnomusicology: Academic flying, climate change, and ethnomusicology: Personal reflections on a professional proble
(https://www.researchgate.net/publication/326266260_Academic_flying_climate_change_and_ethnomusicology_Persc

We don't have time to fly to a conference (<https://medium.com/wedonthavetime/we-dont-have-time-to-fly-to-a-clima>

Advocating flying less in leisure pursuits

Rock climbing (by Kevin Anderson): Meltdown: Climbers and climate change (<https://kevinanderson.info/blog/meltdown>

Surfing (article about Fergal Smith by Paul Evans): Fergal Smith's Big Idea (<https://surfeuropemag.com/longform/fergal-s>

Surfing (video about Fergal Smith): Beyond the Break (<https://www.theperennialplate.com/episodes/2016/11/episode-16>

Birdwatching (by Javier Caletrío): Are we addicted to high-carbon ornithology? (<https://britishbirds.co.uk/article/bb-eye>

Other

Tales of trying to fly less (<https://medium.com/@kovarnic/tales-of-trying-to-fly-less-5883a1858c3f>)

Book

Beyond Flying: Rethinking Air Travel in a Globally Connected World.

Notes

- ① <https://royalsocietypublishing.org/doi/full/10.1098/rsta.2010.0290>
- ② Staying within this limit is a formidable challenge but the alternative of doing nothing is simply not an option. In the conservative International Energy Agency (<https://www.oecd-ilibrary.org/energy/world-energy-outlook-2011-weo-2011>) (<http://www.worldbank.org/en/news/feature/2012/11/18/Climate-change-report-warns-dramatically-warmer-world-th>) (<http://www.worldbank.org/en/news/feature/2012/11/18/Climate-change-report-warns-dramatically-warmer-world-th>) emission trends were on track for a global mean surface temperature rise of 4°C or more by the end of the century with 'c This would mean 'extreme heat waves, declining global food stocks, loss of ecosystems and biodiversity, and life-threate (<http://documents.worldbank.org/curated/en/865571468149107611/pdf/NonAsciiFileName0.pdf>). Kevin Anderson, one o that 4° C warming is 'incompatible with any reasonable characterization of an organized, equitable and civilized global c Put simply, following this 'business as usual' scenario would lead to an erosion of economic and political conditions for c Brown and Caldeira published in Nature (<https://www.nature.com/articles/nature24672>) suggest that in a business-as-u temperatures to increase anywhere in the range of 5.8 and 10.6 degrees Fahrenheit (3.2 to 5.9 degrees Celsius) over prein difference of about a factor of two between the most- and least-severe projections' (see <https://carnegiescience.edu/nev> could-be-most-accurate & video https://www.youtube.com/watch?v=8PdM9_cDL5Y). Another key issue in dealing with greenhouse gases. Climate scientist Glen Peters clarifies that 'whether the remaining budget is 700, 800, or 900 billion to to the uncertainty in future no-CO2 pathways (i.e. expected emissions and behaviour of other greenhouse gases), we sin need to go to zero at an unprecedented rate' (<https://cicero.oslo.no/no/posts/klima/how-much-carbon-dioxide-can-we> emissions exist in the second half of the century, reduction rates would still have to be 3-6% per annum during 2030-205 credibility of these technologies still needs to be demonstrated (<https://www.nature.com/articles/nclimate2392>).
- ③ The Intergovernmental Panel on Climate Change, a United Nations body, says that in order to have a fair chance of li emissions need to be cut by at least half from their 2010 levels by 2030 and reach 'net zero' by around 2050. These mitiga remove carbon from the atmosphere, but these technologies only exist, at best, as small pilot schemes and may never w
- ④ Regarding questions of fairness in the distribution of the effort to reduce emissions between wealthier industrialised c on carbon budgets by the Tyndall Centre shows that if a fairness principle is observed so that developing countries have of poverty, emission reductions by wealthier industrialised countries of at least 10% per annum would be needed (<https://royalsocietypublishing.org/doi/10.1098/rsta.2010.0290>). Yet, even if not accounting for principles of fairness, if w degrees and assume net zero emissions in this century, mitigation rates still need to be around 5% per annum globally ac (<https://www.nature.com/articles/nclimate2384>). These levels of emission reduction are unprecedented.
- ⑤ <https://tandfonline.com/doi/pdf/10.1080/15487733.2018.1458815>
- ⑥ <https://www.tandfonline.com/doi/pdf/10.1080/14693062.2014.965125>
- ⑦ https://www-cdn.oxfam.org/s3fs-public/file_attachments/mb-extreme-carbon-inequality-021215-en.pdf
- ⑧ See <http://piketty.pse.ens.fr/files/ChancelPiketty2015.pdf>. The richest 20% is responsible for 70% of emissions. This se flying academics. Research by Wynes and Donner consisting of a survey of 1509 individuals across eight departments at that almost one third of academics did not fly, 8% produced half of all flight emissions and 25% produced 80% of all flight (https://pics.uvic.ca/sites/default/files/AirTravelWP_FINAL.pdf).
- ⑨ See video <https://www.facebook.com/AlumniUoM/videos/1509359762446284/>
- ⑩ <https://www.inderscienceonline.com/doi/pdf/10.1504/IJISD.2006.012421>
- ⑪ Worldwatch Institute. Vital Signs 2006-2007: The Trends That Are Shaping Our Future. Norton, 2006, p. 68.
- ⑫ <https://neweconomics.org/2015/06/a-fairer-way-to-fly>. In 2017 52% of the US population did not fly. Of those who di 17% took 5-8 flights and 15% took 9 or more flights (<http://airlines.org/wp-content/uploads/2018/02/A4A-AirTravelSurvey>
- ⑬ http://www.ftwatch.at/wp-content/uploads/2017/10/FT-Watch_Green-Flying_2017.pdf
- ⑭ <https://www.iata.org/pressroom/pr/Pages/2018-10-24-02.aspx>
- ⑮ See <https://www.transportenvironment.org/newsroom/blog/ending-aviation's-tax-holiday>. According to Transport & (<https://www.transportenvironment.org/press/eu-sat-data-showing-benefits-ending-airlines'-tax-break---leak>) 'Taxin aviation emissions by 11% (16.4 million tonnes of CO2) and have no net impact on jobs or the economy as a whole while year, a leaked report for the European Commission shows (<https://www.transportenvironment.org/publications/leaked-taxes>). The reduction in carbon emissions, which cause climate breakdown, would be equivalent to removing almost 8 n private aviation are even more generous than those benefiting ordinary airlines. See article by The Economist

(<https://www.economist.com/leaders/2019/03/07/private-jets-receive-ludicrous-tax-breaks-that-hurt-the-environment>)
Studies (<https://ips-dc.org/wp-content/uploads/2008/06/HighFlyersReport.pdf>).

¹⁶ See <https://www.transportenvironment.org/news/eu-urged-stand-firm-aircraft-emissions>. CORSIA is an approach to 'offset' growth in aviation after 2020. A recent academic review concluded that this plan 'will not deliver any major emissions reductions' (<https://www.tandfonline.com/doi/full/10.1080/14693062.2018.1562871>). See also report about offsetting in EU's aviation (https://ec.europa.eu/clima/sites/clima/files/ets/docs/clean_dev_mechanism_en.pdf) and climate scientist Kevin Anderson (<https://kevinanderson.info/blog/wp-content/uploads/2013/02/Offsetting-interview-for-Nature-Climate-Change-Pre-press>).

¹⁷ In the UK the organisation Fellow Travellers is campaigning for the introduction of a 'frequent flyer levy' that would tax frequent flyers (<http://afreeride.org/>).

¹⁸ See <https://stay-grounded.org/wp-content/uploads/2019/02/The-Illusion-of-Green-Flying.pdf>. Aviation is responsible for 2.4% of global greenhouse gas emissions. However, the global warming impact of aviation is larger. This is because emissions at high altitude have an impact on the process of 'radiative forcing' (<https://www.britannica.com/science/radiative-forcing>). According to a conservative estimate, aviation could double the global warming impact of aviation (an estimated 4.9% of man-made global warming) (<https://www.transportenvironment.org/publications/more-damaging-climate-industry-claims>).

¹⁹ The potential of biofuels and alternative sustainable fuels to decarbonise aviation is limited. Synthetic electro-fuels (synthetic kerosene with hydrogen with carbon from CO₂) is one possible way to decarbonise fuel demand according to the environmental organisation Transport Environment (<https://www.transportenvironment.org/publications/roadmap-decarbonising-european-aviation>). However, it is not as simple as switching to electrofuels to meet expected remaining fuel demand for aviation in 2050 would require renewable electricity equivalent to 10% of the electricity currently generated using renewables in Europe. Fellow Travellers notes that this is certainly necessary, but it will not be sufficient on its own to bring aviation emissions within safe limits; even if implemented it will require 1.5 times the current electricity generation in Europe (1. [amazonaws.com/media/afreeride.org/documents/Electric+Dreams.pdf](https://www.amazonaws.com/media/afreeride.org/documents/Electric+Dreams.pdf)). A study from the International Council on Clean Transportation found that alternative jet fuels in the European Union found that overall the cost, even for the cheapest, is much higher than the cost of fossil fuels and that policy support for them to reach the market' (<https://www.theicct.org/publications/cost-supporting-alternative-jet-fuels>). The study argues that biofuels cannot be produced in enough quantities to make a difference without creating serious problems for food supplies and farmers' livelihoods, destroys forests and other valuable habitat, increases greenhouse gases and energy sources (<https://friendsoftheearth.uk/natural-resources/4-reasons-biofuels-arent-answer-climate-change>).

²⁰ <http://www.bbc.com/future/story/20180814-norways-plan-for-a-fleet-of-electric-planes>

²¹ In July 2015 an Airbus two-seater electric aircraft crossed the English Channel in 36 minutes (<https://www.airbus.com/topics/environment/e-mobility.html>). This is a technology demonstrator and engineers acknowledge that the roadmap for electric aviation is to move towards regional aircraft with electric hybrid technology (see also <https://solarimpulse.com/>). According to conservative estimates there were around 130 different electric aircraft programs in development worldwide (including 55 in the US and 58 in Europe) for taxis and personal flying. Regional aviation and large commercial aircraft respectively represent only 10% and 2% of the passenger traffic in Europe (<https://www.rolandberger.com/en/Publications/Electrical-propulsion-ushers-in-new-age-of-innovation-in-aerospace>). The carbon mitigation potential of electric aviation see the report by Fellow Travellers (<https://s3-eu-west-1.amazonaws.com/media.afreeride.org/documents/Electric+Dreams.pdf>).

²² <https://s3-eu-west-1.amazonaws.com/media.afreeride.org/documents/Electric+Dreams.pdf>

²³ [http://www.europarl.europa.eu/RegData/etudes/STUD/2015/569964/IPOL_STU\(2015\)569964_EN.pdf](http://www.europarl.europa.eu/RegData/etudes/STUD/2015/569964/IPOL_STU(2015)569964_EN.pdf)

²⁴ <https://www.carbonbrief.org/analysis-aviation-to-consume-half-uk-1point5c-carbon-budget-2050>

²⁵ <https://www.hybridairvehicles.com/>

²⁶ <https://www.tandfonline.com/doi/pdf/10.1080/14693062.2014.965125>

²⁷ <https://www.sciencedirect.com/science/article/abs/pii/S0959378016300450>

²⁸ <http://archive.news.indiana.edu/releases/iu/2016/06/attari-climate-credibility.shtml>

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²⁹ <https://rationalinsurgent.com/2013/11/04/my-talk-at-tedx-boulder-civil-resistance-and-the-3-5-rule/>. See also <https://science.sciencemag.org/content/sci/364/6436/132.full.pdf?ijkey=FNwWPomZvzwSU&keytype=ref&sited=sci>

- ³⁰ https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3283157
- ³¹ For some people, becoming fully aware of the impact of aviation on the climate is often followed by feelings of guilt or 'flygskam' ('flying shame') to refer to these feelings. It is important to clarify that the flying less movement as understood by example to inspire others, not shaming those who fly.
- ³² <https://www.rebeccawillis.co.uk/>. Rebecca Willis' research 'suggest ways of developing a renewed political mandate for climate action'.
- ³³ Quote from Peter Kalmus' acceptance speech for the Transition US Walking the Talk Award. It is important to add here within their means, especially with the local community, is a meaningful way to cope with 'climate grief'. See Hope and Understanding ecological grief while our world changes around us (<https://thenarwhal.ca/hope-and-mourning-in-the-care:> How climate researchers are coping with the U.N. report (<https://grist.org/article/the-science-of-self-care-how-climate-researchers-are-coping-with-the-u-n-report/>)).
- ³⁴ https://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&language=en&pcode=t2020_rd300&plugin=1
- ³⁵ The distance in miles between London and New York is 3450 miles. The climate impact conversion factor for passenger is 0.8 kg CO₂-e. Therefore the resulting figure is 2,76 tonnes CO₂-equivalent. NASA atmospheric scientist Peter Kalmus (http://beingthechangebook.com/).
- ³⁶ <https://www.nature.com/articles/461472a>
- ³⁷ <https://iopscience.iop.org/article/10.1088/1748-9326/8/1/014016/pdf>
- ³⁸ See Footprint Network (<https://www.footprintnetwork.org/our-work/ecological-footprint/#worldfootprint>)
- ³⁹ <https://medium.com/@kovarnic/tales-of-trying-to-fly-less-5883a1858c3f>
- ⁴⁰ <https://noflyclimatesci.org/biographies>
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- ⁴³ Attending conferences accounts for most of academia's carbon footprint (see <https://mathemagicalconservation.wordpress.com/2015/04/21/attending-conferences-accounts-for-most-of-academia-s-carbon-footprint/>) and most of the carbon footprint of international conferences comes from transport (<https://www.onlinelibrary.wiley.com/doi/abs/10.1111/1746-692X.12106>).
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- ⁴⁵ <https://loco2.com/>
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- ⁴⁷ <https://medium.com/wedonthavetime/the-smart-way-to-make-others-give-up-flying-49cd6bd1272e>
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- ⁵⁷ <https://www.thelocal.se/20190411/reader-voices-how-do-internationals-in-sweden-feel-about-the-growing-anti-flight-movement>

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