STAY GROUNDED

Aviation is a Health Issue

uecna
European Union Against Aircraft Nuisance

Flying poses a long-term risk for the climate and a livable future. It also is an immediate health risk for people living near airports and under flight paths, as well as for cabin crew and passengers.[A] This paper summarises the current science on health effects associated with noise and air pollution and explores ways to tackle them.

THE MOST IMPORTANT FACTS AT A GLIMPSE:

- Flying, while often depicted as a care-free and convenient mode of transport, is actually detrimental to human health. While this is especially true for those flying frequently like cabin crew, pilots and frequent business travellers, people who do not fly also bear the consequences.
- Aircraft noise can lead to wide-ranging health issues. In particular, residents in the vicinity of airports are negatively impacted by take-offs and landings during the night. Curfews exist at some airports and should be expanded.
- The burning of aircraft fuel releases pollutants that cause thousands of premature deaths. A major problem is ultrafine particles, which penetrate deep into the lungs and even enter the bloodstream. Good measuring and strict air regulations for areas surrounding airports must be implemented.
- Aircraft noise, emissions and the related health issues fall disproportionately on low-income communities and airport workers, often including a significant number of people of colour and marginalised populations.
- While technological advancements can help reduce some noise and pollutants, these reductions are eaten up by the increase in yearly flight numbers. Some noise and pollution mitigation options may inflict slight raises in carbon emissions.
- **Reducing the number of flights and stopping airport expansion are the best solutions to counter both health issues and climate breakdown. Residents, health organisations, the climate movement and workers can build powerful coalitions to achieve a fair reduction of aviation, and a healthier future for all.**

[A] While this paper focuses on impacts of flying on humans, we acknowledge its impacts on other living beings and entire ecosystems. The construction and operation of airports and associated projects lead to numerous social and health impacts like the loss of agricultural land, water use, and effects on the social structures of communities.

AIRCRAFT NOISE

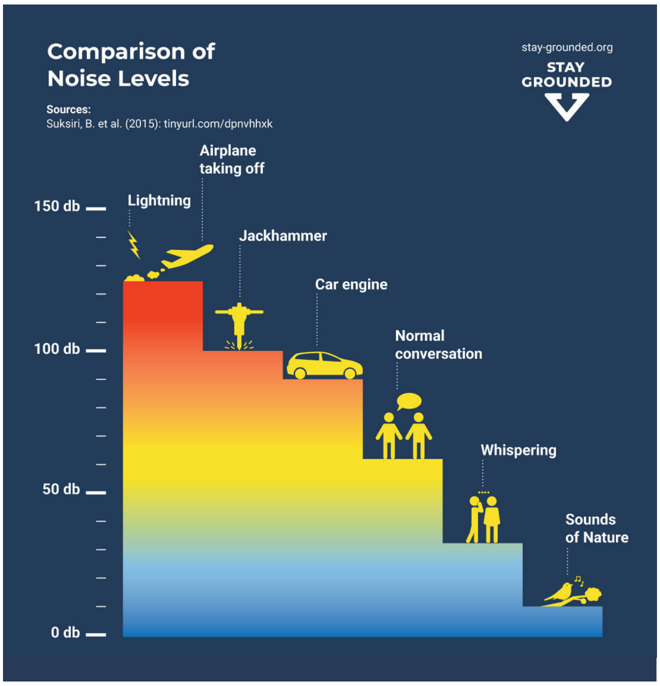
Air traffic noise is associated with a variety of serious health problems:[1] The most critical include cardiovascular diseases (e.g. ischaemic heart disease),[2] cognitive impairment (especially in children),[3] mental health issues (e.g. depression),[4] sleep disturbance and its associated health effects,[5] diabetes[6] and stress-related diseases like hypertension.[7] In airport workers and nearby residents, noise can cause damage to or loss of hearing.[8] Several European studies with large sample sizes confirmed correlations not only between aircraft noise and serious illnesses, but also increased hospital admissions and mortality.[9] One study estimates that night-time aircraft noise near Frankfurt airport leads to 2,340 hospitalisations and 340 deaths per year.[10]
Studies show that aircraft noise is considered more annoying[B] than other sources of noise, such as road or railway traffic: It causes more vibration, often occurs at unpredictable intervals and with disturbingly sudden rise and fall of noise levels.[11]

Despite introducing less noisy planes or flight procedures, **noise pollution is increasing because flight numbers are growing globally,** with further plans for expansion. The trend towards extra-long range flights causes extra noise: planes are loaded with more fuel before departure, meaning they require more thrust during take-off and climbing.[12]

Global heating decreases air density, another reason aircraft require more noise-causing thrust for lift-off.[13] If supersonic aircraft projects come to life they will be ultra-noisy.[14] Lastly, new aircraft engine designs for improved fuel efficiency may actually lead to increased engine noise.[15]
In 2021, the United States published the first Federal Aviation Administration noise survey in nearly 30 years, finding that **a much higher proportion of people are "annoyed" by a day-night average sound level (DNL) of 65 dB or lower than was previously thought.**[16]
Unfortunately, it is hard to acquire comprehensive data for South America, Asia and Africa[C] except for a few localised case studies: For example, 25% of the study cohort at Hangzou Xioshan International Airport was highly annoyed at 55 dB during the day.[17] Most residents of Temisa township in Johannesburg were highly annoyed despite living quite far from the airport and being exposed to less than 55 dB on average, but do not have access to soundproofing or high-quality housing.[18]

NOISE GUIDELINES FOR EUROPE

For aircraft noise, the World Health Organisation recommends a limit of 45 decibels (dB) Lden[D, E] during the daytime and 40 dB Lnight during the night.[19] However, the European Union only considers aircraft noise from an average of 55 dB Lden or above in its legislation,[20] a level linked to significantly higher risk levels for different cardiovascular diseases[21] and lower reading performance in children.[22] The European Aviation Environmental Report assessed noise levels at 98 major European airports in 2019 compared to 2005. It found that the population exposed to Lden 55 dB and Lnight 50 dB was 3.2 million (+30%) and 1.07 million (+71%) respectively. Moreover, 1.3 million people were exposed to more than 50 daily aircraft noise events above 70 dB.[23]



[B] Noise annoyance is widely used to assess impact of noise. Noise Annoyance is associated with depression and anxiety and stress-related psychosocial symptoms. WHO (2011): Burden of disease from environmental noise. tinyurl.com/yckjkrda; Beutel, M.E. (2016): Noise Annoyance Is Associated with Depression and Anxiety in the General Population- The Contribution of Aircraft Noise. tinyurl.com/2v5fabh8; Beutel, M.E. (2020): Noise annoyance predicts symptoms of depression, anxiety and sleep disturbance 5 years later. tinyurl.com/2p98jkvk
[C] Stay Grounded is happy for more information – please send to info@stay-grounded.org, Nguyen et al. (2016) point out that annoyance levels vary between countries based on factors such as housing standards, background noise levels and tolerance for different types of noise. Nguyen, T. et al. (2016): Exposure-response relationships for road traffic and aircraft noise in Vietnam. tinyurl.com/yp76ss9u
[D] Lden is the sound pressure level averaged over the year for the day, evening and night time periods, with a +5 decibel (dB) penalty for the evening and +10 dB for the night. Lnight is the sound pressure level averaged over the year for the night time period only. WHO (2022): Environmental noise. tinyurl.com/ys699ayp
[E] These recommendations were developed for the European region, but according to the 2022 update, they can be considered applicable globally. WHO (2018): Environmental Noise Guidelines for the European Region. tinyurl.com/5xexvvcr; WHO (2022): Environmental noise. tinyurl.com/ys699ayp

AIR POLLUTION

Aircraft emissions are a major source of local air pollution in and around airports and contribute significantly to background concentrations of ozone and particulate matter (PM). According to the latest estimate, **ozone and PM alone cause ~74,300 premature deaths globally per year** - and these don't even include all aircraft emissions.[24,F] Kerosene emissions are similar to those of diesel, which are known to cause numerous health hazards, including cancer.[25] Table 1 lists the main pollutants and health effects from aviation. Most of them result from combusting jet fuels.

POLLUTANTS FROM AVIATION

Pollutant	Origin	Health impact
Nitrogen oxides[26] NOx	Oxidation of atmospheric nitrogen at high engine temperatures	Impaired immune and respiratory functions, cardiovascular diseases and increased response to allergens
Particulate matter (Soot)[27]	Combustion of hydrocarbons	Cardiovascular and respiratory diseases and stroke. Long-term exposure has negative effects on pregnancy and unborn children and is linked to lung cancer and decreased fertility. Depends on size and chemical composition (see below)[28]
Particulate matter (Sulphuric acid and Sulphate)[29]	Oxidation in the atmosphere of the SO_2 formed in the combustion of fuel sulphur compounds	Problematic are mostly ultrafine particles (UFP), which can penetrate deep into the lungs and enter the bloodstream[30]
Particulate matter (Other)[31]	Abrasion of tyre, brake and runway surface. Lead from AvGas (Aviation gasoline) used in small planes and helicopters	Particulate matter is classified as a class 1 carcinogen[32]
Ozone[33] O_3	Chemical reactions in the atmosphere between NOx, methane and VOCs (Volatile organic compounds)	Aggravates lung diseases such as asthma and COPD
Sulphur dioxide[34] SO_2	Combustion of fuel sulphur compounds	Irritations of nasal mucous membranes and respiratory diseases
Carbon monoxide[35] CO	Combustion of hydrocarbons	Respiratory problems such as asthma, heart disease and increased mortality
Hazardous Air Pollutants (HAPs)[36]	Include benzene, 1,3-butadiene, naphthalene, ethylbenzene, formaldehyde, 1-methylnaphtalene, and lead compounds; various origins with more research needed[37]	Classified as carcinogenic[38]

[F] This estimate only considers ozone and PM, not deaths from NOx emissions. Even so, estimates vary significantly between studies. We cite Eastham et al. (2023), who use high-resolution global models and the most recent assessments of ozone's impacts on human health. They conclude 21,200 premature deaths due to PM2.5 pollution and 53,100 deaths due to ozone exposure. They explain why they have different outcomes than older studies:
• Quadros et al. (2020) estimated 58,000 deaths for 2005. Eastham et al. (2023) conclude that "our [...] emissions inventory includes 33% more fuel burn by mass than was used for Quadros' study, and our estimate of the net mortality impact is also 33% greater."
• Eastham & Barrett (2016) estimated 16,000 annual deaths, 6,800 of them from ozone and 9,200 from PM2.5. For ozone, Eastham et al. (2023) attribute the discrepancy with this former article to their finer resolution models and updated estimates on the health impacts of ozone; for PM2.5 the updated methodology only partially explains the difference.
• Yim et al. (2015) likewise estimated 16,000 deaths annually.Eastham, S. et al. (2023): Global impacts of aviation on air quality evaluated at high resolution. tinyurl.com/4vpc6u88; Yim, S. et al. (2015): Global, regional and local health impacts of civil aviation emissions. tinyurl.com/3j9s28xx; Quadros, F. et al. (2020): Regional sensitivities of air quality and human health impacts to aviation emissions. tinyurl.com/mv6tdphc; Turner, M.C. et al. (2015): Long-Term Ozone Exposure and Mortality in a Large Prospective Study. tinyurl.com/4v499bzs; Eastham, D. et al. (2016): Aviation-attributable ozone as a driver for changes in mortality related to air quality and skin cancer. tinyurl.com/465zydb3; WHO (2022): Ambient Air Pollution Fact Sheet. tinyurl.com/87pudvdu

Bendtsen et al. (2021) conclude that "exposure to aircraft emissions induce pulmonary and systemic inflammation, which potentially contributes to cancer, asthma, respiratory and coronary heart disease" and worsen existing diseases.[39] Long-term exposure to PM has negative effects on pregnancy and unborn children and is linked to lung cancer and decreased fertility.[40]

For example, a study of residents near Seattle SeaTac airport found a greater percentage of infants born prematurely or with low birth weight, higher hospitalisation rates, heart disease, diabetes, asthma, stroke, COPD, higher death rates from all causes and lower life expectancy.[41]

EMISSIONS FROM TAKE-OFFS, CRUISING AND GROUND OPERATIONS

The emissions that have the greatest impact on air quality around airports are those from the so-called **LTO (landing and take-off) cycles, which include taxiing, take-off, climb to 915 m (3,000 ft) and, conversely, descent and landing.**[56] The International Civil Aviation Organization (ICAO)[57] has defined maximum emissions for a standard LTO cycle for a variety of pollutants[G] including NOx and PM but not ultrafine particles.[58]

Air pollution from aviation is usually framed and regulated as a local air quality issue, but **emissions linked to the LTO cycle account for only 4% of all emissions. The 96% of pollutants emitted during cruise also have an impact on air quality on the ground** due to the vertical mixing of air and chemical reactions between pollutants.[59] This is particularly true of ozone and $PM_{2.5}$.[60]

Airports themselves are major sources of air pollution: Ground operations and traffic to and from the airport burn fossil fuels and impact local air quality directly. For instance, Carbon monoxide (CO) from ground operations causes respiratory problems such as asthma, heart disease and increased mortality.[61] Tyre, brake and runway surface wear create particulate matter including UFP. [62] More than 2 million airport workers (both civilian and military) are exposed to jet fuel vapours, aerosols or exhaust gases every year.[63]

WHAT IS PARTICULATE MATTER (PM)?

Particulate matter (PM) is a mixture of solid particles and liquid droplets in the air. They include dust, dirt and soot, and can be made up of hundreds of chemicals. Among them are polycyclic aromatic hydrocarbons (PAHs) present in soot, which are carcinogenic[42].
Their toxicity depends on their size. They are classified in the following categories:

- **PM_{10}** (coarse particles, of 10 micrometres and smaller)
- **$PM_{2.5}$** (fine particles of 2.5 micrometres and smaller)
- **Ultrafine particles** (UFP, 100 nanometres and smaller). They can penetrate deep into the lungs and even enter the bloodstream[43]

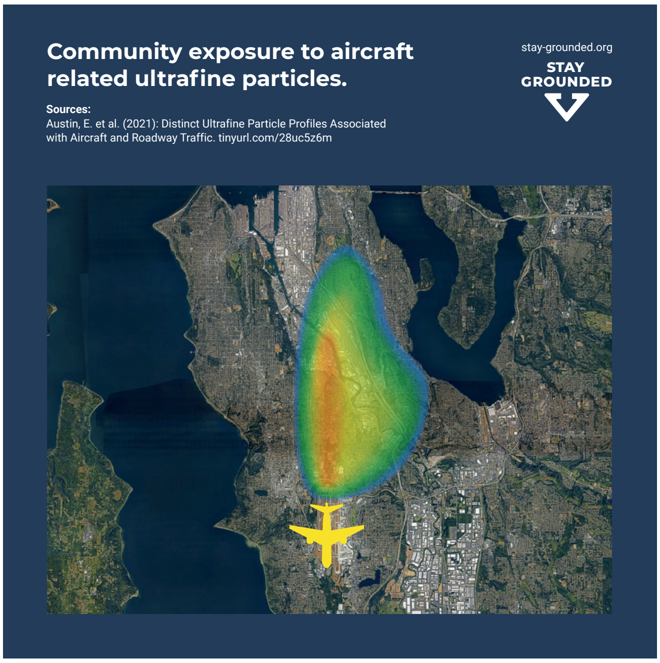
EU air quality limits exist for PM_{10} and $PM_{2.5}$ concentrations, but not yet for ultrafine particle sizes.

Jet engine emissions contain large amounts of ultrafine particles (UFP), a major health hazard:[44] Emerging research links them to breast and prostate cancer, ischemic heart disease, respiratory diseases[45] including COPD,[46] increased odds of preterm births,[47] childhood leukaemia and decreased airway function from just one prolonged exposure.[48]

There is increasing evidence that UFP can spread several kilometres: Aviation particles have been found downwind of airports in the city centres of London, Zurich, Barcelona and Helsinki, potentially affecting millions of people.[49] 33 million people live within a 20km radius of the 20 top-busiest airports in Europe.[50]

Research into UFP and their health effects is ongoing and uncertainties remain: Researchers are beginning to differentiate UFP from aviation as opposed to other sources in order to assess aviation's impact.[51] UFP from aviation do contain lubrication oils and organophosphate esters (OPEs),[52] which have wide-ranging health effects[53] and are listed as a Category 2 carcinogen by the European Union.[54] Jet engines might produce especially small and hence more toxic UFP.[55]

[G] The other regulated pollutants are unburnt hydrocarbons (HC) and carbon monoxide.



Rates of death linked to aviation are highest in Europe, eastern North America and eastern China.[64] Although the levels of $PM_{2.5}$ and ozone are far higher over Europe, more people are affected in Asia due to its larger population.[65]

WHO IS AFFECTED THE MOST BY AIRCRAFT NOISE AND AIR POLLUTION?

Children[66], elderly people[67] and those with existing conditions[68] are the most vulnerable to the effects of noise and air pollution.

Areas downwind from airports and under flight paths are most affected:[69] emissions from jet-fueled aircraft and ground operations have been found inside people's bodies and homes when located up to several kilometres downwind.[70] Houses are cheaper in areas flown over at low altitude.[71] When airports announce expansions or new flight paths, property values decrease due to expected increases in noise.[72] This suggests a higher likelihood of lower-income populations living under these flight paths or in the vicinity of airports undergoing expansions.

Aircraft noise, emissions and the related health issues fall disproportionately on low-income communities and airport workers, often including a significant number of people of colour and marginalised populations.[73]

For example, Sobotta et al. (2007) found that in the US, income, education level and ethnicity will influence whether households move to areas highly exposed to aviation noise.[74] Those experiencing poverty had a 1.35 times higher $PM_{2.5}$ burden than the overall population. 'Non-Whites' had a 28 percent higher burden and 'Blacks' had a 54 precent higher burden than the population at large.[75] Woodburn McNair (2020) concluded that the environmental justice analyses required for US airport expansions did not consistently assess and detect the effects on marginalised communities.[76]

It is not easy to find non-US studies on exposure to aviation noise, income and ethnicity.[H] However, it is clear that well-off residents can protect themselves from noise and health risks more easily by moving elsewhere or investing in sound-proof windows. Poorer people will tend to rent or struggle with the cost of noise insulation.[77]

These disparities in exposure to aviation noise and air pollution highlight obvious questions of social and environmental injustice. The high noise and pollution levels in many poor areas can mostly be attributed to the activities of more affluent groups[78] - who tend to fly more regularly - where poorer populations become victims of those people's lifestyles.

LONDON CITY AIRPORT: WHO BEARS THE CONSEQUENCES?

In 2016, a dozen activists from Plane Stupid, collaborating with Black Lives Matter, blockaded a runway at London City Airport. Their message: 'Climate Crisis is a Racist Crisis'. This act of civil disobedience was directed against the expansion of the business airport located in a workers' district of London. People living under the flight paths of the airport – who are disproportionately Black British Africans and Asians – have far lower incomes than the passengers in the aircraft above.[79] Numbers from 2019 indicated that in Great Britain, Black British Africans were 28% more exposed to air pollution than white Britons.[I]

[H] International studies on the relationship between ethnicity and/or class and exposure to noise and pollution from aviation are scarce. However, the link between income, migration background and environmental pollution more generally has been investigated. Hajat's et al (2015) review of 37 international studies found a clear connection between bad air quality and poverty for the US and mixed evidence for Europe. Research for Asia, Africa and other parts of the world is limited, but trends there seem similar to the US: Hajat, A. Et al. (2015): Socioeconomic Disparities and Air Pollution Exposure: A Global Review. tinyurl.com/2r6my848

[I] The Air Pollution and Inequalities in London report shows that "communities which have higher levels of deprivation, or a higher proportion of people from a non-white ethnic background, are still more likely to be exposed to higher levels of air pollution." Greater London Authority (2021): Air Pollution and Inequalities in London: 2019 Update. tinyurl.com/5h5t4wxy

RISKS FOR PASSENGERS AND EMPLOYEES

Flying, while often depicted as a care-free and convenient mode of transport, is actually detrimental to human health – not only for those below aeroplanes, but also for those flying frequently like cabin crew, pilots and frequent business travellers.

People who fly long-haul face a higher risk of Deep Vein Thrombosis (DVT) and pulmonary embolism.[80] Air passengers are also 100 times more susceptible to catching a cold.[81] Air transport contributed to the extremely rapid spread of Covid-19 and despite this, airlines continued lobbying against travel restrictions, further exacerbating the pandemic.[82]

At cruising altitude, humans are exposed to higher levels of cosmic ionising radiation (CIR), which can cause cancer.[83] Exposure accumulates over time and aircrew in fact have higher rates of specific cancers compared to the general population.[84,J]

The air inside the cabin can cause aerotoxic syndrome: In most planes, the air supply is brought into the cabin through the engines, meaning that chemicals and oil fumes can leak in.[85] Symptoms are wide-ranging and include neurological, respiratory, gastrointestinal and cardiovascular diseases, rheumatism, fatigue and chemical sensitivity.[86] Research into aerotoxic syndrome is ongoing and it is not yet recognised as an occupational hazard.[87] However, crew members and frequent flyers are especially at risk.[88]

Disruptions of the body's circadian rhythm from jet lag and travel fatigue can lead to cognitive decline, psychotic episodes, sleep disorders, poor mental health and depression.[89] Employees who travelled internationally for the World Bank, for instance, have a three-fold increase in psychological claims as opposed to their non-travelling colleagues.[90] Disruptions from frequent flying are also linked to obesity, heart disease, diabetes and cancer.[91]

TACKLING NOISE POLLUTION

There are clear steps to counter noise and related health effects – the most effective one being reducing air traffic:

1. STRICTER RULES ON NOISE!

In most cases, noise levels exceed existing regulations, if there are any at all. Good regulations and their enforcement should therefore be a priority.

- Noise monitoring has to be obligatory around all airports.
- Noise mapping must be made transparent and publicly available.
- The allowed average exposure levels have to be reduced to at least WHO recommendations of 45dB Lden and 40dB Lnight (see above).
- Active mitigation is better than passive measures (e.g. sound-proofing windows): this leads to forced adaptation where society 'learns' to 'live' with the noise.

2. NO PLANES AT NIGHT!

Take-offs and landings overnight are particularly problematic for people's health and well-being.[92] That's why **night flight bans** should be established at all airports.[93]

3. IMPROVED OPERATIONAL PRACTICES?

- Steeper ascents and descents and a continuous descent approach can reduce noise and health impacts. However, steeper ascents potentially use more fuel and can spread noise to other communities.[94]
- Air traffic controlling (like Performance Based Navigation PBN) can create more direct flight paths and therefore more efficient operations.[95] While the FAA argues that PBN can help design flight paths to avoid noise sensitive areas, this can also mean that aircraft noise disturbs the same communities day in and day out.[96]

Prioritising noise mitigation in heavily populated areas and considering social and environmental justice aspects of chosen flight paths is therefore especially important.

4. BETTER TECHNOLOGIES?

While advancements in aircraft design can help reduce aircraft noise by 0.2 dB each year,[K] **reductions are eaten up by the vast increase in yearly flight numbers.** What's more, the sector will need to be forced to make this costly switch through tough regulations and powerful protests. Trends in engine design for improved fuel efficiency may also lead to more engine noise.[97]

5. REDUCE AIR TRAFFIC!

The most effective way to reduce noise pollution is to reduce the number of flights. Banning night fights, heavy long-haul flights, ultrasonic flights and non-essential short-haul and private jet flights are good ways to start.

[J] In the US, pilots are limited to flying a maximum of 1,400 hours per calendar year. This means that pilots and cabin crew could experience more than 8 times the regulatory limit for public exposure to radiation facilities. There have moreover been calls to classify frequent business travellers as radiation workers, because flying 85,000 miles per year would exceed the limits for public exposure to radiation facilities. Code of Federal Regulations (n.d): Flight time limitations and rest requirements: One or two pilot crews. tinyurl.com/32s3b6es; Cohen, S. et al. (2020): Flying Less: Personal Health and Environmental Co-Benefits. tinyurl.com/zrktwyv6

[K] The human ear can perceive volume differences starting at approximately 2 dB. ICAO (2019): Global Trends in Aircraft Noise. tinyurl.com/3sxc4fc9

TACKLING AIR POLLUTION

A variety of measures can help to mitigate aviation's air pollution – the most effective ones being reducing air traffic and introducing cleaner fuels:

1. STRICTER RULES ON POLLUTION AND PARTICLES!

Particle numbers concentrations are a good indicator of general air quality[98] and should not exceed WHO exposure levels.[99] Around airports, particles (including ultrafine particles) can and should be monitored to act as a basis for regulating air traffic.[100] **Aircraft regulations need to address the full range of emissions** and be constructed in ways that result in air quality improvements. This is not always the case, as for instance in France.[L]

2. TECHNICAL IMPROVEMENTS?

These can help but will require regulation in order to be adopted by the aviation industry:

- **Reduced fuel sulphur content** would reduce UFP and their related health impacts. While car fuels must have reduced sulphur content, jet fuels are not yet subject to the same requirements.[101] **Jet fuels should be subjected to *at least* the same standards as automotive fuel.**
- **Reduced aromatics would reduce soot** (fine and ultrafine particulate matter) and contrails. Current jet fuel contains roughly 18% aromatics,[102] which could easily be reduced to 8% as a first step.[103]
- **Further engine optimisation to** reduce NOx emissions without increasing CO_2. However, this is increasingly difficult.[104]

Low-aromatic fuels and low-NOx engines would also reduce aviation's non-CO_2 effects, which make up two-thirds of its climate impact.[105] Fuel desulphurisation alone would increase warming, but if done together with reducing aromatics, there would actually be a net cooling effect.[106] Regulating fuel composition and engine emissions should be a priority, as both are technically feasible and would bring immediate results.

- **Limiting the use of jet engines on the ground** through electric or single engine taxiing[107] and avoiding the use of auxiliary power units (APUs) thanks to external electricity and pre-conditioned air supplies.[108]
- **Electric aircraft** would not cause emissions themselves, but could still use electricity from fossil fuels or require a disproportionate amount of renewable energy.[109] The heavy weight of their batteries means that for the decades to come, they could only replace small engines and short-haul flights – whereas shifting these to the rail would be more sustainable.[110]
- **So-called Sustainable Aviation Fuels (SAF)** are currently hyped as a climate solution. If blended with fossil fuels, they would only lower soot and SO_2 emissions, not NOx and CO. Reductions will only come about slowly, as the mixing rate increases: the EU is aiming for only 6% in 2030, 34% in 2040 and only 70% in 2050.[111] Producing SAFs in a sustainable way and on the scale envisioned, that is, without questioning the growth of the sector, is highly unlikely and could lead to new problems.[112, M]
- **Hydrogen-powered engines** would get rid of most air pollutants but still emit NOx. It is highly unlikely that we will see hydrogen-powered medium- and long-haul flights before 2050, let alone 'green' hydrogen in sufficient quantities.[113,N]

3. REDUCE AIR TRAFFIC!

We may wait a quarter century – or longer – for technological step-changes to come to fruition. Meanwhile, people will continue to suffer from pollution every day. Moreover, growth in the aviation industry will ultimately counter attempts to reduce pollution.[114] **The easiest and most efficient solution to reduce air pollution is to reduce the number of flights and airports.**

[L] French regulations only consider ground emissions, but not the full LTO-cycle. Secondly, measurements are not based on the absolute quantity of pollutants emitted, but on their ratio to the overall traffic. This means that if traffic increases, pollution levels can also rise. Thirdly, French standards set pollution limits for the country as a whole, but not locally. This makes sense for CO2 but not for air pollution in the vicinity of airports. Rester sur Terre/UFCNA (2021): Pollution atmosphérique due aux avions, la grande oubliée. tinyurl.com/5dj49xd9

[M] Transport & Environment (2020) investigated the possible de-carbonisation of the European transport sector and concluded that "in 2050, aviation will account for 22% of all demand for renewable electricity in transport, 535 TWh in total in the base case. Aviation demand in 2050 is higher than the 500 TWh required for all battery electric passenger cars in the EU in 2050!" They recommend prioritising e-fuels for ships and planes and running cars on batteries. T&E (2020): Making aviation fuel mandates sustainable. tinyurl.com/yd3kyzne

[N] Euractiv concludes that "the full global demand for LH2 in aviation would require as much as 500 or 1,500 gigawatts of renewable energy capacity, depending on the scenario assumed, or about 20 or 60 percent of the total capacity of renewable energy available today. Scaling up to this capacity would obviously raise significant planning challenges." Euractiv (2020): Euractiv (2020): Hydrogen-powered aviation. tinyurl.com/4eude94t

CONCLUSION

Reducing air traffic and stopping airport expansion is the best solution to counter both health issues and climate breakdown. It benefits both local communities and society as a whole, while mostly a few frequent flyers will need to cut back on their polluting lifestyle. There is a common interest between residents, health organisations, the climate movement and even affected aviation workers, who can build powerful coalitions to achieve fair mobility and a healthier future for all. Let's join forces to counter expansion projects, achieve caps and limits of flights, end unfair aviation subsidies and tax exemptions, and switch wherever possible to rail travel and work-related online conferences.

CAPS ON FLIGHTS AT SCHIPHOL AIRPORT

Amsterdam airport is a good example of what can be achieved with ambitious campaigning and a broad movement basis. Noise levels had been exceeded since 2015. In 2023, it was decided that Schiphol must reduce its yearly flight numbers from 500k to 440k. This decision is currently under attack, but hopefully can still be implemented against the strong industry lobby. Apart from a general flight cap, the airport announced banning night flights and private jet flights in a bid to lower noise and emissions.[115]

HOW TO ENGAGE?

- **Complain about noisy aircraft and emissions and pressurise your airport and local authorities to:**
  1. install noise and particle measuring systems
  2. make the results transparent
  3. enforce the health regulations.
- **Measure the noise and check the flight paths yourselves:** for a few European countries you can do so through this community-run noise measuring system: www.eans.net and nmt.anotec.es
- **Check CO_2 and pollution at specific European airports:** airporttracker.org
- **Check out UECNA**, the Europe-wide network of communities impacted by noise and aviation from airports: www.uecna.eu
- **Connect with campaigns in your region** which are concerned about noise or health more generally – for example in the UK, there is the UK Noise Association: www.ukna.org.uk
- **Connect with workers and unions at your airport,** see the fact sheet by International Transport Workers' Federation: www.itfglobal.org/en/resources/campaigning-against-air-pollution-in-airports-factsheet and Stay Grounded's guide on engaging aviation workers and trade unions: stay-grounded.org/wp-content/uploads/2021/09/2022_SG_just-transition-guide.pdf
- **Make links with campaigns on climate justice** in order to jointly counter airport expansion, demand curfews and flight reductions - for example by contacting Stay Grounded
- **Find a collection of literature on the topic** in the Stay Grounded library: bit.ly/NoiseHealthLibrary

END NOTES & LITERATURE

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