BFPCA Submission on the Aviation White Paper Terms of Reference

BFPCA Submission to the Department of Infrastructure and Transport regarding the proposed Aviation White Paper Terms of Reference

Prepared by **Brisbane Flight Path Community Alliance** (BFPCA)

https://bfpca.org.au

contact@bfpca.org.au

9 March 2023

BFPCA

Table of Contents

contact@bfpca.org.au
bfpca.org.au

Introduction

Brisbane families and communities are currently subject to severe aircraft noise pollution and suffering from associated health and related impacts from Brisbane Airport's new flight paths launched in July 2020. Both the Aircraft Noise Ombudsman's report and the Brisbane Airport PIR Advisory Forum (BAPAF) have independently confirmed that Brisbane communities were consciously misled using flawed noise modelling, deceptive and unprofessional community engagement, and are now being offered inadequate noise abatement.

Brisbane Flight Path Community Alliance (BFPCA) brings together a large community of members living in some 81 postcodes across Brisbane who are adversely affected by the current operation of Brisbane Airport's flight paths. Our membership, drawn from many suburbs, is united in support of eight key demands.[1] Collectively and as individuals, BFPCA members have been attempting to resolve concerns about aircraft noise via multiple pathways, including:

- Airservices' aircraft noise complaints system and PIR process;
- The Brisbane Airport Community Aviation Consultation Group (BACACG);
- Direct engagement with Airservices and BAC as part of a technical airspace design workshop held on 24 February 2021;
- Submissions and presentations to the Brisbane Airport PIR Advisory Forum (BAPAF);
- Requesting a meeting with the Federal Minister for Infrastructure and Transport.

To date, there has been a notable unwillingness on the part of the Federal Minister, Airservices and BAC to recognise long-standing, identified deficiencies in flight path planning and execution and community consultation, or to undertake steps to meaningfully engage with the community to accurately assess the impact of aircraft noise and other pollution associated with Brisbane airport operations.

BFPCA committee and membership have reviewed the proposed Aviation Industry White Paper Terms of Reference and identified a range of amendments and additions that will help to ensure the White Paper achieves its stated aims.

BFPCA Proposed Amendments

In order for BFPCA to be able to commend the Aviation White Paper's Terms of Reference to our members the following changes are considered necessary.

1.1 **ToR Section – Purpose:** "*The White Paper will explore the likely future trends in aviation over the period to 2050 and articulate long-term policy directions to set the scene for the next generation of growth and innovation in the aviation sector.*"

1.1.1 BFPCA Response: **Add as follows:** "While the White Paper's horizon spans 25+ years, the Australian Government recognises that future trends start in the present moment, which requires urgent policy reform work to commence now coupled with strong regulatory oversight and direct governance arrangements for ongoing input from community stakeholders affected by aviation operations in Australia."

[1] https://bfpca.org.au/scorecard/#demands

contact@bfpca.org.au
bfpca.org.au

1.2 **ToR Section – Purpose:** "*Through the White Paper, the Government will promote an efficient, safe, sustainable and competitive Australian aviation sector, that is critical to the economy and the standard of living of all Australians. The White Paper will consider future trends on the wide range of actors within the aviation sector, including airports and their local communities, government, ground staff, flight crews, freight users, domestic and international airlines through to the travelling public*"

1.2.1 BFPCA Response: **Amend as follows:** "... will promote a safe, environmentally, socially and financially responsible, efficient, fair and competitive Australian aviation sector…"

1.2.2 BFPCA Response: **Amend as follows:** "... that is an important enabler of the economy, achieves long term environmental sustainability, and contributes positively to the standard of living of all Australians."

1.2.3 BFPCA Response: **Amend as follows:** "... including airports, drone and air taxi operators, and their local…"

1.2.4 BFPCA Response **Add as follows**: "The White Paper will ensure there is a fair and equitable distribution of the benefits and costs of operations, between communities and corporations, at Brisbane and other major airports."

2.1 **ToR Section – Scope and themes:** "*The White Paper will examine the Government policy and economic reforms necessary to promote efficiency, safety, sustainability and competitiveness of the aviation sector out to 2050*."

2.1.1 BFPCA Response: **Amend as follows:** "The White Paper will examine what urgent reform work is necessary to Government policy, legislative and regulatory frameworks and economic arrangements in order to promote safety, environmental, and social responsibility, operational efficiency, fairness, financial sustainability and competitiveness of the aviation sector out to 2050."

2.2 **ToR Section – Scope and themes:** "*Areas to be considered include:*

- *aviation's role in economic development, trade and the visitor economy – general, domestic, regional and international aviation;*
- *how to maximise the aviation sector's contribution to achieving net zero carbon emissions including through sustainable aviation fuel and emerging technologies;*
- *changing aviation technologies and ways to position our policies, regulations and systems to encourage uptake and manufacturing of new, more efficient, transport technologies;*
- *airport development planning processes and consultation mechanisms that consider the impact and changing nature of aircraft noise and related expectations on the role of noise sharing and noise mitigation;*
- *how to support and regenerate Australia's general aviation sector;*
- *future industry workforce skills and training requirements;*
- *appropriate consumer protections and access to services;*

contact@bfpca.org.au
bfpca.org.au

- *maintaining fit-for-purpose aviation safety, air navigation and aviation security systems and service delivery agencies;*
- *the role of airlines and airports in supporting regional economies; and*
- *other significant issues raised during the consultation process.*"

2.2.1 BFPCA Response: **Amend bullet point 2 as follows:**

- "how to maximise the aviation sector's contribution to achieving net zero carbon emissions – without relying on 'greenwashing' tactics[2] – and minimise the impact on the environment, health and standard of living of local communities through low GHG emission aviation fuel, noise mitigation and other emerging technologies, or, where technical means to achieve legislated reductions to net zero GHG emissions by 2050 in the aviation sector are not available or feasible, implement other active measures to achieve the same goal;"

2.2.2 BFPCA Response: **Amend bullet point 3 as follows:**

- "changing aviation technologies and ways to position our policies, regulations and systems to encourage uptake, manufacturing and operation of new, environmentally responsible, less polluting, less intrusive, quieter, and more efficient, transport technologies."

2.2.3 BFPCA Response: **Amend bullet point 4 as follows:**

- "airport, drone and air taxi flight path design, development planning processes and consultation mechanisms that effectively consider the: impact of aircraft noise and other forms of aviation related pollution on local communities, and expectations regarding the responsibilities of airport, drone, air taxi, airline and aircraft operators to obtain and maintain a social licence to operate, in light of a growing scientific research and evidence base documenting the negative physical and mental health effects on communities from aircraft noise and other forms of pollution (e.g., tank water pollution, ultra-fine particle air pollution, and atmospheric lead levels associated with some types of aircraft engines);"

2.2.4 BFPCA Response: **Amend bullet point 5 as follows:**

- "how to support and regenerate Australia's general aviation sector to provide exceptional air-based transport, address the contemporary issues of climate change and lack of a social licence, and eliminate regulator capture through measures establishing transparent and credible regulatory oversight addressing a wider set of well-defined contemporary issues than the current limited focus on operational safety and operational efficiency."

[2] https://stay-grounded.org/greenwashing/ – see Appendix 3

contact@bfpca.org.au
bfpca.org.au

2.2.5 BFPCA Response **Add the following bullet point:**

- "how to revise and amend the current legislative and regulatory frameworks pertaining to the design, development and operation of airports, drone and air taxis, and aircraft to achieve a standard suite of requirements (e.g., curfews, flight movement caps nationally) applicable to all capital city and regional airports that prioritise safety, along with minimisation of environmental and community impact, ahead of operator efficiency and profitability."

3.1 **ToR Section – Outcome:** "*The White Paper will clearly articulate the Commonwealth Government's policies on desired aviation outcomes in relation to efficiency, safety, sustainability and competitiveness to ensure the sector is appropriately positioned to deliver aviation services for the Australian public and international visitors out to 2050*"

3.1.1 BFPCA Response: **Amend as follows:**

- "The White Paper will clearly articulate the Commonwealth Government's policies on desired aviation outcomes to promote a safe, environmentally and socially responsible, efficient, fair, financially sustainable, and competitive sector appropriately positioned to deliver aviation services for the Australian public and international visitors out to 2050."

3.1.2 BFPCA Response: **Add as follows:**

- "The White Paper will make provisions for an independent, in-depth enquiry into the extent and depth of what is widely called 'regulatory capture' in the Australian aviation industry. The aim being to document its extent, its effects on the scale and distribution of future public benefits and costs, and frame draft policy and regulatory instruments to reduce and eliminate it as quickly as possible."[3]

Summary

The White Paper Terms of Reference as proposed does not provide sufficient scope for consideration of issues at the core to revitalising and preparing the Australian Aviation industry in the light of accelerating climate change and changing community expectations regarding government's essential role in providing strong, effective and impartial regulatory oversight of the privatised aviation sector. In summary, in order for BFPCA to be able to commend the Terms of Reference to its members, we recommend the following topics be explicitly addressed:

1. The need for legislative and regulatory overhaul of the *Air Services Act* 1995 to achieve true regulatory independence, eliminate actual, possible or perceived **regulatory / state capture**,[4] a broader scope for consideration of contemporary factors (e.g., climate change, social licence to operate) that will affect future airport and flight path design and operations, rather than the current limited focus on safety, efficiency and private industry profits.

[3] see Appendix 2
[4] https://australiandemocracy.org.au/statecapture

contact@bfpca.org.au
bfpca.org.au

2. The need for **standard criteria** across all capital and regional airports regarding the specification and adoption of curfews, flight movement caps, and airport capacity declarations as provided for under the *Airports Act* 1996, Section 195.
3. **International best practice** and genuine community engagement processes and impact reporting by qualified, independent experts across all jurisdictions regarding planned and ongoing airport operations.
4. Stronger and **evidence-based** consideration of all issues of the impacts of aircraft noise and other pollution on mental and physical health, and the role of strong regulation to achieve net aircraft noise pollution reductions.

Next Steps

BFPCA welcomes the opportunity to provide further input and dialogue regarding the development of both the Terms of Reference and the White Paper, and we will make ourselves available to participate in the upcoming Aviation White Paper Roundtable.

We represent a sizable community across 226 suburbs of the Greater Brisbane region[5] and bring considerable experience and expertise in relation to quantifying and understanding the community impact of Brisbane Airport, Archerfield Airport and associated flight paths on local communities and would welcome any opportunity to provide these insights to the Department to guide its formulation of the Aviation White Paper and associated policy reform work.

[5] According to Airservices' own admission in the latest round of Senate Estimates: https://bfpca.org.au/estimates/

contact@bfpca.org.au
bfpca.org.au

Appendix 1 – The Department's Proposed Terms of Reference

SECTION	PARAGRAPH
Purpose	The White Paper will explore the likely future trends in aviation over the period to 2050 and articulate long-term policy directions to set the scene for the next generation of growth and innovation in the aviation sector. Through the White Paper, the Government will promote an efficient, safe, sustainable and competitive Australian aviation sector, that is critical to the economy and the standard of living of all Australians. The White Paper will consider future trends on the wide range of actors within the aviation sector, including airports and their local communities, government, ground staff, flight crews, freight users, domestic and international airlines through to the travelling public.
Scope and themes	The White Paper will examine the Government policy and economic reforms necessary to promote efficiency, safety, sustainability and competitiveness of the aviation sector out to 2050. Areas to be considered include: • aviation's role in economic development, trade and the visitor economy – general, domestic, regional and international aviation; • how to maximise the aviation sector's contribution to achieving net zero carbon emissions including through sustainable aviation fuel and emerging technologies; • changing aviation technologies and ways to position our policies, regulations and systems to encourage uptake and manufacturing of new, more efficient, transport technologies; • airport development planning processes and consultation mechanisms that consider the impact and changing nature of aircraft noise and related expectations on the role of noise sharing and noise mitigation; • how to support and regenerate Australia's general aviation sector; • future industry workforce skills and training requirements; • appropriate consumer protections and access to services; • maintaining fit-for-purpose aviation safety, air navigation and aviation security systems and service delivery agencies; • the role of airlines and airports in supporting regional economies; and

contact@bfpca.org.au
bfpca.org.au

- other significant issues raised during the consultation process.

Outcome	The White Paper will clearly articulate the Commonwealth Government's policies on desired aviation outcomes in relation to efficiency, safety, sustainability and competitiveness to ensure the sector is appropriately positioned to deliver aviation services for the Australian public and international visitors out to 2050. The White Paper will not seek to replicate work underway through processes like the Employment White Paper, THRIVE 2030 strategy or Sustainable Aviation Fuel and the to be established Jet Zero-style Council. Instead the Paper will build and help cement priorities coming out of these processes into a long-term vision for Australian aviation.
Output	The White Paper will set overarching principles and directions for aviation over the short/medium/long term, including concrete actions over the next five years to help position the sector to achieve these directions.
Timeframes and deliverables	• Green Paper, released mid-2023 – outline key challenges and opportunities for the aviation sector to enable government, industry and community to give feedback on Green Paper proposals • White Paper, released in first half of 2024 – authoritative, in-depth report, drawing on feedback from the Green Paper.

contact@bfpca.org.au
bfpca.org.au

Appendix 2 – Justification for amendments to the proposed Terms of Reference

Regulatory Capture – Identification, Prevention and Monitoring

This Appendix 2 focuses on the sixth point under DoI's Terms of Reference (ToR):

> ensuring regulatory mechanisms adequately protect communities potentially affected by aircraft operations, distributing the benefits and costs of aviation fairly;

It is contended that major parts of aviation regulatory mechanisms are subject to long-standing 'regulatory capture'[6] by the aviation industry, primarily Australia's two major airlines (Qantas, Virgin) and major airport corporations. It is alleged this situation extends deep into the upper reaches of those DoI sections responsible for ensuring that community wellbeing and voices are listened to and respected with regard to the impacts of aircraft noise and other related forms of pollution. In this regard we consider that AirServices Australia (AsA) – the most public-facing part of DoI – has lost what little remained of the credibility it possessed at the time of the Senate enquiry in 2010.[7] It is now, according to its own statements,[8] merely a servant of the aviation industry. It has, demonstrably, little or no interest in its responsibilities for protecting communities from continuing damage from severe and frequent aircraft noise and related hazardous pollution.

It is noteworthy that only about a year after the release of the 2009 Aviation White Paper public concern at its biases and shortcomings was great enough to prompt a Senate enquiry. Also noteworthy is the fact that Coalition members of the enquiry laid responsibility for these failures to properly consult with and protect the public interest and wellbeing on the Howard government. (p.75)

Proposed draft ToR text addition:

> "The White Paper will make provisions for an independent, in-depth enquiry into the extent and depth of what is widely called 'regulatory capture' in the Australian aviation industry. The aim being to document its extent, its effects on the scale and distribution of future public benefits and costs, and frame draft policy and regulatory instruments to reduce and eliminate it as quickly as possible."

The need for this was demonstrated over a decade ago in a 2010 report by a Senate enquiry on "The effectiveness of Airservices Australia's [AsA] management of aircraft noise" (e.g. see p. 61). Its findings, and Airservices Australia's (AsA) performance since then, provide sufficient evidence for serious concern about continuing regulatory capture. **As of 2023 the Senate Committee's 2010 recommendations remain, for the most part, unimplemented.**

In 2009-10 the Rural and Regional Affairs and Transport References Committee of the Australian Senate conducted a bipartisan enquiry into "The effectiveness of' AirServices Australia's management of aircraft noise." Statements and submissions from some 181 witnesses from a wide range backgrounds were received and documented. The Committee published its report in June 2010. The Committee came to two principle conclusions:

- 6.44 A recurring theme throughout this inquiry has been the frustration felt by a range of stakeholders that there are no practical avenues for resolution of concerns.

[6] https://australiandemocracy.org.au/statecapture
[7] Senate Inquiry into the effectiveness of Airservices Australia's management of aircraft noise: https://www.aph.gov.au/Parliamentary_Business/Committees/Senate/Rural_and_Regional_Affairs_and_Transport/Completed_inquiries/2008-10/aircraft_noise/report/index
[8] https://bfpca.org.au/estimates/

contact@bfpca.org.au
bfpca.org.au

and
6.45 The committee is concerned that under current legislation there does not appear to be any recourse for stakeholders to seek proper resolution of their complaints regarding aircraft noise, or indeed more broadly in relation to the activities of airport lessees and air operators.

The Committee expressed its concern that:

- this management task is not assisted by legislation that appears to be silent on a dispute resolution procedure where consultation and community engagement have failed. The committee is of the view that this situation requires close consideration by the government with a view to clarification of the appropriate avenues for dispute resolution. (6.45 cont.)

It is nearly impossible to accept or believe that legislation with such shortcomings came to be enacted by accident rather than deliberately. If this is the case then it is likely that the potential beneficiaries, other than genuine public interest, influenced the drafting and passage of the legislation.

To address these and other related concerns the Committee made ten recommendations, noting there was not unanimity on all parts of all the recommendations.

During the last decade, and as far as can be determined, only two recommendations, e.g. #1, and parts of #5, have been implemented.

Committee Recommendations	
Implemented	Not Implemented
1. AsA is now member of CAG groups	2. “Community Aviation Advocate position” – not funded or established.
	3. No review undertaken of “Airservices Australia's Communication and Consultation Protocol”.
	4. No independent review undertaken of “Airservices Australia's procedures for the lodgement of complaints about aircraft noise and the extent to which complaints data is analysed and disseminate …”
5. Only first part implemented. The “Aircraft Noise Ombudsman [ANO] must be established independently of AsA and report publicly and directly to the Minister … and to the Australian Parliament.” (emphasis added)	6. ANO should “provide an annual report of its operations and this should include a description of the actions Airservices Australia has undertaken to implement recommendations and, where appropriate, a description of those instances where appropriate action has not been taken.”
	7. Government “revise the current process through which ANEFs are developed to establish an independent body charged with the coordination of the process and the review of the accuracy and reasonableness of the data upon which the forecasts are made.
	8. AsA “review noise levels over affected areas with a view to offering a noise amelioration scheme compensating residents affected by aircraft noise consistent with that of other Australian capital city airports.”
	9. Generally applicable “… sufficient grounds exist for the Minister for Environment Protection, Heritage and the Arts to review the changes to flight paths under paragraph 160(2)(b) of the EPBC Act 1999 in response to stakeholder concerns.”

contact@bfpca.org.au
bfpca.org.au

Committee Recommendations	
Implemented	Not Implemented
	10. Airservices Australia be required to have regard to paragraph 160(2)(b) of the EPBC Act 1999 and seek advice from the Minister for Environment Protection, Heritage and the Arts in advance of major changes to air routes around airports under its jurisdiction."

Source: "The effectiveness of Airservices Australia's [AsA] management of aircraft noise." CoA, 2009, p. viii

In summary, the weight of findings and recommendations relates directly to requiring AsA to better fulfill the parts of its mandate to do with ameliorating aircraft noise (and other) impacts on affected communities. Over a decade since then almost nothing has changed for the better, in fact, according to many informed observers, **AsA's performance in this regard has deteriorated**. For example, poor performance by AsA in regard to community consultations and dealing with thousands of complaints with regard to radically increased aircraft noise from Brisbane Airport operations was trenchantly criticised in a 2021 ANO report.

If the aim or the White Paper is to prepare the Australian aviation sector to provide lasting public and private benefits in the coming decades it will be necessary to radically reorient and restructure the overall aviation legislative and regulatory framework. This might best be initiated by addressing the manifest shortcomings of AsA, followed by or in parallel with a thorough, forensic examination of the nature of the power relationships between the relevant sections of DoI and the commercial aviation industry. This would, sensibly, be accompanied with a benefit-cost and distributional analysis of the long-term monetary benefits to privately-owned aviation companies and the health and amenity losses imposed on afflicted communities.

Regulatory Capture – Definitions

There are a number of definitions of regulatory capture available from the literature. These definitions share many common features, differing only in emphases. Here we offer a small selection considered most relevant to the Australian Aviation sector. It is noted it is a practice with direct implications for consumer and community protection and one where pervasive conflict-of-interest is an important factor.

One fitting definition cited in the Senate Committee Report (p. 60) is:

> "Regulatory capture is the term used to refer to situations in which a government regulatory agency, created to act in the public interest, instead acts in favour of the commercial or special interests that dominate the industry it is charged with regulating.
>
> At a first level of capture, the regulator allows the regulated to breach the law, ethic, good practice rule, moral principle or public interest duty that the regulator is responsible for upholding. At a second level, the regulator assists the regulated to avoid the regulatory consequences after the fact.
>
> At the deepest level of development, the 'capture' is so complete that the regulator may assist the regulated to defeat the regulatory regime before the fact."

Regulatory capture refers to instances where regulators are excessively influenced or effectively controlled by the industry they are supposed to be regulating.

> "Regulatory capture refers to the corruption of the regulatory process such that the public good is sacrificed in favor of the commercial interests of the regulated entity."[9]

This definition from Carpenter and Moss seems to fit the Australian situation well:

[9] Cherry, E., & Dannhauser, R. W. (2016). *Corrupt Or Collaborative? an Assessment of Regulatory Capture.* CFA Institute. https://www.cfainstitute.org/advocacy/policy-positions/corrupt-or-collaborative-an-assessment-of-regulatory-capture

contact@bfpca.org.au
bfpca.org.au

> "a process by which regulation … is consistently or repeatedly directed away from the public interest and toward the interests of the regulated industry by the intent and action of the industry itself."[10]

AsA has characterised its working relationship with the Australian aviation industry as a 'partnership.' Such a self-description is clearly in conflict with its statutory role and responsibilities as a government regulator under the *Air Services Act* 1995. While such a self-description is understandable, given its almost total reliance on industry funding, it reveals that AsA Board and management seems to have forgotten it also has equal – if not higher – responsibilities for acting in the public interest, especially with respect to community consultation and minimising the environmental (noise) impacts of aircraft operations.

> " … capture exists when regulators are motivated by self-interest and therefore select policies that would not gain the support of an informed public. Capture can be produced by several mechanisms in addition to bribes. *Regulatory agencies may be dependent for funds on the firms they regulate*; firms can provide support to legislators, who then apply pressure to agencies through oversight committees; or individual regulators may be attracted by higher paying jobs in the industry they oversee."[11] (emphasis added, p. 178)

> "Regulatory capture' is a phrase commonly used to describe a situation in which an industry which is regulated controls a regulatory agency's policies. In popular political discourse, its use is generally normative, and is designed to call attention to a regulatory process gone awry."[12]

Regulatory Capture is now well understood to reduce economic efficiency and consumer benefits and to unfairly favouring the owners of the companies in a sector over the public who purchase or use the goods and services provided by the companies. It involves, at base, the companies in a sector finding ways to influence the drafting of laws and regulations, implementation of these laws and regulations, and hiding these practices and processes from public scrutiny and accountability.

[10] Carpenter, D., & Moss, D. A. (Eds.). (2013). *Preventing Regulatory Capture: Special Interest Influence and How to Limit it.* Cambridge University Press. https://www.tobinproject.org/sites/tobinproject.org/files/assets/Kwak%20-%20Cultural%20Capture%20and%20the%20Financial%20Crisis.pdf

[11] Levine, M. E., & Forrence, J. L. (1990). Regulatory Capture, Public Interest, and the Public Agenda: Toward a Synthesis. *Journal of Law, Economics, & Organization*, 6, 167–198. http://www.jstor.org/stable/764987

[12] Levine, M. E. (2002). Regulatory Capture. In P. Newman (Ed.), *The New Palgrave Dictionary of Economics and the Law: Volume 1-3: A-Z* (pp. 1667–1671). Palgrave Macmillan UK. https://doi.org/10.1007/978-1-349-74173-1_316

contact@bfpca.org.au
bfpca.org.au

Appendix 3 – Stay Grounded Greenwashing Factsheets

Available at: https://stay-grounded.org/greenwashing/

"What the aviation industry tells you and what they DON'T tell you – What we need to know about decarbonisation promises and false solutions

Following the Covid19-Pandemic and the halt it put to most national and international flights, the aviation industry and their lobby are working hard to get back to their pre-COVID climate damaging growth path. As a reaction to the rising public and political awareness of the climate harming effects of aviation, the industry accompanies its quests for bailouts and further subsidies with promises of green flying through technology.

By taking a closer look at what the industry tells us and what they don't tell us, in our new fact sheet series we debunk common misconceptions and look behind the green curtain of their promises"

1. Efficiency
2. Electric Flight
3. Hydrogen
4. Biofuels
5. E-fuels
6. Net Zero

contact@bfpca.org.au
bfpca.org.au

Greenwashing Fact Sheet Series

"Greenwashing" is misinformation presented by an organisation in order to mislead others about the environmental impact of its current or future activities.

Globally, the aviation industry plans to triple in size by 2050. If this happens, we could see aviation fuel consumption and therefore greenhouse gas (GHG) emissions double by 2050. Governments, lobbied by the industry, use unrealistic distracting promises of technological solutions to greenwash this growth. They also use economic growth and job arguments to justify subsidies and tax breaks for airports, airlines, manufacturers and fossil fuel companies. In this series of Fact Sheets, we examine these claims and debunk common myths and misconceptions.

Fact Sheet 1 - Efficiency Improvements

Aircraft efficiency refers to the amount of fuel burned (and emissions produced) by an aircraft in order to transport its payload (passengers or cargo) a given distance (e.g. one kilometer). Efficiency improvements (i.e. reductions in fuel burn) are achieved by optimising the design of the aircraft, the engines, the airline operations (e.g. the flightpath) and by increasing the amount of passengers/cargo carried onboard the aircraft.
CO_2/passenger-km is proportional to efficiency (fuel/passenger-km).

WHAT THE AVIATION INDUSTRY TELLS YOU

Flying can be decarbonised by improving aircraft efficiency.

Supporting aircraft technology development and air traffic optimisation will have a **beneficial environmental impact**.

Therefore: financial restrictions on airlines **such as increased pricing or fuel taxes shouldn't be imposed**, as this will reduce profit available to invest in new technologies and processes.

WHAT THEY ***DON'T*** TELL YOU

History shows us that "efficiency improvements" have always **been accompanied by increased emissions**! This is because efficiency improvements also reduce the cost of flying and contribute to air traffic growth, leading to emissions growth which far outpaces the emissions reductions of efficiency gains.

Emissions reductions through efficiency gains can also be cancelled out by airlines **upgrading the class of seats**, and by **flying further or faster**.

Therefore: we need further measures to limit emissions **such as increased pricing or fuel taxes to incentivise less fuel burned**. Such policies will actually **accelerate efficiency improvements**.

EFFICIENCY DOES NOT "DECARBONISE" AVIATION

A common industry misconception is that flying can be decarbonised by making aircraft more efficient every year, often expressed in misleading statements such as: "*since the advent of jet technology, carbon-dioxide emissions from aviation have reduced by 80%*".[1]

It's correct that these improvements have resulted in emissions reductions **per passenger-km** flown. Coupled with tax breaks and subsidies, and increasing purchasing power of the global population, this has resulted in a rapid growth of air traffic (doubling every 15 years) and of CO_2 emissions that has far outstripped the efficiency savings. [see infographic]

As aircraft efficiency improves, some airlines simultaneously reduce their per seat efficiency by increasing the number of more profitable business or first class seats. They also fly further (ultra long-haul) which burns more fuel, even in efficient aircraft. A new generation of supersonic aircraft are also being developed[2] that would require up to nine times more energy per passenger-km than subsonic aircraft.[3] Private/business jet use has also been increasing; they are 5-14 times more polluting than commercial aircraft due to low passenger density or higher flight speeds.[4]

Prior to the COVID-19 pandemic, Airbus had projected that air traffic would double again by the mid-2030s and then again by 2050. This would amount to an **8-times increase** from year 2000 levels,[5] i.e. an average growth of 4.2% per year. Despite the slump in air traffic due to COVID-19, the industry still predicts growth rates of about 4% per year beyond 2024 until 2038.[6]

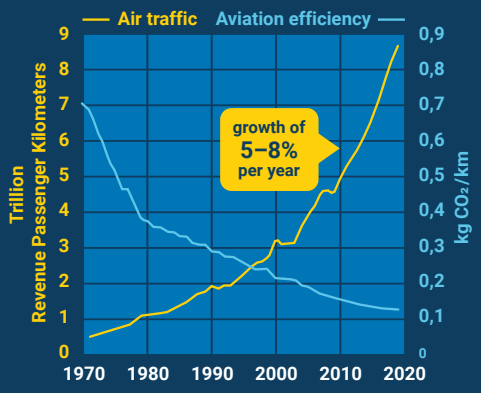
Air traffic is growing faster than efficiency improves

stay-grounded.org

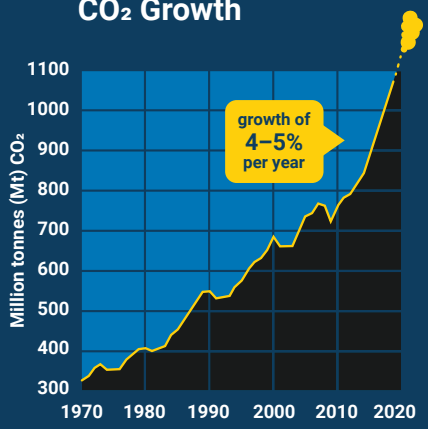
STAY GROUNDED

Historic fuel efficiency gains have been outpaced by the massive growth of air traffic and aviation emissions have constantly risen. The industry aims at getting back to pre-Covid level in 2024 and predicts future growth rates of up to 4.1%. The first graph shows how efficiency improvements have slowed down over time (blue curve), while growth rates remained very high. In the second graph we can see that aviation CO_2 emissions were constantly rising - in relation to traffic growth and despite efficiency gains. The third and fourth graph show a possible future scenario of air traffic and aviation CO_2 emissions growth to 2050, assuming an average of 1.3% efficiency improvements per year based on studies by ICAO. It becomes very clear that efficiency improvements alone cannot stop the growth of emissions.

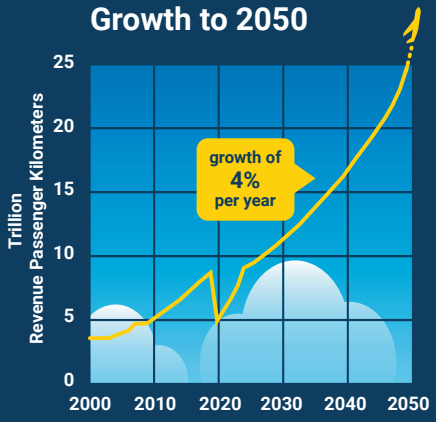
Air Traffic Growth and Fuel Efficiency



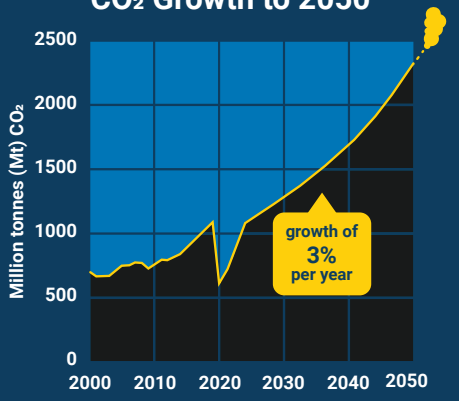
Aviation CO_2 Growth



Projected Air Traffic Growth to 2050



Projected Aviation CO_2 Growth to 2050



Sources:
Lee et al. (2021): https://bit.ly/Aviation-climate-forcing
Klöwer et al (2021): https://bit.ly/quantifying-aviation-emissions
UNEP (2020): https://bit.ly/UNEP-EmGap2020

The earth's atmosphere isn't affected by emissions per passenger-km, but instead by total emissions produced. This has been rapidly increasing, rather than decreasing.

In a **poorly-regulated** industry, efficiency improvements may facilitate market growth and increase total emissions, not reduce them. This is known as Jevon's Paradox.[7] Thus, efficiency gains alone cannot be relied upon to decarbonise the industry - **we also need regulations to limit air traffic.**

A method of limiting aviation emissions would be to increase the cost of jet fuel in order to incentivise reduced consumption. Additionally, a frequent flyer levy or air miles levy could incentivise people to fly less.[8] There are historic examples of jet fuel price increases: e.g. the OPEC oil crisis in the 1970s-80s, during which it was seen that aircraft technology development actually *accelerated*, as there was a larger incentive to reduce fuel burn (e.g. flight testing of "Open Rotor" concepts). These designs were shelved when the oil price decreased again in the 1990s and are yet to re-emerge due to low fuel prices.[9] This example demonstrates that reality does not match the narrative presented to us by airlines and the aviation industry.[10] Financial restrictions on airlines such as increased pricing or fuel taxes wouldn't reduce spending on new technologies and processes as claimed by airlines[11]; rather, they would increase the industry's desire to chase greater efficiency improvements.

While the development of new technologies and fuels may be helpful, it cannot be an excuse to delay emissions reductions that are needed NOW to mitigate the climate crisis. The only way to effectively reduce aviation emissions is to reduce air travel. To achieve this, we need effective regulations to limit air traffic.

In our Degrowth of Aviation[12] report, we lay out how a set of measures could lead to a just reduction of aviation. In our Just Transition[13] paper, we present the idea of how a conversion of the aviation industry can guarantee security for the livelihood of workers.

END NOTES & LITERATURE

[1] The Engineer (2019): https://bit.ly/interview-newby
[2] BBC (2021): https://bit.ly/bbc-supersonic
[3] Kharina, A et al. (2018): https://bit.ly/icct-supersonic
[4] Murphy, A et al. (2021): https://bit.ly/TE-PrivateJets
[5] Airbus (2019): https://bit.ly/AirbusMarketForecast
[6] ATAG (2020): https://bit.ly/atag-report
[7] Wikipedia: https://bit.ly/JevonsParadox
[8] Stay Grounded (2018): https://bit.ly/FFL-AML
[9] Wikipedia (2021): https://bit.ly/Propfan
[10] Further reading: Peeters, P et al. (2016): https://bit.ly/myths-tech
[11] Flightglobal (2020): https://bit.ly/KLM-tax-claim
[12] Stay Grounded (2019): http://bit.ly/DegAvR
[13] Stay Grounded (2021): https://bit.ly/JustTransitionAviation

Neustiftgasse 36
1070 Vienna, Austria
www.stay-grounded.org
info@stay-grounded.org

For donations please visit:
stay-grounded.org/donation/

STAY GROUNDED

Greenwashing Fact Sheet Series

"Greenwashing" is misinformation presented by an organisation in order to mislead others about the environmental impact of its current or future activities.

Globally, the aviation industry plans to triple in size by 2050. If this happens, we could see aviation fuel consumption and therefore greenhouse gas (GHG) emissions double by 2050. Governments, lobbied by the industry, use unrealistic distracting promises of technological solutions to greenwash this growth. They also use economic growth and job arguments to justify subsidies and tax breaks for airports, airlines, manufacturers and fossil fuel companies. In this series of Fact Sheets, we examine these claims and debunk common myths and misconceptions.

Fact Sheet 2 - Electric Flight

Electric aircraft propulsion systems typically involve aircraft propulsors (propellor or fan blades) that are driven by electric motors. In "fully-electric" aircraft, these motors are powered by electrical energy provided directly from batteries or hydrogen fuel cells [see Fact Sheet 3]. In "hybrid-electric" aircraft, these electric motors act in series, or parallel, with a combustion engine powered by jet fuel.

WHAT THE AVIATION INDUSTRY TELLS YOU

Electric aircraft will be **"zero emissions".**

Electric flight is **an efficient mode of transport.**

Their **contribution to decarbonising** aviation **will be significant.**

They will be **available soon.**

WHAT THEY ***DON'T*** TELL YOU

Electric aircraft will **NOT be "zero emissions" until the electric grid is fully decarbonised.**

Electric flight is **NOT efficient compared to public transport on the ground** (rail, coach)

Any contribution to decarbonising aviation will be **severely limited by range and payload.**

The only **aircraft likely to be certified this decade will be very small** and we won't see larger aircraft before 2050, too late to prevent climate breakdown.

ELECTRIC AIRCRAFT WILL NOT BE "ZERO EMISSIONS" ANY TIME SOON

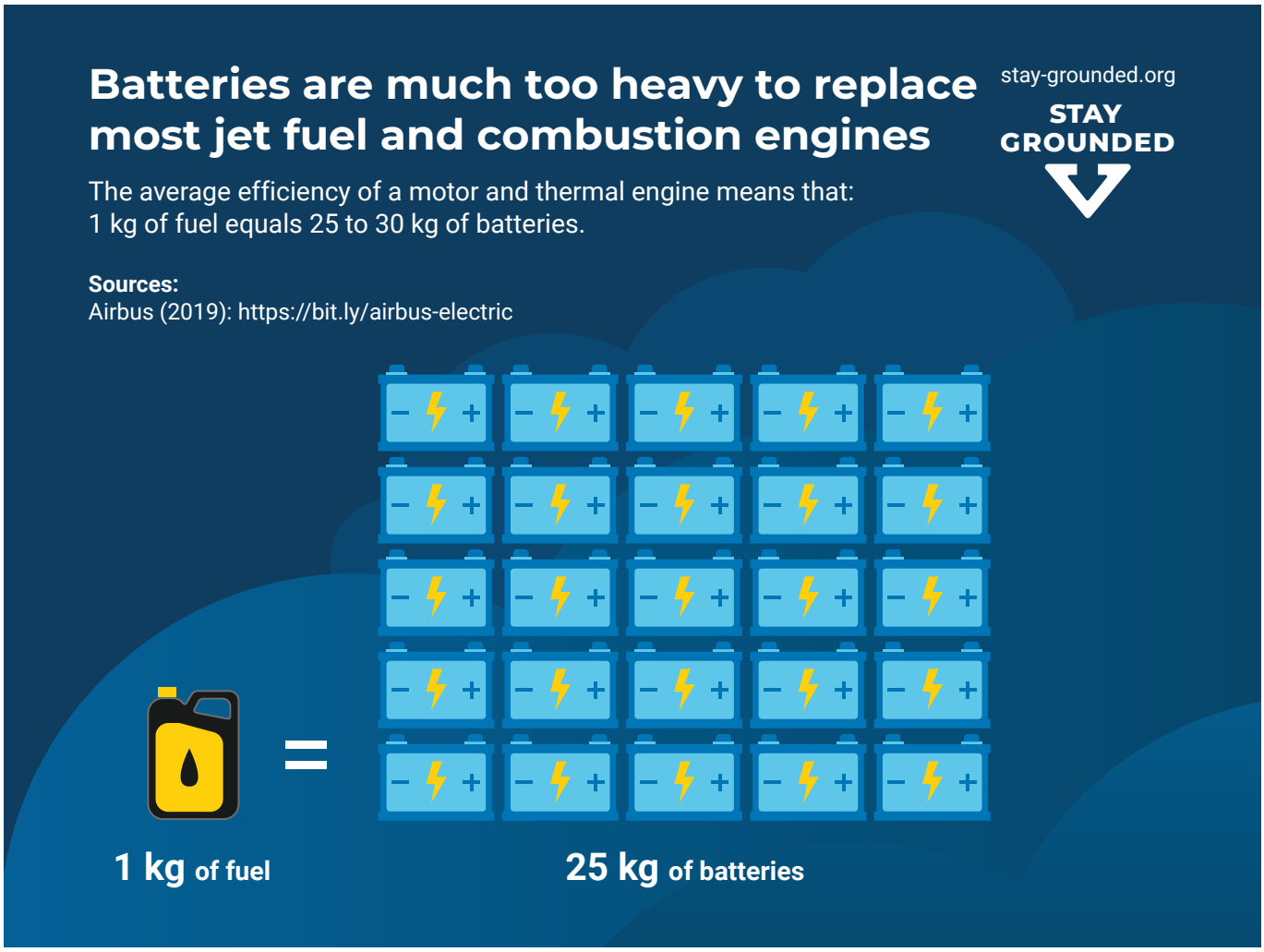
"Fully-electric" aircraft are powered by batteries, and if the batteries are charged using only renewable electricity, the aircraft operation can be considered "zero emissions". However, we are a long-way from decarbonising electricity generation, and adding additional load from other energy-intensive activities, will make it harder to move away from fossil fuels. Also, manufacturing the vehicles and batteries has significant social and environmental impacts, due to mining the necessary materials such as lithium and cobalt and producing the components. As such, even "fully-electric" aircraft cannot yet be considered "zero emissions".

"Hybrid-electric" aircraft burn jet fuel, and so still produce CO_2 and other greenhouse gas emissions during operation. They are therefore not "zero emissions". These hybrid-electric systems unlock potential new aircraft and engine architectures, such as "distributed propulsion" which could provide aircraft-level aerodynamic improvements, although such improvements can often be negated by the additional complexity of designs.

ELECTRIC FLIGHT IS NOT EFFICIENT

Flying is a fundamentally inefficient mode of transport and difficult to electrify. It should not be favoured over more efficient ground transport options that are easier to electrify. This is because aircraft use large amounts of power to take-off and climb and are more sensitive to the weight of batteries and electrical systems[1]. Where infrastructure allows: lower energy- and emissions- intensive ground-based public transport options such as rail, coach, or ferry services should be favoured at the short distances where electric aircraft are viable.

There are a large number of relatively small start-up companies attempting to develop and certify electric aircraft over the next decade. Many of the concepts receiving early investment are electric Vertical Take-Off & Landing (eVTOL) aircraft[2]. These aircraft are designed to take-off and land on helicopter pads or short runways, in order to enable versatility of operation from a range of locations. However, these aircraft are even more inefficient than conventional fixed-wing electric aircraft, as they have higher take-off and landing power requirements and higher weight and drag during the rest of the flight. They should not be considered a positive environmental development.



DECARBONISATION WILL BE SEVERELY LIMITED BY AIRCRAFT RANGE AND PAYLOAD

Current batteries and electrical systems are far too heavy to displace most jet fuel and combustion engines.

The Chief Technology Officer of Airbus has stated that *"even assuming huge advances in battery technology, with batteries that are 30 times more efficient and 'energy-dense' than they are today, it would only be possible to fly an A320 airliner for a fifth of its range with just half of its payload"*[3]. It is therefore not foreseeable that this type of aircraft which is the most common in airports for short-haul flights could become electric in the short or even medium term. Only very small, short-range aircraft will be electric. This is reflected by the fact that most companies attempting to certify electric aircraft during the 2020s are developing aircraft carrying less than 10 passengers which do not fit the current configuration of most airports. In addition, unlike a fuel tank where the weight decreases as fuel is burned during the flight, a battery does not become lighter during the trip. These issues further impact the payload and range capability of the aircraft[4].

Currently this means that electric aircraft will **only be viable for short flights** under 1,000 km by 2050 which account for only 17% of aviation CO_2 emissions[5]. However, the scope to decarbonise overall aviation emissions is even more limited because, although electric aircraft can be justified for some niche cases in regions where ground transport options are poor, everywhere else short flights can be substituted by more efficient train, coach or ferry services.

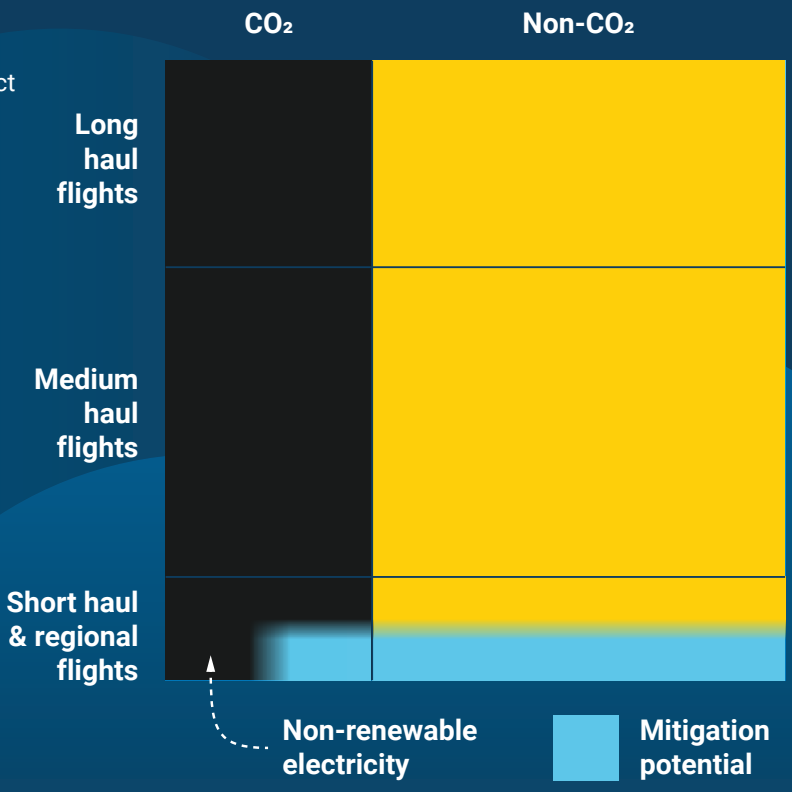
The potential of electric aircraft to mitigate the climate impact of aviation is less than 10% of its total impact by 2050

stay-grounded.org

STAY GROUNDED

Only regional flights and a part of short haul flights might be powered by electricity before 2050 because of the weight of the batteries. Where implemented, electric flight will eliminate any non-CO_2 climate impact, but CO_2 emissions will continue for decades until electricity is fully renewable.

Sources:
Stay Grounded (2020):
https://bit.ly/factsheetClimateImpact
CleanSky2&FCH (2020):
https://bit.ly/report-hydrogen, p. 16



LARGE ELECTRIC AIRCRAFT WON'T BE HERE SOON

Improvements in the weight of battery technology will not overcome their disadvantages any time soon. The Chief Technology Officer of United Technologies declares: *"Unless there is some radical, yet-to-be invented paradigm shift in energy storage, we are going to rely on hydrocarbon fuels for the foreseeable future"*[6]. In its recent "Net Zero by 2050" report[7], the International Energy Agency (IEA) sees the adoption of commercial battery electric and hydrogen aircraft from 2035, but expects that these aircraft would account for less than 2% of global aviation energy consumption in 2050. **Hence, we should not allow the talk of electric flight to distract us from the priority of reducing aviation emissions today.**

While the development of new technologies and fuels may be helpful, it cannot be an excuse to delay emissions reductions that are needed NOW to mitigate the climate crisis. The only way to effectively reduce aviation emissions is to reduce air travel. To achieve this, we need effective regulations to limit air traffic.

In our Degrowth of Aviation[8] report, we lay out how a set of measures could lead to a just reduction of aviation. In our Just Transition[9] paper, we present the idea of how a conversion of the aviation industry can guarantee security for the livelihood of workers.

END NOTES & LITERATURE

[1] GreenBiz (2018): https://bit.ly/electric-airplanes
[2] FlightGlobal (2021): https://bit.ly/eVTOL-aircraft
[3] BBC (2019): https://bit.ly/BBC-E-flight
[4] Airbus (2019): https://bit.ly/airbus-electric
[5] CleanSky2&FCH (2020): https://bit.ly/report-hydrogen
[6] BBC (2019): https://bit.ly/BBC-E-flight
[7] IEA (2021): https://bit.ly/iea-NetZero, p.136
[8] Stay Grounded (2019): http://bit.ly/DegAvR
[9] Stay Grounded (2021): https://bit.ly/JustTransitionAviation

Neustiftgasse 36
1070 Vienna, Austria
www.stay-grounded.org
info@stay-grounded.org

For donations please visit:
stay-grounded.org/donation/

STAY GROUNDED

Greenwashing Fact Sheet Series

"Greenwashing" is misinformation presented by an organisation in order to mislead others about the environmental impact of its current or future activities.

Globally, the aviation industry plans to triple in size by 2050. If this happens, we could see aviation fuel consumption and therefore greenhouse gas (GHG) emissions double by 2050. Governments, lobbied by the industry, use unrealistic distracting promises of technological solutions to greenwash this growth. They also use economic growth and job arguments to justify subsidies and tax breaks for airports, airlines, manufacturers and fossil fuel companies. In this series of Fact Sheets, we examine these claims and debunk common myths and misconceptions.

Fact Sheet 3 - Hydrogen Flight

There are plans to use hydrogen as a power source for aircraft instead of kerosene. It could either be burned in a jet engine or used to feed a fuel cell to generate electricity to power a propeller. It is produced from other energy sources, has a significant energy loss during the process and is usually stored in liquid form at −253 °C.

WHAT THE AVIATION INDUSTRY TELLS YOU

Happening soon
New aircraft propelled by hydrogen could enter into service by 2035.

Zero emissions
When burned or used in a fuel cell, hydrogen does not produce any CO_2, only water.

Government support required
Public money is needed for funding for hydrogen aircraft development and to subsidise hydrogen production.

WHAT THEY ***DON'T*** TELL YOU

Too late
If it happens, it will come much too late to tackle the climate emergency.

Not for medium and long-haul flights
Hydrogen will not be viable for medium and long-haul flights before 2050. Until then, only the regional and short-haul market should be targeted, a large part of which can be substituted by road or rail.

Not zero emissions
Hydrogen-powered aircraft will not have zero emissions, even if hydrogen is produced from renewable electricity, because it will still emit NO_x and generate contrail cirrus that have a higher climate impact than CO_2 today.

Huge energy consumption
The deployment of "green" hydrogen in aviation would require huge quantities of renewable electricity, which would deprive other sectors needing to decarbonise.

Success not assured
Hydrogen-powered aircraft exist only on paper. Before it becomes a reality, many problems must be solved, especially in the field of safety, and new technologies must be developed.

Financial support from governments means taxpayers pay
...most of whom never fly.

Airbus studied hydrogen aircraft in the 2000s but shelved their plans in 2010 due to technical issues[1] that are yet to be resolved. In 2020, they then announced their intention to restart development of new hydrogen aircraft that could enter into service in 2035. They are studying four concept aircraft and will select one by 2025[2,3]. Other manufacturers are also developing small hydrogen aircraft that may be certified in the 2020s.

HYDROGEN AIRCRAFT UNABLE TO MEET CLIMATE TARGETS IN TIME AND QUANTITY

Even if the aggressive schedule announced by Airbus in 2020 is met, it will be too late for the climate. According to the United Nations Environment Program (UNEP), worldwide GHG emissions must be reduced by 55% by 2030 and 90% by 2050 in order to not exceed the globally agreed 1.5°C heating limit[4]. The design of a whole range of aircraft and the conversion of the fleet to hydrogen would start too late and take too long to meet this goal. Aircraft have a typical lifetime of 25 years.

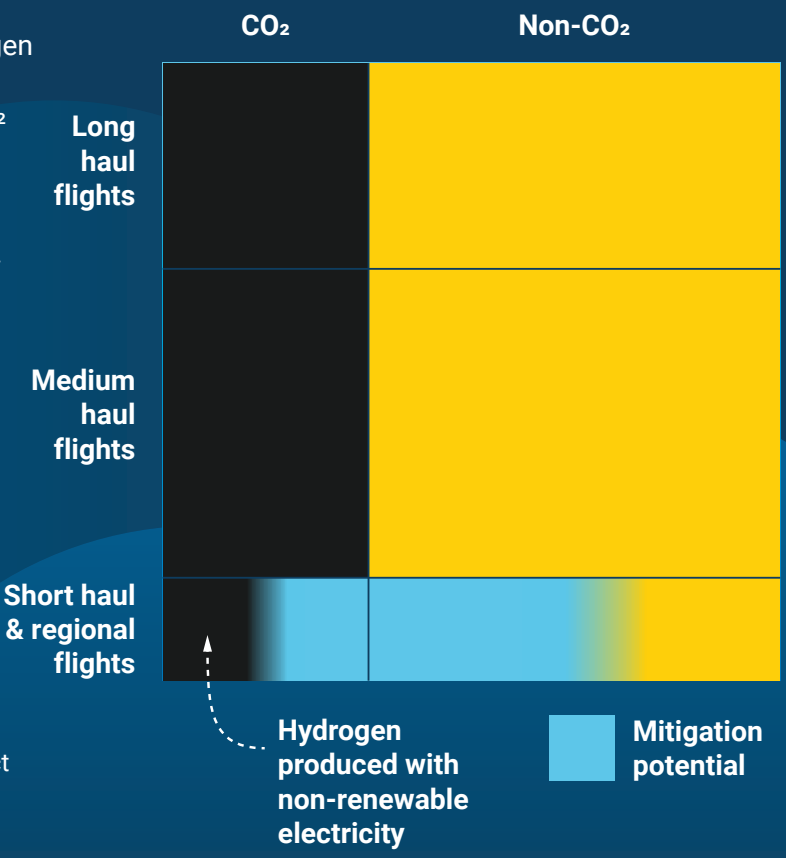
According to a report produced by the European Commission (EC) in collaboration with key industry partners, hydrogen would be best suited for regional and short- to medium-haul flights. For long-haul flights, which contribute about one third of aviation emissions, hydrogen would not economically compete with synthetic fuels before 2050[5]. By then, for that segment, the industry plans to rely upon alternative jet fuels (biofuels and e-fuels - see Fact Sheets 4 and 5). More recently, Airbus stated that a medium-haul aircraft would not be available before 2050, so, before that time hydrogen could potentially displace less than 20% of CO_2 emissions[6].

Hydrogen's potential to mitigate the climate impact of aviation is less than 10% of its total impact by 2050

stay-grounded.org

STAY GROUNDED

The technical challenge of designing and building hydrogen-powered aircraft, of meeting safety requirements and of supplying hydrogen both to planes and to airports makes it highly improbable that we will see hydrogen-powered medium and long haul flights before 2050. On the shorter flights where hydrogen might be used, CO_2 emissions would not be fully reduced until all the hydrogen was sourced from 100% renewable electricity. And the non-CO_2 impacts would only be partially addressed, as hydrogen-powered engines would still emit NO_x and produce contrails.



Sources:
Stay Grounded (2020):
https://bit.ly/factsheetClimateImpact

CleanSky2&FCH (2020):
https://bit.ly/report-hydrogen

HYDROGEN WOULD STILL HAVE SIGNIFICANT NON-CO_2 IMPACTS

The EC report takes into account the CO_2 as well as the non-CO_2 impact of aviation on climate, NO_x, water vapour and contrails, considering that the total impact is 3.1 times that of CO_2 alone (see also Fact Sheet on non-CO_2)[7]. It estimates that the total climate impact could be reduced by only 50-75% versus kerosene if hydrogen is burned in turbines and 75-90% if it is used in fuel cells. But this is still highly hypothetical.

PRODUCING GREEN HYDROGEN WOULD REQUIRE HUGE RENEWABLE ELECTRICITY RESOURCES

Hydrogen aircraft are part of a new economy of hydrogen aiming at replacing fossil fuels where electricity is not a possible alternative.
In order to be "carbon-free", hydrogen needs to be produced with renewable electricity (green hydrogen > see infobox).

The challenge is that the energy requirements are huge and will exceed production capacities needed to:

- Replace coal and gas in power plants that supply the electric grid
- Help satisfy new demand for electricity (cars, heating, data, etc.)
- Replace today's grey hydrogen (produced from fossil fuels) used for industrial processes (e.g. fertiliser production)
- Satisfy new demand for hydrogen for trucks, ships...
- Satisfy new demand for hydrogen for production of e-fuels for aviation

In a scenario where 40% of the airline fleet would be converted to liquid hydrogen in 2050 and the rest of the fleet would use e-fuels, the resulting electricity demand would be equal to the current total worldwide electricity production and about four times the production of renewable electricity in 2018[8]. As demand for electricity grows so does the risk that renewable electricity supply will not be able to match it, which will increase the risk of using non-renewable power.

FINANCIAL SUPPORT FROM GOVERNMENTS IS UNJUSTIFIED: THE POLLUTER SHOULD PAY

Airbus says "*support from governments will be key to meet their ambitious objectives with increased funding for research and technology, digitalisation and mechanisms that encourage the use of sustainable fuels and accelerate the renewal of aircraft fleets*"[9].

However: given that most taxpayers rarely or never fly[10] it would be unfair for them to subsidise research and development, particularly as the commercial success of hydrogen is uncertain; timescales are lengthy; and any significant deployment of hydrogen aircraft would be a waste of limited renewable energy resources.

GREY, BLUE AND GREEN HYDROGEN

This colour code refers to different production methods:

- **Grey Hydrogen = produced from methane or coal (both fossil fuels)**
- **Blue Hydrogen = Grey Hydrogen combined with Carbon Capture & Storage (CCS)**
- **Green Hydrogen = produced (via electrolysis) from water via renewable electricity**

In 2018, the vast majority of the hydrogen production was "grey", accounting for 2% of total global CO_2 emissions. Only 0.5% of the production was "green", and a tiny amount was "blue"[11]. "Blue" hydrogen is unproven at scale, and ultimately still involves the use of fossil fuel and may produce more carbon emissions than simply using "grey" hydrogen[12].

Today, hydrogen is mostly used by industry, for oil refining and for producing ammonia fertilisers. But many sectors, including aviation, are exploring its potential to support clean energy transitions and a new hydrogen economy is being projected.

As new uses for hydrogen develop, there is a major concern that the oil and gas sector will continue with business as usual in order to fulfill new hydrogen demand by extracting it from fossil hydrocarbons, rather than leaving it in the ground.

SUCCESS IS FAR FROM ASSURED

Hydrogen flight is unproven, with many technical and safety aspects yet to be understood. There is some skepticism even within the aviation industry. Boeing is not following Airbus[13] and engine manufacturers have expressed reservations[14]. Even Airbus have admitted that hydrogen will not be widely used in planes before 2050, stating that only regional 50-100 seaters would be ready for hydrogen in the 2030s, a small market with a small share of current CO_2 emissions[15]. If airlines transition to using a large amount of such aircraft, this will substantially affect their operations and the design of airport infrastructure (e.g. runways, gates, terminals, fuelling and maintenance requirements). It would therefore be sensible to halt aviation expansion plans until we know to what extent hydrogen aircraft will be used.

While the development of new technologies and fuels may be helpful, it cannot be an excuse to delay emissions reductions that are needed NOW to mitigate the climate crisis. The only way to effectively reduce aviation emissions is to reduce air travel. To achieve this, we need effective regulations to limit air traffic.

In our Degrowth of Aviation[16] report, we lay out how a set of measures could lead to a just reduction of aviation. In our Just Transition[17] paper, we present the idea of how a conversion of the aviation industry can guarantee security for the livelihood of workers.

END NOTES & LITERATURE

[1] BBC News (2010): https://bit.ly/bbc-hydrogen
[2] Airbus (2020): https://bit.ly/airbus-zero
[3] Airbus (2020): https://bit.ly/AirbusPod
[4] UNEP (2019): https://bit.ly/UNEP-EmissionGap, p. 15
[5] CleanSky2&FCH (2020): https://bit.ly/report-hydrogen
[6] Reuters (2021): https://bit.ly/hydrogen-limits
[7] Stay Grounded (2020): https://bit.ly/factsheetClimateImpact
[8] CleanSky2&FCH (2020): https://bit.ly/report-hydrogen
[9] Airbus (2020): https://bit.ly/airbus-zero
[10] Gössling, S. et al. (2020): https://bit.ly/Goessling-Global-Aviation
[11] IEA (2021): https://bit.ly/IEA-hydrogen
[12] Howarth, R. et al (2021): https://bit.ly/3AZRyqi
[13] Simple flying (2021): https://bit.ly/Boeing-NoHydrogen
[14] France TV (2020): https://bit.ly/interview-petitcolin
[15] Reuters (2021): https://bit.ly/hydrogen-limits
[16] Stay Grounded (2019): http://bit.ly/DegAvR
[17] Stay Grounded (2021): https://bit.ly/JustTransitionAviation

Neustiftgasse 36
1070 Vienna, Austria
www.stay-grounded.org
info@stay-grounded.org

For donations please visit:
stay-grounded.org/donation/

STAY GROUNDED

Greenwashing Fact Sheet Series

"Greenwashing" is misinformation presented by an organisation in order to mislead others about the environmental impact of its current or future activities.

Globally, the aviation industry plans to triple in size by 2050. If this happens, we could see aviation fuel consumption and therefore greenhouse gas (GHG) emissions double by 2050. Governments, lobbied by the industry, use unrealistic distracting promises of technological solutions to greenwash this growth. They also use economic growth and job arguments to justify subsidies and tax breaks for airports, airlines, manufacturers and fossil fuel companies. In this series of Fact Sheets, we examine these claims and debunk common myths and misconceptions.

Fact Sheet 4 – Biofuels

Alternative jet fuels or so-called "Sustainable Aviation Fuels" (SAF) are liquid hydrocarbon fuels that can be used with existing aircraft in place of kerosene produced from fossil fuels. **The industry's premise of the sustainability** of these fuels is to create the fuel using CO_2 taken from the atmosphere, rather than using fossil fuels extracted from deep underground that will then emit additional CO_2 to the atmosphere when burned. The argument is that blending these fuels with fossil fuels would thereby reduce emissions.

Alternative jet fuel can be broadly categorised into two varieties:

- Biofuels - produced from biomass sources (explained below)
- Synthetic electro-fuels (e-fuels) - produced using elec-tricity (see Fact Sheet 5)

WHAT THE AVIATION INDUSTRY TELLS YOU

Aviation **will not use first generation biofuels from crops** but will instead use second generation biofuels from "sustainable waste" that will not compete with agriculture or cause adverse environmental or social impacts.

Aviation biofuels **could significantly reduce emissions** vs. fossil jet fuel.

Aviation biofuels could be **scaled up rapidly** to a significant percentage of jet fuel consumption.

Due to the significant extra cost, **governments should provide financial support for biofuels**, so that aviation industry growth is not affected.

Biofuel production can use various sources of biomass as an input. First generation biofuels use agricultural crops. Second generation biofuels **aspire to use** industrial, agricultural, municipal or household waste, such as: used cooking oil, fat, corn husks, forest resources, or food waste.

WHAT THEY ***DON'T*** TELL YOU

Aviation **does not rule out the use of first generation biofuels from crops**, which are proven to cause very serious environmental and social impacts such as biodiversity loss, rising food prices and water scarcity.
There is a **very limited quantity of "sustainable waste"** available globally for second generation biofuels. This could also **be used more efficiently to decarbonise other sectors**.

Biofuel use can still produce **significant CO_2 emissions**. Also non-CO_2 emissions which have a strong climate impact today, will only be partially eliminated by using biofuels.

Aviation biofuel scale up has been promised by the industry for more than a decade but currently **less than 0.01% of jet fuel is biofuel.** Second generation biofuels are likely to **only replace a small percentage** of fossil fuel use in the future.

Subsidies for biofuels risk **wasting public money on a false solution**. They would keep flying artificially cheap which would result in more air traffic and emissions than if the industry paid.

BIOFUEL USE IS SEVERELY CONSTRAINED BY THE SUSTAINABILITY AND AVAILABILITY OF BIOMASS

It is often claimed that aviation would use only second generation biofuels derived from "waste" sources, therefore avoiding any direct or indirect sustainability impacts. Yet the use of first generation biofuels from crops and even entire trees **has not been ruled out**. There are plans for huge "SAF" refineries in Paraguay using soybeans as a feedstock[1] and such fuels are permitted under the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA), which is the only internationally agreed policy and runs until 2035[2]. The threat of scaling up the use of commodities like soy or palm oil with **high risk of deforestation** is increasing as greater political emphasis is placed on the supposed benefits of "SAF".

The cultivation of energy crops in large monoculture fields increases the use of fertilisers, pesticides and herbicides; with **devastating environmental, biodiversity and health impacts**. The expansion of agriculture like soy and palm leads to CO_2 emissions from land use change which can be similar to, or greater, than fossil fuel emissions[3] (Fig. 1) It can also result in humanitarian impacts[4] like land conflicts, labour abuses, rising food prices, water scarcity and chronic disease in neighbouring communities from pollution.

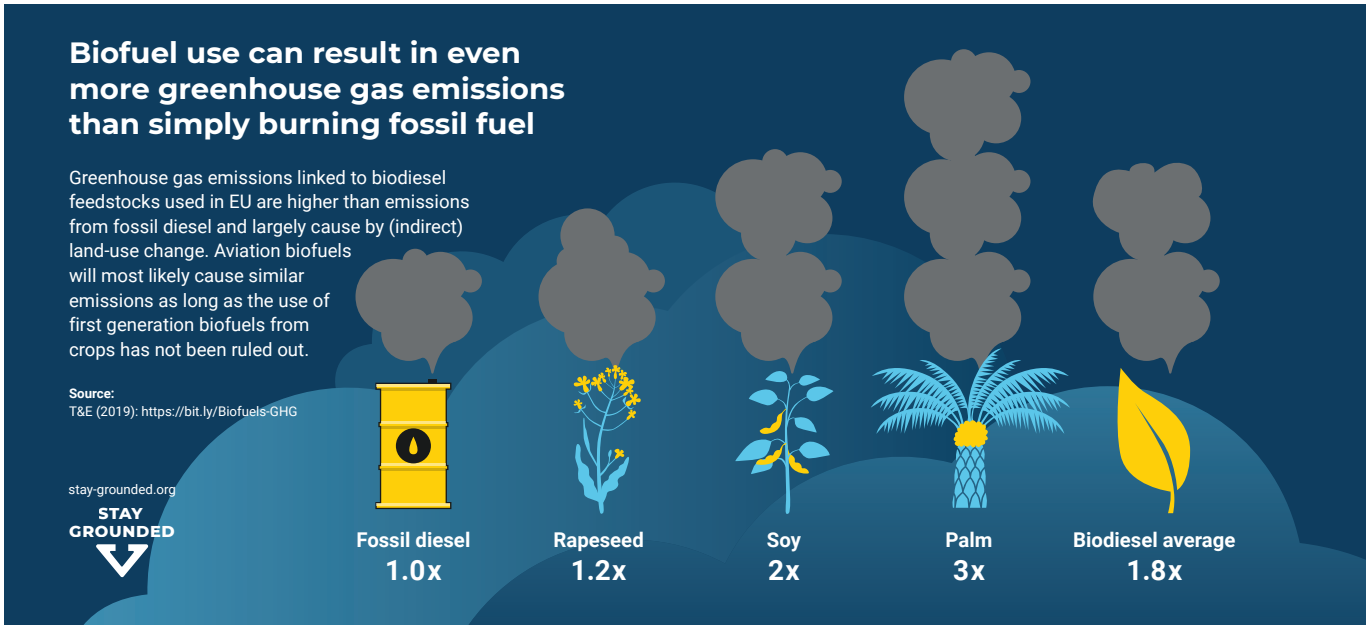
The only process currently able to produce second generation biofuels for aviation at a commercial scale uses "waste oils", due to its similarity to biodiesel, which is already produced at a limited commercial scale for the road sector. It has been found that when "waste oils" are used to produce large quantities of biodiesel, it displaces their use in other sectors; which then transition to other sources, such as palm oil[5]. This also creates the opportunity for **fraud**, for example: where fresh palm oil has been sold as "used cooking oil"[6]. Also palm oil or palm oil derivatives are often being used but being disguised by another term.[7] This indirectly causes an increase in crops for energy with their associated impacts.

BIOFUELS WOULD COMPETE WITH OTHER APPLICATIONS

The future quantity of any sustainable biomass "waste" available globally is **strictly limited** and without fuel production processes having been demonstrated at any significant commercial level. An EU report (contributed to by Airbus, Boeing, BP, Shell, and easyJet) in 2020 stated that *"biofuels' reliance on feedstock, changes in land use, high water use, and/or monoculture (i.e., the production of a single crop) means that the aviation industry will be competing with other interests that need the feedstock for other purposes"*[8].

Governments will need to use any biomass produced to feed a growing global population whilst also decarbonising the power, heating, agriculture (e.g. replacing fossil fuel fertilisers) and transport sectors.

Current government policies will not result in combustion engines being completely phased out of cars, trucks, or ships until after 2040. This means aviation will **compete with ground transport** for limited quantities of sustainable biofuel over the next few decades and it is recognised that high targets for aviation biofuels may only incentivise the diversion of resources from existing use in the road sector[9]. The UK Government notes that when production facilities produce more aviation biofuel than road biodiesel, their overall efficiency decreases and production costs increase; making *"economy-wide decarbonisation more expensive"*[10]. Therefore, the only result would be to shift an emissions saving from one sector to another, whilst decreasing the total emissions saving achieved and increasing costs.
There are also dangerous plans to rely heavily on biomass for negative emissions via Bioenergy Carbon Capture & Storage (BECCS) facilities, which is an **unproven technology** and would **increase pressure on scarce global resources** and amplify the risk of all the impacts detailed above.



BIOFUELS WOULD ONLY PARTIALLY REDUCE AVIATION CLIMATE IMPACT VS. FOSSIL FUEL

The industry claims that *"SAF can reduce emissions by up to 80% during its full life cycle"*[11]. However, GHG savings of only 60% have been proposed at national levels as a threshold for "SAF"[12] and fuels eligible under the international CORSIA scheme can have savings as low as 10%.[13] In addition, aviation also produces non-CO_2 emissions such as contrails which are estimated to cause a greater global warming effect than aviation CO_2 today[14]. Recent studies have shown that while biofuels can contribute to reducing non-CO_2 emissions, **they will only be partially reduced**[15]. So even if fossil fuel were entirely replaced by biofuels, significant emissions would still be generated.

GOVERNMENTS SHOULD NOT SUBSIDISE AVIATION BIOFUELS: THE POLLUTER SHOULD PAY

Even if scaled up further, aviation biofuels will still cost far more than kerosene. Biofuel from "waste oil" is the most cost competitive but still costs double the price and *"other conversion processes cost as much as eight times the price"*[16]. These increased costs would undermine the expansion plans of the industry. The only way the aviation industry can continue to grow whilst using larger quantities of alternative jet fuels such as biofuel, would be to obtain large government subsidies for their production. According to a 2019 study by the International Civil Aviation Organisation (ICAO), 328 new large bio-refineries would need to be built every year by 2035, at an approximate capital cost of US$29-115 billion a year to generate enough biofuel for international aviation only[17]. However, investing in bio-refineries would pose a huge risk to public finances as it is

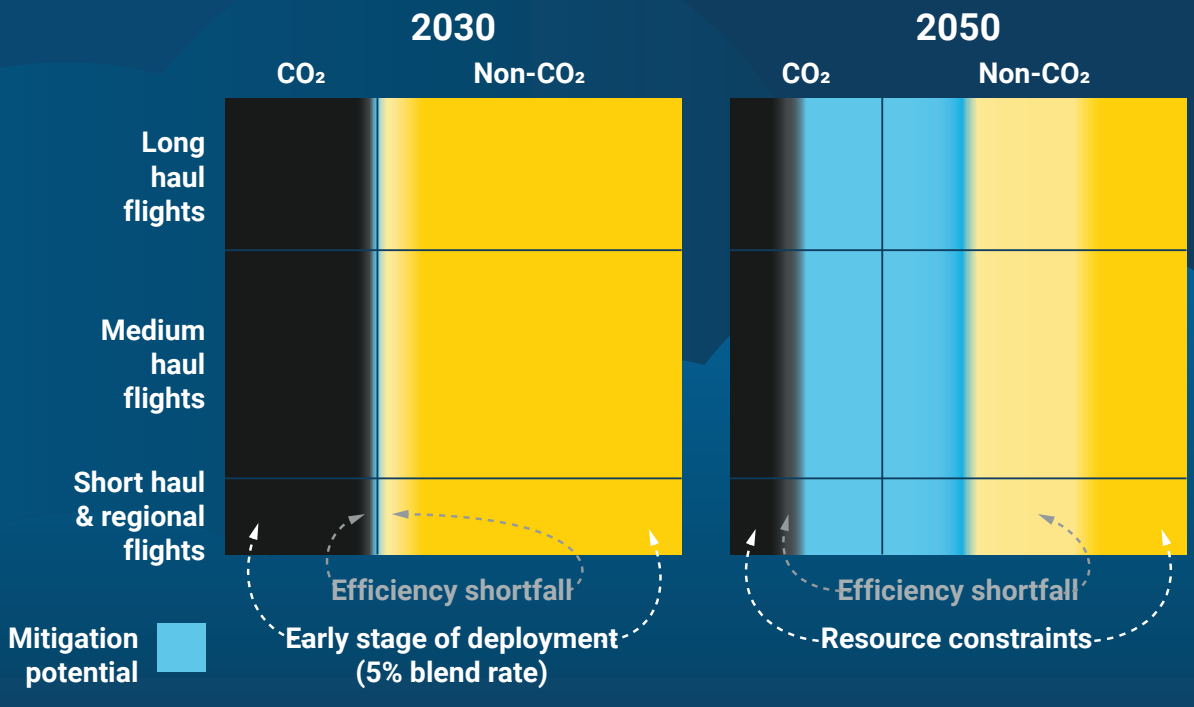
Alternative fuels' potential to mitigate the climate impact of aviation is less than 5% of its total impact in 2030

stay-grounded.org

STAY GROUNDED

It will most probably not exceed 40% in 2050 (in the EU). In the short term, the development of this quite new sector will be slow and not accelerate before the 30s. In the longer term, the reduction of the impact of alternative jet fuels will be constrained by their limited efficiency at reducing non-CO_2 impacts like contrail cirrus and the limited availability of resources (feedstock for biofuels and renewable electricity for e-fuels).

Sources:
Stay Grounded (2020): https://bit.ly/factsheetClimateImpact
CleanSky2&FCH (2020): https://bit.ly/report-hydrogen, p. 16
EU "Fit for 55" roadmap (2021): https://bit.ly/EU-Fit-for-55



unlikely, for the reasons given here, that aviation biofuels can ever be viewed as "sustainable". This would result in facilities that are likely to turn into "stranded assets" with a large loss of investment. In the end taxpayers, most of whom never or rarely fly, should not be paying for that.

BIOFUELS CANNOT BE SCALED UP RAPIDLY ENOUGH AND NEITHER SHOULD THIS BE THE GOAL

Biofuel scale up has been promised by the aviation industry for more than a decade but this has not materialised. Targets have been routinely missed by significant margins and then ambition ratcheted down across successive years. For example, in 2009, the International Air Transport Organisation (IATA) was aiming for 10% biofuels by 2017[18] and in 2011, Air Transport Action Group (ATAG) stated: *"We are striving to practically replace 6% of our fuel in 2020 with biofuel. We hope this figure can be higher"*[19]. However, as of 2021, only less than 0.01% of jet fuel is biofuel[20].

Even if we were to accept the industry's most optimistic future projections of aviation biofuel use, they **still do not** expect that such fuels will provide a large percentage of total fuel consumption over the next few decades, given their plans for huge growth in air traffic and fuel consumption. For example, the EU has presented plans that will only put them on track to deliver 5% alternative jet fuel (mostly biofuel) by 2030[21]. With limited quantities of biomass available and thus limited biofuel potential, the only way to deliver a greater overall percentage within meaningful timescales would be to **decrease total fuel consumption**. However, as stated above: even those limited quantities would compete with other applications and bring danger of human rights violations, emissions through land-use change and biodiversity loss. This makes biofuels **a false solution** on many different levels and a clear threat to meeting climate targets in a just manner.

While the development of new technologies and fuels may be helpful, it cannot be an excuse to delay emissions reductions that are needed NOW to mitigate the climate crisis. The only way to effectively reduce aviation emissions is to reduce air travel. To achieve this, we need effective regulations to limit air traffic.

In our Degrowth of Aviation[22] report, we lay out how a set of measures could lead to a just reduction of aviation. In our Just Transition[23] paper, we present the idea of how a conversion of the aviation industry can guarantee security for the livelihood of workers.

END NOTES & LITERATURE

[1] Global AG Investing (2019): https://bit.ly/biofuel-paraguay
[2] T&E (2019): https://bit.ly/Corsia-assessment
[3] T&E (2019): https://bit.ly/Biofuels-GHG
[4] Milieudefensie (2020): https://bit.ly/Neste-biofuel
[5] Biofuelwatch (2017): https://bit.ly/aviation-biofuels-report
[6] BBC (2021): https://bit.ly/doubts-biofuels
[7] Biofuelwatch: https://bit.ly/names-palmoil
[8] CleanSky2&FCH (2020): https://bit.ly/report-hydrogen, p. 18
[9] ICCT (2021): https://bit.ly/SAF-feedstock, p 1-4
[10] Department for Transport UK (2021): https://bit.ly/SAF-Mandate, p. 48-49
[11] IATA (2021): https://bit.ly/IATA-SAF
[12] Department for Transport UK (2021): https://bit.ly/SAF-Mandate, p. 48-49
[13] T&E (2019): https://bit.ly/Corsia-assessment
[14] Lee, D et al (2021): https://bit.ly/factsheetClimateImpact
[15] Vogt, C et al (2021): https://bit.ly/biofuels-nonco2, p. 1
[16] ICCT (2021): https://bit.ly/SAF-feedstock, p 1-4
[17] ICAO (2019): https://bit.ly/destination-green, p. 20
[18] IATA (2009): https://bit.ly/IATA-projections, p.14
[19] ATAG (2011): https://bit.ly/atag-future-of-flight, p.2
[20] FlightGlobal (2020): https://bit.ly/faith-in-SAF
[21] European Commission (2021): https://bit.ly/refuel-EU, Annex 1, p. 28
[22] Stay Grounded (2019): http://bit.ly/DegAvR
[23] Stay Grounded (2021): https://bit.ly/JustTransitionAviation

Neustiftgasse 36
1070 Vienna, Austria
www.stay-grounded.org
info@stay-grounded.org

For donations please visit:
stay-grounded.org/donation/

STAY GROUNDED

Greenwashing Fact Sheet Series

"Greenwashing" is misinformation presented by an organisation in order to mislead others about the environmental impact of its current or future activities.

Globally, the aviation industry plans to triple in size by 2050. If this happens, we could see aviation fuel consumption and therefore greenhouse gas (GHG) emissions double by 2050. Governments, lobbied by the industry, use unrealistic distracting promises of technological solutions to greenwash this growth. They also use economic growth and job arguments to justify subsidies and tax breaks for airports, airlines, manufacturers and fossil fuel companies. In this series of Fact Sheets, we examine these claims and debunk common myths and misconceptions.

Fact Sheet 5 - Synthetic Electro-fuels

Alternative jet fuels or so-called "Sustainable Aviation Fuels" (SAF) are liquid hydrocarbon fuels that can be used with existing aircraft in place of kerosene produced from fossil fuels. The industry's premise of the sustainability of these fuels is to create the fuel using CO_2 taken from the atmosphere, rather than using fossil fuels extracted from deep underground that will then emit additional CO_2 to the atmosphere when burned. The argument is that blending these fuels with fossil fuels would thereby reduce emissions.

Alternative jet fuel can be broadly categorised into two varieties:

- Biofuels produced from biomass sources (see Fact Sheet 4)
- Synthetic electro-fuels (e-fuels) produced using electricity (explained below)

Synthetic electro-fuels or "e-fuels" can be produced by combining hydrogen with carbon to create a liquid hydrocarbon. In order to minimise emissions, hydrogen must be extracted from water by electrolysis using renewable energy; and carbon must be extracted from the air using a process called 'Direct Air Capture' (DAC). These can then be combined, to form a hydrocarbon fuel using Fischer-Tropsch (FT) synthesis[1]. The latter processes must also be powered with renewable energy.

E-fuels are also known as "Synfuels" or Power-to-Liquid (PtL) fuels. E-fuels, as well as biofuels, are drop-in fuels that could be blended with conventional fossil jet fuel (kerosene) and used by the existing fleet.

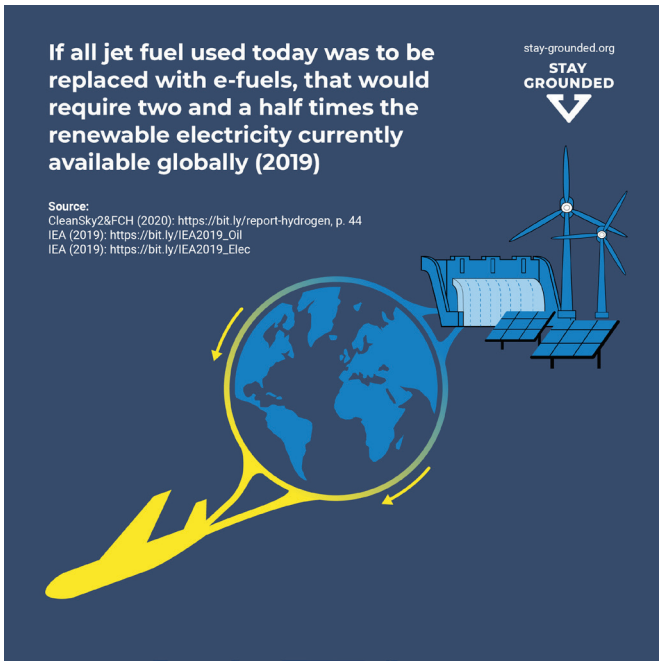
At first sight, e-fuels seem to be the ultimate weapon for decarbonising aviation: they should be able to be used directly in all types of current aircraft, whatever their range; they do not suffer from raw material limitations because they are made from water and air, which are very abundant resources; and the electricity required could itself be generated from the sun and wind, which are very abundant energies. So why are there no aircraft powered by these fuels yet and very few for another ten years or so? Mainly because the production of e-fuels is extremely wasteful of energy. It would deprive other sectors needing to decarbonise as there will not be enough renewable energy available to satisfy all the requirements in the next decades. Also because this is a new industry starting almost from scratch, that still needs to complete process development and set up a whole new sector.

WHAT THE AVIATION INDUSTRY TELLS YOU

Happening soon
E-fuels could start to be blended with kerosene in 2030.

Zero emissions
Their production would not cause any CO_2 emissions and their combustion would just return to the atmosphere the CO_2 from where it would be extracted.

Government support required
Due to the significant extra cost governments should provide financial support for e-fuels, so that aviation industry growth is not affected.



WHAT THEY ***DON'T*** TELL YOU

Too late
E-fuels do not address the climate emergency. Although the technology has been demonstrated, it's still at the pilot stage and several decades of heavy investment would be needed to scale up production.

Not zero
Even if CO_2 emissions can theoretically be reduced down to zero, they would still generate NOx and contrail cirrus that have twice as much climate impact than CO_2 today.

Requires huge quantities of renewable electricity
E-fuels require even more energy to produce than hydrogen, which would deprive other sectors needing to decarbonise.

Very low energy efficiency
No more than about 10% of the electricity used would be converted into thrust to move an aircraft, whereas it can be used with a much better efficiency in most other applications.

Financial support from governments means taxpayers pay
Most of whom rarely or never fly... Subsidies for e-fuels risk wasting public money on an expensive solution and would keep flying artificially cheap, resulting in more air traffic and emissions than if the industry paid.

E-FUELS CANNOT BE SCALED UP RAPIDLY ENOUGH TO MEET CLIMATE TARGETS

The deployment of e-fuels is likely to be slow and last several decades. Very few countries have concrete plans for implementation. Currently, only the EU is considering a mandate for e-fuels which starts at only 0.7% in 2030[2] and the NGO Transport & Environment believes that an objective of more than 1% in the EU would be challenging[3]. This is **far behind the emissions reduction pace** that must be achieved in order to not exceed the globally agreed 1.5°C heating target: according to the United Nations Environment Program (UNEP), worldwide greenhouse gas (GHG) emissions must be reduced by 55% by 2030[4].

E-FUELS WOULD ONLY PARTIALLY REDUCE NON-CO2 EMISSIONS

Additionally, aviation should not only reduce CO_2 emissions but also non-CO_2 emissions that have twice as large a climate impact today[5]. Whereas CO_2 emissions of e-fuels could theoretically be reduced to zero if CO_2 is extracted from the air and renewable electricity is used to produce hydrogen and in all the other processes, this is far from being the case for non-CO_2 impacts. Recent estimates indicate that e-fuels will **not contribute to reducing non-CO_2 impacts by more than 12% versus kerosene[6].**

PRODUCING E-FUELS WOULD REQUIRE HUGE QUANTITIES OF RENEWABLE ELECTRICITY THAT WOULD DEPRIVE ALL OTHER SECTORS THAT NEED TO DECARBONISE

E-fuels could be part of a new economy of hydrogen aiming at replacing fossil fuels where electricity is not a possible alternative. But their production would require huge quantities of renewable electricity: not only must hydrogen be produced from electricity with significant energy loss, but making synthetic fuels from hydrogen requires further process steps with even higher energy losses. Hydrogen needs to be combined with CO_2 and the resulting fuel must be processed and purified to make it usable by aircraft engines. CO_2 must be extracted from the atmosphere using "Direct Air Capture" (DAC) at high energy cost due to its dilution. No more than about 10 % of the electricity spent would be converted into thrust to move an aircraft[7].

Using renewable electricity to make e-fuel therefore looks like a crazy idea because energy requirements would be huge, whereas renewable electricity is crucially needed to decarbonise the global economy and can be used with a far higher efficiency in most other applications. For example, electricity powering a battery-electric coach results in an approximate 77% power-to-motion efficiency[8], which is 8x better than if used for an e-fuel powered flight in an aircraft! For the decades to come, the production capacity of renewable electricity will still not be enough to :

- Replace fossil fuel in power plants that supply the electricity grid
- Help satisfy new demand for electricity (cars, heating/cooling, data, etc.)
- Replace today's grey hydrogen (produced from fossil fuels) used for industrial processes e.g. fertiliser production
- Satisfy new demand for hydrogen for trucks, ships, aviation…

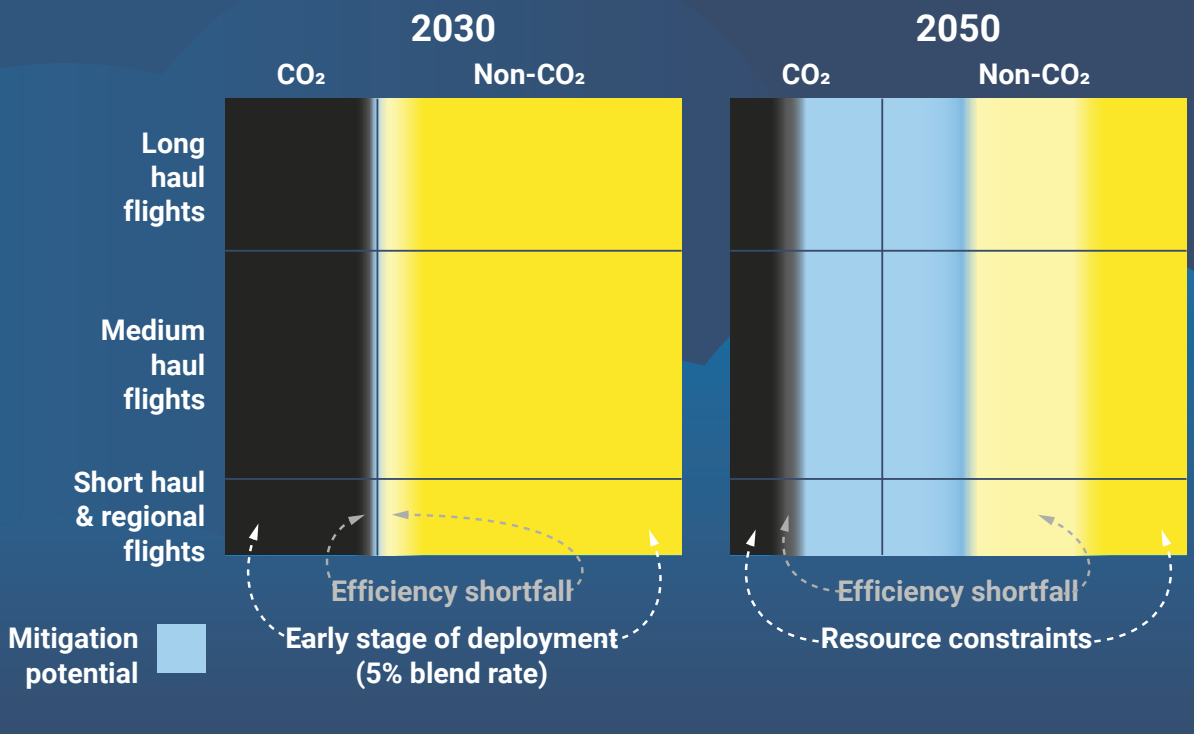
Alternative fuels' potential to mitigate the climate impact of aviation is less than 5% of its total impact in 2030

stay-grounded.org

STAY GROUNDED

It will most probably not exceed 40% in 2050 (in the EU). In the short term, the development of this quite new sector will be slow and not accelerate before the 30s. In the longer term, the reduction of the impact of alternative jet fuels will be constrained by their limited efficiency at reducing non-CO_2 impacts like contrail cirrus and the limited availability of resources (feedstock for biofuels and renewable electricity for e-fuels).

Sources:
Stay Grounded (2020): https://bit.ly/factsheetClimateImpact
CleanSky2&FCH (2020): https://bit.ly/report-hydrogen, p. 16
EU "Fit for 55" roadmap (2021): https://bit.ly/EU-Fit-for-55



In a scenario where 100% of the airliner fleet would use e-fuels in 2050, the resulting electricity demand would be 20% higher than the current total worldwide electricity production and 4.7 times the production of renewable electricity in 2018[9]! As demand for electricity grows so does the risk that renewable electricity supply won't be able to match that demand, which will **increase the risk of using non-renewable** power.

GOVERNMENTS SHOULD NOT SUBSIDISE AVIATION E-FUELS: THE POLLUTER SHOULD PAY

The complex process and the huge energy requirements will result in high costs: e-fuels cost six to nine times the price of kerosene in 2020 and would still cost 2 to 3 times more in 2050[10]. Governments will therefore be asked for subsidies. These **would keep flying artificially cheap** which would result in more air traffic and emissions than if the industry were to pay the costs themselves. Taxpayers, most of whom never or rarely fly, should not be paying for that.

OTHER LESSER KNOWN ISSUES

The industry is facing a dilemma over the production of the CO_2 required: achieving the highest climate impact reduction (60%), would mean extracting diluted CO_2 from the atmosphere at very high energy expense, when concentrated CO_2 is still available in large quantities from industrial exhaust/chimneys (cement, steel, refineries…). However, if CO_2 was to be extracted from factory exhausts, this would just be using fossil fuel a second time and still result in additional emissions ending up in the atmosphere. The climate impact reduction would then drop down to 30%[11].

Another rarely mentioned issue is that the manufacturing process produces a mix of hydrocarbons, of which only 50-70% is suitable for aviation[12]. This means that about 30-50% of the renewable electricity used in the process would be wasted for by-products that could be obtained in more efficient ways or for which there are better alternatives.

E-fuels will long be a precious commodity, rare and expensive, that should not be widely used in the future to replace kerosene in quantities much larger than today if the industry keeps growing.

While the development of new technologies and fuels may be helpful, it cannot be an excuse to delay emissions reductions that are needed NOW to mitigate the climate crisis. The only way to effectively reduce aviation emissions is to reduce air travel. To achieve this, we need effective regulations to limit air traffic.

In our Degrowth of Aviation[13] report, we lay out how a set of measures could lead to a just reduction of aviation. In our Just Transition[14] paper, we present the idea of how a conversion of the aviation industry can guarantee security for the livelihood of workers.

END NOTES & LITERATURE

[1] The Royal Society (2019): https://bit.ly/policy-briefing-e-fuels
[2] European Commission, (2021): https://bit.ly/refuel-EU, Annex I, p. 28
[3] T&E (2021): https://bit.ly/TE-E-kerosene
[4] UNEP (2019): https://bit.ly/UNEP-EmissionGap, p. 15
[5] Stay Grounded (2020): https://bit.ly/factsheetClimateImpact
[6] CleanSky2&FCH (2020): https://bit.ly/report-hydrogen
[7] Ausfeder, F. et al (2017): https://bit.ly/analysis-sektorkopplung
[8] T&E (2020): https://bit.ly/briefing-e-fuels
[9] CleanSky2&FCH (2020): https://bit.ly/report-hydrogen, p. 44
and IEA: https://bit.ly/iea-data-statistics
[10] CleanSky2&FCH (2020): https://bit.ly/report-hydrogen, p. 48
[11] CleanSky2&FCH (2020): https://bit.ly/report-hydrogen, p. 21
[12] Novelli, P. ONERA, (2021): https://bit.ly/decarbonising-aviation, (video), 26'
[13] Stay Grounded (2019): http://bit.ly/DegAvR
[14] Stay Grounded (2021): https://bit.ly/JustTransitionAviation

Neustiftgasse 36
1070 Vienna, Austria
www.stay-grounded.org
info@stay-grounded.org

For donations please visit:
stay-grounded.org/donation/

STAY GROUNDED

Greenwashing Fact Sheet Series

"Greenwashing" is misinformation presented by an organisation in order to mislead others about the environmental impact of its current or future activities.

Globally, the aviation industry plans to triple in size by 2050. If this happens, we could see aviation fuel consumption and therefore greenhouse gas (GHG) emissions double by 2050. Governments, lobbied by the industry, use unrealistic distracting promises of technological solutions to greenwash this growth. They also use economic growth and job arguments to justify subsidies and tax breaks for airports, airlines, manufacturers and fossil fuel companies. In this series of Fact Sheets, we examine these claims and debunk common myths and misconceptions.

6 – Net Zero & Carbon Neutrality

Reaching *"net zero"* targets is currently the central goal set in nearly every climate strategy - be it industry or government. For its part, **the aviation sector has committed to reach net zero CO_2 emissions by 2050**.

According to the IPCC[1], *net zero CO_2 emissions* are achieved when any remaining anthropogenic CO_2 emissions are balanced **globally** by anthropogenic CO_2 removals. This means with the *net zero* concept, some "hard-to-abate" emissions are still allowed, provided that equivalent quantities of CO_2 are removed from the atmosphere. *Net zero CO_2 emissions* are also referred to as *carbon neutrality*. When **all** greenhouse gases are taken into account, this is referred to as *net zero emissions*.

Balancing residual emissions is promised via *Carbon Dioxide Removal*; this is a range of processes that remove CO_2 from the atmosphere in addition to the removal via natural carbon cycle processes. It can be achieved either by increasing biological or geochemical sinks of CO_2 or by using industrial processes to capture CO_2. *Carbon Dioxide Removal* is one of two types of carbon offsets[2] besides credits for *'avoided' emissions*.

WHAT THE AVIATION SECTOR TELLS YOU

Reaching *net zero* will prevent climate breakdown. If we balance CO_2 emissions to *net zero* by 2050, then we'll align with the Paris Agreement goal for global heating not to exceed 1.5 °C.

We have the technology. There are a range of technological options that can be relied upon to provide credible emission pathways towards net zero whilst still allowing air traffic to grow.

Resorting to CO_2 removal will be necessary. We'll not be able to reduce all aviation CO_2 emissions by 2050 and therefore will need to resort to CO_2 removal to reach *net zero*.

Non-CO_2: Not enough data, no action. Effects of non-CO_2 emissions are not well enough understood and quantified to be included in *net zero* plans.

We are addressing the issue. Net zero plans are a means of taking responsibility for climate impacts and mitigation.

WHAT THEY ***DON'T*** TELL YOU

Too slow, too late. All that matters is the cumulative emissions in the atmosphere. So *net zero by 2050* will be irrelevant if aviation's fair share of the global carbon budget for 1.5 °C is exceeded long before 2050.

Technology is unproven and resource intensive. We cannot wait: we need to reduce emissions now, which means decreasing air traffic.

Appropriation of CO_2 removal by aviation would not be equitable. One sector cannot appropriate the limited potential of CO_2 removal to offset its own remaining emissions, thus buying its way out. What we need instead is a fair, global allocation of the remaining carbon budget.

Non-CO_2: Too large to be ignored. The precautionary principle therefore requires that they are also included and reduced.

Our children will pay the price. Corporations and governments use the net zero by 2050 goal to diminish the sense of urgency, disguise inaction today and evade responsibility.

REACHING *NET ZERO* BY 2050 WILL NOT PREVENT CLIMATE BREAKDOWN: IT'S FAR TOO LATE

After an initial unambitious commitment in 2009 to halve its CO_2 emissions in 2050 compared to 2005, the International Air Transport Association (IATA) stepped up its target in October 2021[3], announcing that it was aiming to achieve 'carbon neutrality' by 2050. It claimed it would align aviation with the Paris Agreement's goal of limiting global heating to 1.5 °C and unveiled its plans. As we shall see, this new target remains largely insufficient and only postpones efforts to reduce emissions that should be made much earlier and more massively.

Indeed, **what matters in order to achieve the Paris Agreement objective is not the level of emissions in 2050, but rather the cumulative quantity of greenhouse gases that will be released into the atmosphere over the next 30 years.** The only equitable way to meet the Paris Agreement target is to allocate a fair share of the global carbon budget to aviation, i.e. a fair share of the amount of CO_2 that can still be emitted before the 1.5 °C heating threshold is exceeded and to adjust air traffic to fit within this budget. As this study shows[4], aviation's carbon budget will be exceeded well before 2050 if air traffic does not begin to decline. Technologies proposed to make aviation greener are still uncertain and will take too long to develop and deploy if they ever can be.

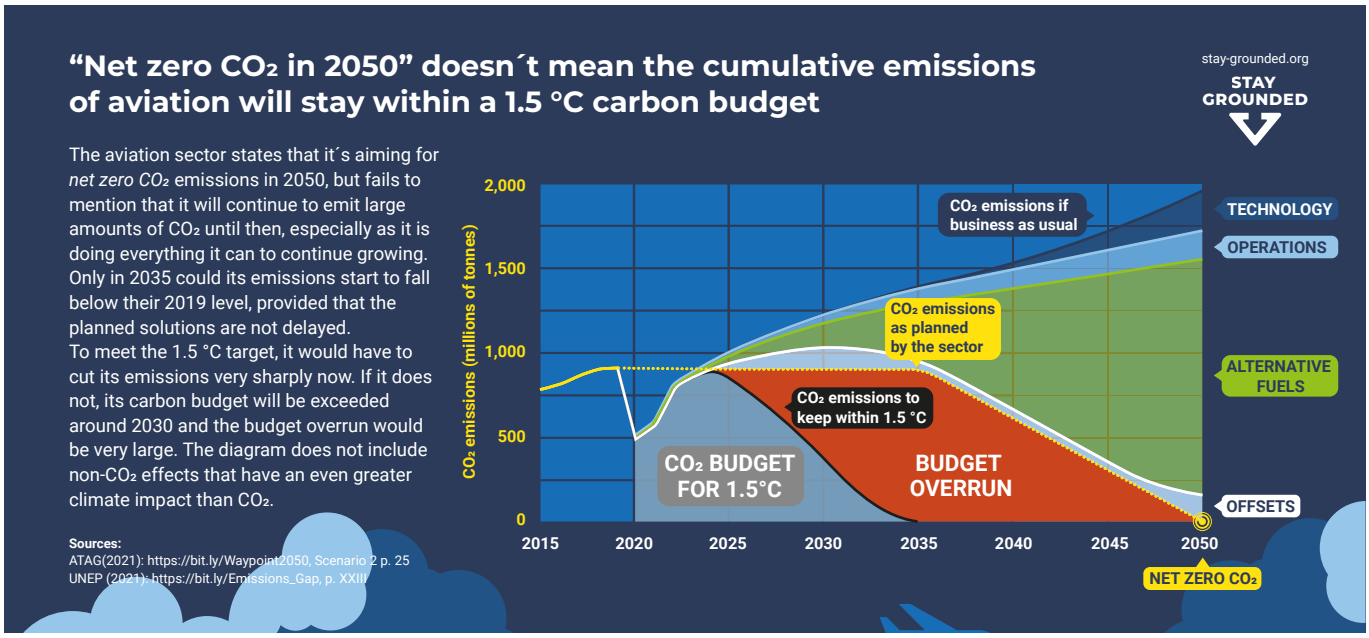
Reaching *net zero* in 2050 may temper the rise in temperature, but cannot keep global heating under the 1.5 °C or even the 2 °C threshold. It would then no longer be enough to aim for net zero, but require negative net emissions and removal of much larger quantities of CO_2 to attempt to salvage a livable climate.

THE TECHNOLOGICAL PROMISES WILL NOT BE KEPT. THEY ARE UNPROVEN AND TOO RESOURCE-INTENSIVE

The sector's strategy is largely based on the promise of technological solutions and it uses these to justify its continued growth. It has a variety of so-called 'sustainability' strategies: improving aircraft and operational efficiency; using alternative fuels with reduced CO_2 emissions; and developing alternative propulsion systems (electric and hydrogen). As we demonstrate in other fact sheets (Fact sheets 1-5), "efficiency improvements" have always resulted in increased emissions and alternative fuels pose too many resource problems to be deployed quickly in the massive quantities required. As for hydrogen and electric aircraft, they are not feasible before 2050 for medium and long-haul flights, which currently account for the majority of aviation (CO_2 and non-CO_2) emissions. So **it's very likely that there will be far more remaining emissions than projected by the sector.**
We cannot therefore rely on technology to respond to the climate emergency. **The only solution to rapidly reduce aviation emissions is to reduce air traffic.**

ONE SECTOR CANNOT APPROPRIATE THE MEANS TO REMOVE CO_2 FROM THE ATMOSPHERE, ESPECIALLY SINCE THEY ARE NOT AVAILABLE OR PROVEN AT SCALE

Despite plans to use alternative fuels and technological innovation, airlines are predicting that they will not be able to completely eliminate CO_2 emissions by 2050 and will need to resort to a variety of means to remove previously emitted CO_2 from the atmosphere. IATA estimates that 19% of the remaining emissions will need to be offset, i.e. 342 million tonnes (Mt)[3]. In addition to the current methods of offsetting, which are mainly based on capturing CO_2 through biomass, there would also be a need to capture CO_2 from the air using industrial processes (Direct Air Carbon Capture and Storage: DACCS).



NET ZERO OR REAL ZERO? OUR ECOSYSTEM IS NOT JUST MATHS

The concept and logic of *net zero* or *carbon neutrality* is in itself problematic and needs a closer look. Particularly from indigenous communities, we see strong resistance against this concept because it supports the scientifically false illusion that it is easily possible to restore the lost balance between the climate and ecosystem through compensation and so-called "nature-based solutions" (NBS). As industrial processes like DACCS have their own problems[6] and are unproven at scale, most net-zero promises still heavily rely on NBS. But while fossil carbon is the result of millions of years of sequestration, the carbon stored in living ecosystems cycles much quicker and cannot be counted as permanent sink to equate to the emissions from fossil carbon. The carbon emitted by a flight will affect the climate for thousands of years. A forest planted as compensation could burn down in 20 years and release the stored carbon. *Net zero* promises are leading to a growth in demand for offsets which leads to further commodification of nature. The diversity of our planet's ecosystems is turned into tradable carbon, often including land grabbing from Indigenous Peoples in the Global South[8]. The NGO CLARA has developed a short guide and indicators to read net zero pledges and unveil the negative impacts and false assumptions behind them[9].

This 342 Mt value is still a lot and very unlikely to be feasible, since the potential for CO_2 removal is limited and will have to be shared with other sectors. Moreover, the very idea that one sector would appropriate (by paying more than others) part of the limited means available to compensate for the emissions it doesn't want to reduce is contrary to the concept of *carbon neutrality*, which can only apply at a global scale[1].

In any case, the land managed by humans is today a net global emitter of carbon, due in particular to deforestation and forest fires. This will remain so for many years before the situation is reversed and biomass becomes a net carbon absorber[5]. Actions to restore or increase biomass must first compensate for its continuing destruction. As for industrial processes, they are only at the demonstration stage and have not yet been proven to be deployable on a large scale. Furthermore, DACCS is a very inefficient use of scarce renewable energy, which can provide far greater emissions reductions if used to power the grid, road transport or heat buildings[6].
Net zero CO_2 by 2050 is an illusion. Too far away from meeting the requirements of the climate emergency and giving the false impression that it's as easy to remove CO_2 from the atmosphere as it is to dump it. This is thermodynamically absurd[7].

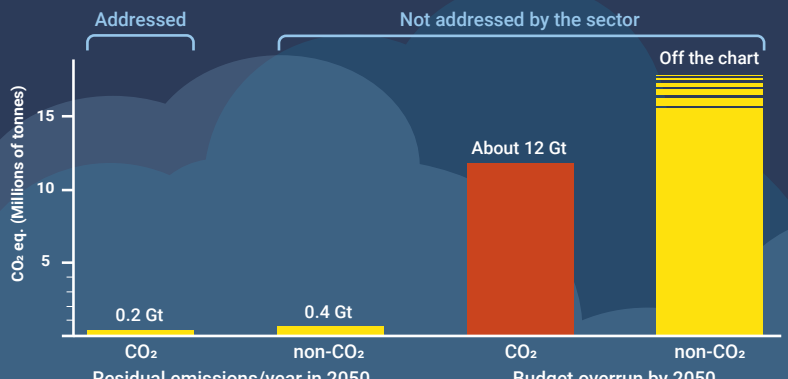
CURRENT AVIATION NET ZERO ROADMAPS ONLY INCLUDE CO_2; THEY MUST ALSO INCLUDE NON-CO_2 IMPACTS

Aircraft generate emissions other than CO_2, mainly NOx and condensation trails (contrails) which, when transformed in the atmosphere, have a climate impact best-estimated to be twice as large as that of CO_2. The total emissions impact of air transport is therefore most likely three times greater than that of CO_2 alone[10].
The aviation sector is using the uncertainty surrounding the quantification of these impacts as a pretext to oppose any regulation, even though promising simple measures are in sight[9]. Furthermore, they are deliberately distracting people from the fact that implementing these measures – as well as reducing air traffic – would massively and rapidly reduce aviation caused heating because non-CO_2 emissions

The sectors' plans for CO_2 removal hugely exceed the potential of biomass or Direct Air Capture

stay-grounded.org
STAY GROUNDED

The amount of CO_2 that the aviation sector plans to remove from the atmosphere would only compensate for the CO_2 emissions that would remain in 2050 (because it would not have taken the means to fully eliminate them). This amount is already quite significant compared to the limited potential of CO_2 removal, which would have to be shared with other sectors. Even worse, this amount is far from enough if we add all the CO_2 that the sector will have emitted before 2050 in excess of its carbon budget, as well as the effects of non-CO_2 emissions.



Sources:
ATAG (2021): https://bit.ly/Waypoint2050, Scenario 2 p. 25. ATAG predicts that aviation will still emit 155 Mt CO_2 in 2050 that will need to be offset, which is lower than the 342 Mt predicted by IATA, but in any case, it's only a small part of the future climate debt of aviation.
UNEP (2021): https://bit.ly/Emissions_Gap, p. XXIII
Stay Grounded (2022): https://bit.ly/factsheetClimateImpact

have a higher global warming potential (GWP) and a much shorter lifetime than CO_2.
Instead of denial, the precautionary principle should be applied, which would mean that the sector should be eliminating both CO_2 and non-CO_2 emissions.

FAR FROM TAKING RESPONSIBILITY, THE AVIATION SECTOR IS USING *NET ZERO* CO_2 AS A WAY TO CONTINUE ITS GROWTH AND POSTPONE ACTION

Even if net zero CO_2 is achieved by 2050, the sector will have emitted far more than it should have in order to avoid exceeding 1.5 °C. It will be leaving all ecosystems and both present and future human generations with a 'carbon debt' that will need to be paid off (if eventually possible) by removing massive amounts of carbon from the atmosphere, while having to cope with increasingly difficult climatic conditions and reduced resources to survive. It's also notable that aviation emissions aren't currently being priced to set aside future money for this debt. Rather, air travellers can effectively emit for free today, and somebody else (future taxpayers) will have to deal with the consequences tomorrow.

According to UN projections[11], **keeping global heating below 1.5 °C would require a 55% reduction in emissions by 2030 and *net zero emissions by 2050*. While the 2030 and 2050 targets are inseparable, the aviation sector is only committed to the more distant one because it refuses to reduce air traffic now,** which is the only way to achieve the 2030 target. It is deceptively buying itself time by suggesting that it still has time to continue business as usual. It doesn't.

THE FAKE CARBON NEUTRALITY OF AIRPORTS

Some airports claim carbon neutrality but this is a fallacy because it only concerns a very small part of their emissions. The emissions included are confined to Scope 1 (emissions from airport controlled sources, e.g. buildings) and Scope 2 (emissions from energy purchased by the airport).

88 airports around the world claim to be *carbon neutral*. This label has been awarded to them by ACA[12], an organisation belonging to the Airports Council International (ACI). It means that these airports have taken steps to reduce and/or offset (by purchasing carbon credits) the emissions over which they consider themselves to have control. Some are for example building solar farms on their premises or planting trees and presenting that as an offset. They see no obligation to reduce (or offset) Scope 3 'indirect' emissions, because they are considered not under the airport's direct control, although they account for more than 99% of total emissions related to airports[13,14]. Most of these emissions are from flights and from ground transport used by passengers and airport workers travelling to/from an airport.

While the development of new technologies and fuels may be helpful, it cannot be an excuse to delay emissions reductions that are needed NOW to mitigate the climate crisis. The only way to effectively reduce aviation emissions is to reduce air travel. To achieve this, we need effective regulations to limit air traffic.

In our Degrowth of Aviation[15] report, we lay out how a set of measures could lead to a just reduction of aviation. In our Just Transition[16] paper, we present the idea of how a conversion of the aviation industry can guarantee security for the livelihood of workers.

END NOTES & LITERATURE

[1] IPCC glossary: https://bit.ly/ipccglo
[2] Stay Grounded (2017): https://bit.ly/GreenFlyR, p. 9-10
[3] IATA (2021): https://bit.ly/IATA2021
[4] ISAE-SupAero (2022): https://bit.ly/ISAE2022, p. 158-159
[5] IPCC AR6 WG3 SPM (2021): https://bit.ly/IPCC_AR6WG3, p. 6
[6] The CCC (2020): https://bit.ly/CCCELEC, p. 11
[7] Recharge (2021): https://bit.ly/Recharge_DAC
[8] FoE International (2021): https://bit.ly/chasing_unicorns, p. 18
[9] CLARA (2022): https://bit.ly/CLARA_NetZero
[10] Stay Grounded (2022): https://bit.ly/factsheetClimateImpact
[11] UNEP (2021): https://bit.ly/Emissions_Gap, p. XXIII
[12] ACA: https://bit.ly/ACA_neutrality. 88 airports had achieved the Neutrality, Transformation or Transition level in September 2022.
[13] ADP (2018): https://bit.ly/ADP_ACA, p. 22-30
[14] DGAC (2020): https://bit.ly/DGAC_2019, p. 7, 9
[15] Stay Grounded (2019): http://bit.ly/DegAvR
[16] Stay Grounded (2021): https://bit.ly/JustTransitionAviation

Neustiftgasse 36
1070 Vienna, Austria
www.stay-grounded.org
info@stay-grounded.org

For donations please visit:
stay-grounded.org/donation/

STAY GROUNDED