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Attention: Department of Infrastructure, Transport, Regional Development, Communication and the Arts

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Australian Aviation Green paper 2023

INTRODUCTION

Flight Free Australia welcomes this opportunity to submit feedback on the Australian Aviation Green Paper.

We campaign to raise awareness of aviation's contribution to global heating on a planet that's already dangerously hot, but getting hotter and to encourage Australians to reduce aviation greenhouse gas emissions by pledging to fly less often.

Our major concern with the Green Paper is that it presents a future for Australian aviation at odds with the priority of avoiding 2ºC of warming.

The Green paper seeks to maximise aviation's contribution to net zero. But that goal – net zero emissions by 2050 – will probably not stop warming of 2ºC, nor its catastrophic consequences.

In our answer to the Green Paper's Chapter 2 question "Are there any other trends the Australian Government could add to help guide the future of the sector?" we describe the global warming trend.

Further, we will explain why the Green Paper's two main "net zero" enablers – Sustainable Aviation Fuels and carbon offsets – will fail to reduce ongoing aviation emissions and fail to enable the use of carbon drawdown to cool an already overheated planet.

The Australian Aviation White Paper must reframe the future of Australian aviation. Neither Net Zero 2050, nor Jet Zero, nor the Transport Net Zero Roadmap, nor the possible emissions reduction pathway scoped by the Green Paper are commensurate responses to our climate predicament.

Rapid aviation degrowth is the only possible way to maximise aviation's contribution to avoiding 2+ºC.

The White Paper needs to inform the flying public of the risk aviation's real contribution to warming presents to a safe future, and map and implement – as only a national government can – a pathway to an emissions free aviation sector.

Any reduction in emissions from proposals the Green Paper puts forward will be marginal and nullified if Australian aviation grows as the Green Paper projects.

This following submission responds to questions the Green Paper asks in Chapters 2 and Chapter 5.

Specifically, the questions in Chapter 2 Likely future directions out to 2050: *What emphasis should the Australian Government place on these trends to help guide the future of the sector?* and *Are there any other trends the Australian Government could add?*

And the questions in Chapter 5 Maximising aviation's contribution to net zero: *Given there are a number of measures that industry and Government could pursue to help achieve net zero by 2050 in aviation, are there specific measures that more emphasis and support should be given to?*

And *What should be included in relation to aviation in the Australian Government's Transport and Infrastructure Net Zero Roadmap and Action Plan (including for sectors such as GA and airports)?*

Chapter question responses

CHAPTER 2
LIKELY FUTURE DIRECTIONS OUT TO 2050

The Australian Government's intended key objectives for the Aviation White Paper are maintaining Australia's high standards of safety and security; minimising the environmental impacts of aircraft operations including aircraft noise and emissions, and achieving our national commitment to net zero by 2050; promoting sustainable competition, workforce and productivity growth; and ensuring appropriate consumer protection and access arrangements for passengers and other aircraft users.

Question: ***What emphasis should the Australian Government place on these trends to help guide the future of the sector? Are there any other trends the Australian Government could add?***

The most significant trend, to be added to those the Green Paper is using to help guide the future of the sector, is that of growing global emissions and warming and their earlier than predicted impacts. This trend has implications for the achievability of the Australian Government's and the Aviation White Paper's net zero by 2050 emissions reduction objective. A growing body of evidence and analysis reveals an increasing risk that, "net zero by 2050" is unlikely to prevent warming to 2°C and beyond[1] .

Growing global emissions and warming

Emissions are growing[2]. Although Australia signed the Paris Agreement which committed to keep global heating below 1.5°C, this threshold will likely now be broken within two or three years[3]. Eminent climate scientist James Hansen warns that it is now close to impossible for the atmosphere to stay under 1.5°C: "The 1.5°C target certainly will be exceeded, and the world will almost certainly blow through the 2°C ceiling"[4] . This conclusion is supported by other climate scientists, including Professor Hans Joachim Schellnhuber, Prof. Kevin Anderson, the late Prof Will Steffen and Sir David King[5]. Climate Tracker analysis has the planet heading to 2.4°C on current policies[6].

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1 IPCC Fifth Assessment Report (https://www.ipcc.ch/assessment-report/ar5/) and the 2018 Special Report on Global Warming of 1.5°C (https://www.ipcc.ch/sr15/) promote NZ2050 scenarios with a 50% or 66% chance of staying below the target, or one-in-two or one-in-three chances of failure, and a 10% chance of exceeding 3°C of warming (https://press.princeton.edu/books/paperback/9780691171326/climate-shock#).

2 https://www.noaa.gov/news-release/greenhouse-gases-continued-to-increase-rapidly-in-2022

3 https://www.nature.com/articles/s41558-023-01848-5

4 https://justcollapseorg.files.wordpress.com/2023/05/global-warming-in-the-pipeline.pdf

5 https://www.breakthroughonline.org.au/_files/ugd/148cb0_a0d7c18a1bf64e698a9c8c8f18a42889.pdf
https://www.youtube.com/watch?v=0_FtS_HNbkc
https://www.resilience.org/stories/2020-06-08/collapse-of-civilisation-is-the-most-likely-outcome-top-climate-scientists/
https://privatebank.barclays.com/ideas/2022/april/2022-sustainable-portfolio-management-report/sir-david-king-climate-crisis-actions-needed-now/

6 https://climateactiontracker.org/climate-target-update-tracker-2022/
https://www.nature.com/articles/s41558-023-01848-5

Earlier than predicted impacts

The IPCC Working Group I report "Climate change widespread, rapid, and intensifying" notes warming is increasing faster than modelled and aligning with "extreme/unlikely" IPCC scenarios[7]. In 2023 alone Bangkok, Hong Kong, and Athens have seen their streets run with water while Derna in Libya has been devastated as its infrastructure could not cope with the extreme rain. The island of Rhodes, the Canadian forests and Maui have been consumed by fire. Meanwhile, "normal" recent anthropocene linear increases in sea temperatures, heat records and Antarctic ice melt, have all been off the charts. Prof. Julian Allwood has identified societal collapse, mass movement of people unable to feed themselves, flooding of major cities and agricultural land, and war, as probable consequences of upcoming climate impacts[8].

Growing emissions are already directly impacting aviation industry operations. Severe wind turbulence is injuring passengers inflight, extreme heat is grounding more flights and forcing airlines to limit passengers and fuel loads[9].

Implications for "Net zero 2050"

There have been recent calls from economists, from scientists, from activists and from non-governmental organisations for greater urgency by the Australian Government in developing a roadmap for, and implementing a rapid transition to, faster trajectory to zero emissions. Institutions such as the UN, and Australia's the Climate Council, call for emissions cuts of 75% by 2030 and net zero emissions by 2035. Professional organisations including ATSE (the Australian Academy of Technological Sciences & Engineering) have also called for the net zero timescale to be 2035, not 2050[10]. Even commercial organisations such as Bank Australia have a Net Zero by 2035 working plan. Non-governmental organisations such as the Climate Council have already set up working groups calculating the required reduction in greenhouse emissions across all sectors for emergency implementation.

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7 https://www.ipcc.ch/2021/08/09/ar6-wg1-20210809-pr/#:~:text=The%20changes%20we%20experience%20will,seasons%20and%20shorter%20cold%20seasons

8 https://www.churchtimes.co.uk/articles/2022/16-september/features/features/real-zero-four-awkward-truths-about-reaching-net-zero

9 https://www.theguardian.com/australia-news/2023/jul/01/strong-winds-cause-travel-chaos-in-sydney-as-passengers-hospitalised-after-severe-turbulence-on-haiwaiian-flight
https://www.bloomberg.com/news/articles/2023-07-14/extreme-heat-can-cause-flight-delays-here-s-why-and-what-to-do-about-it
https://gulfnews.com/business/aviation/delta-passengers-stuck-on-plane-in-extreme-heat-prompting-us-investigation-1.97116385
https://www.theguardian.com/us-news/2023/jul/23/us-airlines-heat-delays-limit-passengers-fuel
https://time.com/6296849/extreme-heat-planes-fuel/

10 https://www.climaterescue.net

We know, from the IPCC, that this "net Zero 2050" emissions reduction pathway has a less than 50:50 chance of keeping warming under 2°C[11] . And a one in ten chance of triggering climate system feedbacks that push global boiling to a catastrophic 4°C[12]. A cautious, risk-based assessment would conclude that pursuing the Australian Government's proposed emissions reduction pathway for aviation – when it could result in the collapse of society as we know it – is extremely high-risk.

Other trends the Australian Government should respond to in mapping the future of the sector include the following.

Climate crisis as a systemic threat multiplier

There is a need to account for the climate crisis as a systemic threat multiplier. From a systems perspective, the aviation industry has international economy-wide interactions and dependencies. Environmental climate impacts such as crop failures, natural disasters, and weather pattern shifts will disrupt markets and societies with direct and indirect consequences for the operation and development of aviation. These consequences are implicit in the pursuit of a net zero 2050 flight path, and risk derailing the other expected trends identified in the Green paper: demand-side drivers, supply-side drivers, sustainability drivers, emerging aviation technologies and workforce skills and training requirements.

Biosphere overshoot

A biofuel SAF led aviation future does not take into account the already evident biosphere overshoot and the further risk to nature it presents. Ecological economists report that by growing our way through the challenge of climate change, we will overshoot the planet's resource limits[13]. As such, fossil fuel industries like commercial aviation, currently doubling in size every 15 years, need to be selectively "de-grown" because reducing carbon emissions is "only one of many intersecting struggles we face"[14]. Alternative aviation fuel "solutions" all come with negative implications for water, food security, and biodiversity.

The Australian Government's Aviation White Paper needs to incorporate a brutally honest assessment of the global warming trend when mapping aviation's future. A risk-based assessment would likely conclude that a duty of care to its citizens necessitates abandoning a "net zero by 2050" pathway for aviation emissions.

The aviation industry must radically & rapidly downsize to maximise the reduction of its greenhouse gas emissions to near zero emissions by 2030. We list possible ways in which this may be achieved in our response to the following Chapter 5 questions.

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11 For a 50% likelihood of limiting global warming to 1.5°C, emissions from 2020 need to be limited to only 500 Gt CO2 (Report of Working Group-III (WG-III) to the 6th Assessment cycle (AR6) of the Intergovernmental Panel on Climate Change, 2022 https://www.ipcc.ch/report/ar6/syr/downloads/report/IPCC_AR6_SYR_SPM.pdf yet only 100 Gt CO2 remained by 2022. and for a 67% likelihood of limiting warming to 2°C emissions need to be limited to 1150 GtCO2 yet two-thirds had been emitted by 2022 (https://osf.io/ge92t/)

12 https://www.realclimate.org/index.php/archives/2023/07/what-is-happening-in-the-atlantic-ocean-to-the-amoc/

13 https://www.nature.com/articles/s41586-023-06083-8

14 Jason Hickel, Less is More: How Degrowth Will Save the World (https://www.jasonhickel.org/less-is-more)

CHAPTER 5
MAXIMISING AVIATION'S CONTRIBUTION TO NET ZERO

The Australian Government is determined to work with industry to ensure a strong and sustainable aviation sector that supports emissions reduction targets on the path to net zero by 2050, while growing jobs and innovation. The Australian Government is clear that all emitters in the aviation industry will need to contribute to net zero commitments.

Question: ***Given there are a number of measures that industry and Government could pursue to help achieve net zero by 2050 in aviation, are there specific measures that more emphasis and support should be given to?***

The Green Paper states that "Aviation is a 'hard to abate' sector in the global push to reach net zero. However, there are a number of ways to reduce net aviation emissions including efficiency gains, new propulsion technologies, high-quality carbon offsets and sustainable aviation fuels (SAF)."

However, at no point does the paper state the actual extent to which aviation can "contribute to Net Zero". The extent being promoted by industry to government is small, and represents their inclination to maintain industry growth rather than their opportunity to transform into climate safe, responsible entities. We contend that the ways listed in the Green Paper to reduce emissions are not exhaustive and ignores other options which would not allow for expansion of the industry.

Aviation emissions degrowth is vital because climate safe atmospheric carbon levels are being breached. Currently average Australians are responsible for a huge 0.88 tonnes of carbon emissions from aviation per year[15] while non-CO2 emissions mean the warming from this is considered to be 3 times that at 2.64 tonnes of CO2-e. By Oxfam's calculation, to have constrained warming to 1.5°C every person on Earth would have needed to emit an average of just 2.3 tons of CO2 per year from all sources by 2030 – roughly half the average footprint of every person on Earth today.[16]

The table[17] below presents IPCC[18] carbon budgets for even a 50% chance of avoiding catastrophic warming.

Approximate global warming relative to 1850–1900 until temperature limit *(°C)**(1)*	Additional global warming relative to 2010–2019 until temperature limit *(°C)*	Estimated remaining carbon budgets from the beginning of 2020 *($GtCO_2$)*				
		Likelihood of limiting global warming to temperature limit(2)*				
		17%	*33%*	*50%*	*67%*	*83%*
1.5	0.43	900	650	500	400	300
1.7	0.63	1450	1050	850	700	550
2.0	0.93	2300	1700	1350	1150	900

15 https://www.carbonbrief.org/emissions-from-chinese-aviation-could-quadruple-by-2050/

16 https://www.oxfam.org/en/press-releases/carbon-emissions-richest-1-set-be-30-times-15degc-limit-2030#

17 https://www.nature.com/articles/ngeo3031

18 IPCC Sixth assessment (AR6) Working Group 1 (WG1) report

This data has been overtaken by more recent research, with changes in heating and warming data acting to decrease the expected carbon budget. Work on emission budgets and pathways consistent with limiting warming to a long term average of 1.5°C showed that "strengthening near-term emissions reductions would hedge against a high climate response or subsequent reduction rates proving economically, technically or politically unfeasible."[19] A stronger response in aviation policy is required. In considering this response, policy makers must consider Professor Michael Mann's statement: "... it's a question of how bad we're willing to let it get," he says. "1.5°C is already really bad but 3°C is potentially civilisation-ending bad."[20]

We need to prioritise government policy supports. Switching aviation fuels cannot significantly reduce warming, but what limited production it can offer must be prioritised, for example a national reserve of fuel for firefighting is essential. Sustainability is not possible beyond this.

The following critique is of the measures (so-called "SAF" plus offsets) nominated in the Green Paper.

A) Current "offsets" approach not effective

Our two major airlines – Qantas and Virgin Australia – are required to reduce their emissions intensity by 4.9 per cent per year to 2030. (footnote 5) However, currently the method being used for this is offsets, and offsets do not reduce emissions[21]. In fact, offsets may have little benefit to emission reductions that would not be otherwise achieved by government regulation. Without additionality, our climate prognosis does not improve.

The Green Paper has recognised the problem with offsets. "Under the Safeguard Mechanism reforms, facilities using offsets equal to 30 per cent or more of their baseline will need to provide a report detailing why they are not performing more on-site abatement. This may drive increased uptake of SAF and other decarbonisation measures where available." In the context of the high risk of catastrophic climate impacts, and slow progress in reduction in other industry sectors, reporting and accounting of offsets as emissions reductions is misleading. Actual reductions in fossil fuel use, mandated by the government in its regulatory role, would put the onus back on to industry to achieve this.

B) Alternative aviation fuels are not sustainable

We suggest that there is no evidence that so-called "sustainable" aviation fuels are sustainable by the definition "safely able to be maintained forever". The government needs to de-link its response from techno-solutions that ignore the limitations on these and take alternative proven approaches available as a regulator and guardian of the public interest. We address this later.

C) Measures are not urgent and rollout occurs over decades beyond a safe reduction timescale.

The CSIRO/Boeing report, "Sustainable Aviation Fuels Roadmap" (sic) and the Australian Jet Council report that "Australia is currently sitting on enough resources to produce almost five billion litres of SAF by 2025 [which] could supply nearly 60% of jet fuel demand projected for that year." Sustainable Aviation Fuels (SAF) is able to be blended with Conventional Jet Fuel (CJF) in ratios of up to 50% in current aircraft. The eventual rollout of the entire strategy relies on massive fleet replacement of new aircraft being produced. This does not match the need for urgency.

19 https://www.ipcc.ch/sr15/chapter/chapter-2/

20 Our Fragile Moment, https://www.theguardian.com/environment/2023/sep/30/human-civilisation-climate-scientist-prof-michael-mann

21 www.theguardian.com/environment/2023/sep/19/do-carbon-credit-reduce-emissions-greenhouse-gases

D) Measured benefits cannot overcome the massive problem of non-CO2

While biofuels can contribute to reducing non-CO2 emissions, Vogt et all found that they will only be partially reduced[22]. Recent scientific evidence (UK Jet Zero Strategy) suggests that "whilst non-CO2 emissions can have both warming and cooling effects, the net *warming* rate is likely to be around three times that of CO2." So even if fossil fuels were entirely replaced by biofuels, significant emissions would still be generated.

E) Sustainability cannot be achieved when biofuels compete with food production

Depending on the production process, and the time horizon of analysis, the Green paper staes that "Biofuels can emit more greenhouse gases than some fossil fuels on an energy-equivalent basis. Crop-based feedstocks may also compete with food production, potentially increasing the cost of essential grains and cooking oils." As the production of SAF in the near term is largely focussed on canola and sugar cane products, there is certainly a danger that food stuffs are taken from the hungry to supply the aviation industry and that land on which food could be grown is repurposed to supply fuel.

F) Impact of massive aviation biofuel demand on other sectors

For governments, overseeing all emission producing sectors, exceptionalism for aviation is inappropriate. Governments will need to use biomass produced in Australia to feed a growing local and global population whilst also decarbonising the power, heating, agriculture (e.g. replacing fossil fuel fertilisers) and transport sectors. There is no climate justice benefit to government expenditure on this small sector of the public, so it will not be able to command wide public support from competing interests.

G) No record of successful reduction in warming from aviation evidenced

Even should the minimal benefit of using biofuels over fossil fuels be supported, we know that the aviation industry has been talking about greener flying for decades without acting on it. Aviation biofuel scale up has been promised by the industry for more than a decade but currently less than 1% of jet fuel is biofuel[23]. Meanwhile, the doubling of flying every 15 years has seen efficiency gains cancelled out by increases in traffic.

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22 Vogt, C et al (2021): https://bit.ly/biofuels-nonco2, p. 1

23 https://stay-grounded.org/wp-content/uploads/2021/08/SG_factsheet_8-21_Biofuels_print_Lay02.pdf

H) Biofuels are themselves not emissions free.

In production of, for instance, the massive fossil use in producing fertilisers, transportation and so forth, biofuels are not emissions free (before they are burned). As IATA itself notes, "simply using SAF does not necessarily reduce overall carbon emissions". Aviation and Climate analyst Ryan Kats-Rosense states that a "Well-to-Wake Lifecycle GHG Assessment by the ICCT shows that currently only ONE type of SAF is truly Carbon Neutral: SAFs made from municipal Solid Waste without any Plastics" [24].

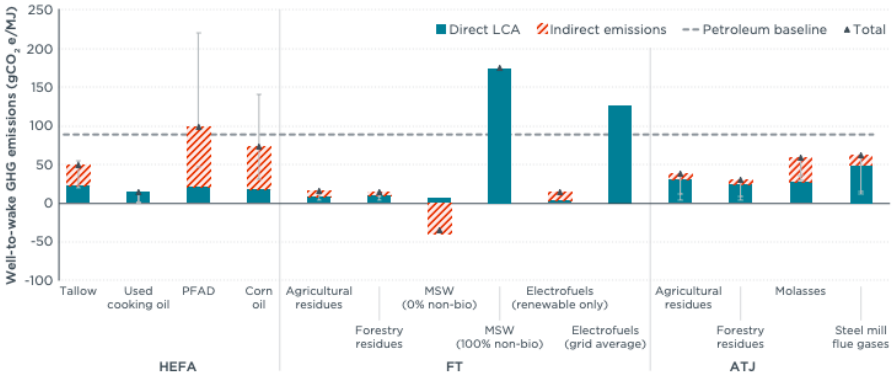

Figure 7: Well-to-wake GHG emissions for SAFs made from noncrop feedstocks relative to petroleum jet fuel baseline. The error bars on this figure reflect the range of possible displacement emissions taking into account the low and high ends of the ranges estimated by Malins (2017) and Searle et al. (2017) for relevant feedstocks.

I) Expense of non-fossil fuels and inability of industry to finance

Non-fossil fuels are two to four times more expensive than current fuels[25]. Virgin Australia chief executive Jayne Hrdlicka is reported on 7 November, 2021 as saying "We need government support to ensure that the seed capital that's needed, the funding to get up to scale, is there and available"[26]. Australia must not get further into the business of taxpayer subsidies for polluting industries like aviation. Every year we provide approximately $1 billion in subsidies to aviation that grounded transport does not receive. We cannot extend that by becoming a pillager of food production as fuel producer, when the incremental benefit of this switch may be tiny, and the cost to taxpayers massive.

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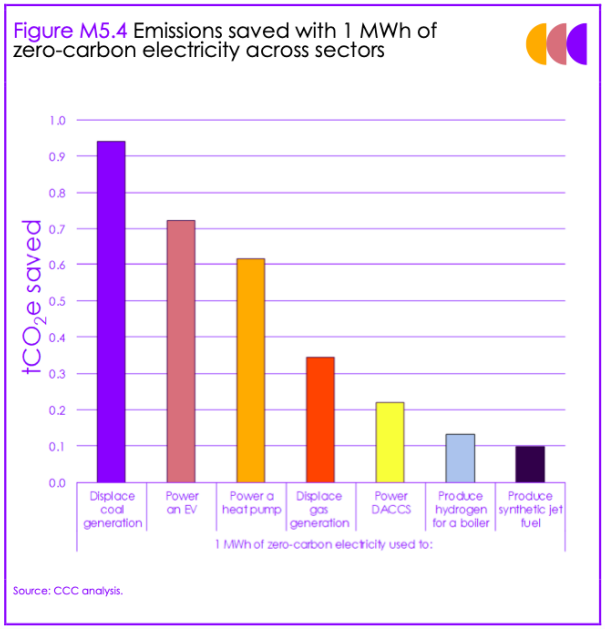
24 Figure from: https://theicct.org/wp-content/uploads/2021/06/Alt-aviation-fuel-sustainability-mar2021.pdf

25 https://www.resourcewise.com/environmental-blog/sustainable-aviation-fuels-frequently-asked-questions-and-answers#:~:text=Low%2Dcarbon%20SAF%20is%20approximately,add%20significant%20cost%20for%20airlines.

26 https://www.afr.com/companies/transport/virgin-plans-to-meet-net-zero-emissions-by-2050-20211104-p5960n#:~:text="We%20need%20government%20support%20to,investment%20cycle%2C"%20she%20said.

J) No analysis of atmospheric benefits from alternative land use changes or of other uses for renewable energy

In the CSIRO/Boeing report, there was no analysis of the climate mitigation benefit of a switch to biofuels for aviation versus the needs of other transport sectors, nor indeed other carbon reduction methods which are considerably more affordable as noted by the UK Climate Change Commission[27].



The opportunity cost loss of not being able to permanently carbon farm on sugar cane and canola monocultures, or of rewilding land that is currently focussed on cropping, has not been calculated, or if it has, it has been left out of this report. No opportunity cost calculus has been presented to show the atmospheric benefit of investing in biofuels versus carbon farming on these lands – the simpler, faster and more direct way to increase carbon sequestration.

K) No global possibility of a rollout of an aviation biofuel industry

Countries such as Australia and Brazil, with massive agriculture industries and sufficient land and water could potentially create an aviation biofuel industry, but many others, such as those in Asia, would be left out of this solution. So how will bio-fuelled flights Hong Kong or Singapore refuel at their destination?

The SAF roadmap in summary

Changing to a biofueled aviation industry would:

- Require massive investment in refineries, planes and airports which airlines refuse to accept, and would therefore be extremely costly to the taxpayer
- In the current decade, critical to driving emissions down, the industry would only be able to operate with a minimal numbers of planes and require massive future input into construction
- Provide a maximum indicative benefit in reducing warming from in air combustion with the current 50:50 blending, but it would be much lower taking into account non-CO2 factors.
- Ultimately rely on non-solutions such as offsets for the majority of benefits.
- All benefits would be overwhelmed by predicted growth in flights

So huge taxpayers cost/minimal climate benefit is the picture. With a 50% increase in flights projected between now and 2030, and most biofuels being far from fossil fuel free, is it possible that this plan would in fact result in no net reduction in warming from aviation in 2030?

27 https://www.theccc.org.uk/wp-content/uploads/2020/12/Sector-summary-Electricity-generation.pdf

By removing offset accounting from the scenario, and insisting on caps on kerosene usage across the economy, emissions will come down through reduced flights. Meanwhile, if industry can offer a sustainable aviation fuel option to Australia, this must be utilised for emergency flights first to deal with the problems this industry's previous emissions have caused, then be assessed if there is any room for further flying beyond this. Meanwhile we must boost our environment protection law to ensure that land use for food production is not excessively dominated by the biofuel industry, regulating strongly against monoculture and for carbon sinks and rewilding.

The biggest problem in this policy framework is that the maximum benefits of the new approaches (offsets, biofuels and e-fuels) amount to only half of the carbon emissions listed in the most ambitious scenario in the LEK consulting report informing the Green Paper, yet the growth of aviation at 4% a year will itself outweigh these efficiency gains and aviation will remain a growing source of warming.

There are positive measures that could reduce aviation and do not rely on technology that will arrive too late. We summarise these in our next answer on the Transportation Roadmap.

CHAPTER 5
MAXIMISING AVIATION'S CONTRIBUTION TO NET ZERO

Question*: What should be included in relation to aviation in the Australian Government's Transport and Infrastructure Net Zero Roadmap and Action Plan (including for sectors such as GA and airports)?*

The recent paper "How to make climate-neutral aviation fly" neatly summarises both the possibilities, and the predicament, that we face attempting to contain greenhouse gas emissions produced by aviation.

"In summary, if aviation growth is sustained, fully mitigating the climate impacts caused by the European aviation sector this coming century through offsetting, and the adoption of syn-jet fuel, it ***will simultaneously require CDR and significant amounts of energy, natural and financial resources****—despite*

(i) avoiding flight-CO2 emissions of fossil origin by using synthetic jet fuel,

(ii) technical and economic improvements in aircraft and fuel production,

(iii) decarbonized energy supply and

(iv) considering lower bound levels for non-CO2 effects.

Thus, ***from a physical standpoint, reducing air-traffic demand is a good short-to mid-term solution****. It drastically reduces the scale of the environmental and economic effort needed to limit the impact of aviation on the climate. Doing so gives society time to develop other, possibly longer-term, sustainable solutions (e.g., navigational avoidance, hydrogen-powered and battery-electric aircraft, and other CDR options), which may be combined with the ones addressed in our work."*[28]

In answering the previous question we established that the measures the Green Paper proposes are insufficient to meet the challenge of the climate crisis. In now proposing an efficacious response we are guided by Professor Sir David King, former UK Government's Chief scientific adviser cited in Climate Reality Check 2021[29] saying "We have to move rapidly, what we do over the next three to four years, I believe, is going to determine the future of humanity." A commensurate response to our climate predicament must see simultaneous sustained reductions in fossil fuel use, removal of atmospheric carbon (drawdown) and repair (active cooling).

One way forward: a "Cap and Adapt" policy, regulating caps in fossil fuel use to which industry must adapt

Regardless of the model, we must ensure that governments have rapid emissions reductions at the centre of their aviation policy and account for all emissions, including international emissions. Capped limits that reduce annually for direct greenhouse gas emissions from Australian aviation must be monitored.

The safeguard mechanism is not a safeguard so long as it relies on discredited offsets. We cannot agree with mandating so-called SAF as each alternative fuel technology has so many problems, which we detailed in our answer to the previous question, but primarily – they cannot provide significant reductions in warming from aviation. The plan we propose, which goes beyond the "Safeguard mechanism", is a plan to cap the amount of aviation fuel in circulation and mandate this cap to reduce over time.

28 Sacchi, R., Becattini, V., Gabrielli, P. et al. How to make climate-neutral aviation fly. Nat Commun 14, 3989 (2023). https://doi.org/10.1038/s41467-023-39749-y

29 Climate Reality Check 2021, https://www.breakthroughonline.org.au/specialfeatures

Based on work by Larry Edwards, a Cap and Adapt policy could be implemented nationwide, but is particularly valuable in hard to mitigate sectors like aviation.[30] A hard cap on fossil fuel use, particularly one which reduces over the next seven years, is the safest method of transitioning aviation away from fossil fuel dependency. How the industry adapts to this can be left to the aviation and fuel industry, but this method mandates that it be steered by industry, whether it wishes to or not.

Pollution charges can be a primary way to significantly alter the current emission trajectory. Another variant of this "Cap and Adapt" approach would be a *polluter pays* principle that goes across all users of kerosene. By increasing the cost of kerosene for every unit burnt over a cap, we reduce pollution. Currently, subsidies and taxation incentives are promoting the most polluting transport sectors. Pollution charges should account for their full climate forcing, including non-CO2 effects. We propose government support for industries currently relying on cheap aviation be reinvested in local communities rather than, for instance, encouraging through subsidies FIFO working styles or industries reliant on high foreign visitation.

Australia should advocate for a Cap and Adapt policy at an international level, and could also create a border adjustment which does not allow 100% fossil fuelled planes to enter our air space. This would operate like the nuclear free South Pacific embargo, making clear that the Pacific is endangered by the industry which connects us and sending a signal that aviation must return to much lower levels.

The aviation industry will adapt and shrink to a sustainable level on this policy. This is the only sense in which aviation and sustainability can be used in the same sentence. We see that flights have to be reduced at emergency speed and that this has to happen urgently in light of the climactic situation. We trust that the government will do this in such a way that emergency flights are protected.

Additional aviation emissions reduction approaches

Low-carbon fuel standards.
The Green Paper indicates that "Stakeholder feedback has included the suggestion that the Government considers the introduction of a low-carbon fuel standard. Unlike volumetric mandates, low-carbon fuel standards are performance standards that mandate a specific reduction in the carbon intensity of the average fuel mix over time. Given Australia is dependent on different liquid fuels across multiple sectors, a low-carbon fuel standard will need to be considered in a broader process, outside the aviation specific Green and White Papers."

If a carbon fuel standard were to be adopted it would need to mandate annual average fuel mix carbon intensity reductions to near zero.

Mandating use of SAF
As detailed above mandating the use of SAF, won't lead to emissions reductions of any significance.

As the Green Paper notes: "The RefuelEU Initiative, starting in 2025, stipulates fuel suppliers are obligated to blend 2% into the jet fuel supply (increasing incrementally to 63% by 2050)." This initiative's minimum 63% GHG reduction for non-food or animal feed-based biofuel feedstocks, compares to the CORSIA's SAF required "minimum of 10% net GHG emissions reduction compared to fossil jet fuel baseline". But, because taking CO2 out of the atmosphere to make fuel, only to put it back in when burnt, does not reduce current levels of atmospheric CO2, neither mandate will deliver levels of emissions reductions commensurate with that needed to avoid catastrophic warming.

30 https://www.researchgate.net/publication/344333610_Cap_and_Adapt_Failsafe_Policy_for_the_Climate_Emergency

End the exceptionalism of aviation, and make it pay its fair share
Aviation traditionally doubles in size every 15 years, hence cancelling out all emission reductions made by more fuel-efficient planes. Therefore, we need strict limits on how the government invests in these industries as it is like trying to fill an endless bucket. An incentive for polluters to invest in renewable aviation is required. For instance, the tax on fossil aviation fuel should be equalised with ground transport as the present tax is approximately 10 times lower. Petrol/diesel excise is counted at a rate of $0.46 per litre, while fuel for domestic aviation is $0.03556 per litre, and international aviation fuel is not taxed[31]. The Australia Institute calculates the concessional rate of excise levied on aviation gasoline and aviation turbine fuel at $1.19 billion in 2022/23 . In effect, the current arrangements are a reverse subsidy of rich and middle class frequent flyers, and a big subsidy to high carbon intensity travel such as, for example, that in the UK, where 70% of UK flights are taken by 15% of people[32].

End incentives for aviation and air travel which discriminate against non-flyers
While this measure will affect all flyers, it could be combined with a levy on frequent flyers which would target the 1% of people (globally) who create 50% of emissions. Further measures could target the highest tiers of frequent flyers which are required to send 27 tonnes of CO2e warming[33] into the atmosphere to retain this status, a level 10 times the sustainable level of average emissions by humans for a safe climate[34].

Target flight demand reductions
Finally, measures to reduce demand will support industry in this regard as less demand will lead to less polluting services being delivered. According to the IPCC:

The indicative potential of demand-side strategies across all sectors to reduce emissions is 40-70% by 2050 (high confidence).”[35] *“[m]itigation strategies can be classified as Avoid-Shift-Improve (ASI) options, that reflect opportunities for socio-cultural, infrastructural, and technological change. The greatest Avoid potential comes from reducing long-haul aviation…”. Specifically, “[s]ocio-cultural factors such as avoid[ing] long-haul flights and shifting to train wherever possible can contribute between 10% and 40% to aviation GHG emissions reduction by 2050”.*[36]

Other aviation emissions reduction measures include the following.

Define “sustainable” aviation fuels as zero emissions fuels and ban greenwashed fuels that don’t meet this definition being so branded. It is reasonable for the government to warn customers of the climate impact of flying.

Stop the use of offsets. Offsets cannot be relied upon and should not form part of a serious strategy for climate impact abatement for aviation.

Ban fossil fuel advertising by fossil fuel dependent businesses including aviation.

Reduce perverse incentives to pollute. The Australian government should conduct an inquiry into the impact of banning frequent flyer programmes that incentivise travellers to take more flights.

Develop travel alternatives on main routes, for instance, building fast renewables electrified rail, subsidising new intercity electric coach providers and infrastructure

31 https://australiainstitute.org.au/wp-content/uploads/2023/05/P1378-Fossil-fuel-subsidies-2023-Web.pdf
32 https://www.sciencedirect.com/science/article/pii/S2214367X21000466
33 https://www.wearepossible.org/latest-news/the-true-cost-of-frequent-flyer-reward-schemes
34 https://www.oxfam.org/en/press-releases/carbon-emissions-richest-1-set-be-30-times-15degc-limit-2030#
35 IPCC AR6 WGIII, ‘Summary For Policymakers’ C.8 and WGIII, IPCC AR6‘Full Report’, Ch. 5, 5-3
36 IPCC AR6 WGIII, Ch 5, 5-3

Battery powered aircraft charged by renewables electricity for short-haul regional flights are to be encouraged.

Rationing could plausibly play an important role in an effective and fair means of reducing emissions and is therefore worthy of serious consideration. As well as being fairer than taxes, rationing can be more effective in achieving results quickly.[37]

Excluded from this list are technical improvements in aircraft design that reduce fuel burn, and flight path changes that reduce non-CO2 effects, because any reduction in emissions they might achieve will be minimal and not commensurate with those needed to avoid catastrophic warming. Likewise, green hydrogen power may theoretically reduce flight emissions but, given production costs, its future deployment should be prioritised across other more essential economic sectors.

Professor Hans Joachim Schellnhuber, professor of theoretical physics, founding director of the Potsdam Institute for Climate Impact Research (1992-2018) and former chair of the German Advisory Council on Global Change, describes our predicament thus:

"...[C]limate change is now reaching the end-game, where very soon humanity must choose between taking unprecedented action, or accepting that it has been left too late and bear the consequences.".

This is the unprecedented action we see is required in aviation.

37 https://www.tandfonline.com/doi/full/10.1080/21550085.2023.2166342