

Code red for aviation: Scoping and reducing the sector's contribution to climate change

#codedred #climatechange #cop26 #net zero #sustainable aviation
#sustainableaviationfuel #icao



SUMMARY

The “code red” alert for the climate from the IPCC’s Sixth Assessment Report (AR6) has particular implications for aviation. Air transport’s

climate-harming emissions have grown substantially from year to year over decades and, with the exception of 2020, they are likely to continue to do so in the absence of intensive and focused action to wean the sector away from its dependence on fossil fuels and towards making its requisite contribution to the climate imperative. Quantum changes in emissions mitigation governance and measures are essential, starting soonest. This “white” paper, out for comment and debate, proposes a package of requisite actions by the UNFCCC (starting at COP26 in November), the International Civil Aviation Organization, regulatory authorities, industry (air transport, tourism and trade), travelers and shippers.

BACKGROUND

Aviation emissions (pre-Covid) represent about 2.8% of global CO₂ emissions. But recent research indicates that they contribute 3.7% of radiative forcing (including non-CO₂ emissions and contrails) and AR6 suggests that the contribution of methane may now be somewhat larger than previously estimated. These proportions may seem a relatively small contribution to global warming but they are expected to continue their almost inexorable increase, improvements in efficiency being outweighed by traffic growth and, for many years to come, only marginally reduced reliance on fossil fuels. Moreover, the international aviation component (about 60% of the total) is not explicitly included in the UNFCCC’s Nationally Determined Contributions (NDCs) under the Paris Agreement and is addressed only in a diffuse manner.

In 1997, the UNFCCC’s third Conference of the Parties (COP3) decided, via the Kyoto Protocol, to treat international aviation indirectly through the International Civil Aviation Organization (ICAO). CO₂ emissions from

international aviation have since doubled from 317Mt in 1997 to 641Mt in 2019, to match the total emissions of the 129 lowest emitting countries combined, ranking just behind Canada and at least one and half times those of the United Kingdom. The World Meteorological Organization has stated that, under present trends and commitments, international aviation and shipping will be the world's major source of CO2 emissions by 2050, with aviation playing the leading part.

ICAO's current basket of emissions mitigation measures for international aviation – technology, operations, the CORSIA¹ carbon offsetting scheme and Sustainable Aviation Fuels (SAF) – will contribute *pro rata* much less than any of the first NDCs to which 192 UNFCCC Parties have committed. [Climate Action Tracker](#) has concluded that these measures, and notably CORSIA, are “critically insufficient” – the worst level – and compatible with a 4°C+ world.

Some 120 nations, along with several major airlines, have now committed to net-zero emissions by 2050 at the latest. But, nearly 24 years after being given its Kyoto mandate, ICAO still has no long-term global aspirational goal for mitigation of international aviation emissions, although for the past eleven years it has been “exploring the feasibility” of one.

ICAO remains considerably constrained in having to relate the UNFCCC's principle of Common But Differentiated Responsibilities (CBDR) with “equal application” provisions of the Chicago Convention. Developing a universal commonality for 193 States takes considerable time and effort and has resulted in a “lowest common denominator”. Furthermore, the UN agency has no regulatory authority over any individual Member. At

¹ Carbon Offsetting and Reduction Scheme for International Aviation.

the outset of its consideration of market-based measures, the Organization dismissed the idea of developing a new legal instrument for aviation emissions mitigation as too cumbersome and taking too long to deliver (a number of years).

ICAO, whose mandate, beyond its key functions of promoting safety and security of aviation, and efficient air traffic management, is essentially to protect and promote air transport, has also been unduly influenced by the air transport industry. The industry has naturally been supportive of technical and operational measures since these improve efficiency and fuel represents some 25-30 per cent of operating costs. But it has been reluctant to accept much more than nominal market-based measures because these increase costs.

Technological and operational measures, while effective, proved to be inadequate against a growth in traffic. The market-based measure ultimately adopted by ICAO in 2016, CORSIA, is the primary global tool for aviation emissions mitigation, but it is based on out-of-sector carbon offsetting. Carbon offsetting is at best an interim and inadequate mechanism. It shifts the moral responsibility for carbon reduction to someone else, the quality of offset units is heterogeneous and far from guaranteed, and an [EU study](#) showed that the majority of even offsets of the highest standards simply do not work. In the words of Christiana Figueres, past Executive Secretary of the UNFCCC: “Carbon offsetting is not a silver bullet, nor an alternative to the deep and decisive emission reductions that economies and communities have to make now and into the future.”

CORSIA is a complex form of offsetting and, despite including the word “Reduction” in its name, is not aimed at reduction of emissions but

rather sets out to achieve a goal of carbon neutral growth, now above 2019 levels. The Scheme will not have any practical effect for a few more years and emissions below 2019 levels will continue to be churned out annually without redress. Given also a range of a range of exceptions incorporated in CORSIA, it has been estimated by the International Council for Clean Transportation to cover only 25% of international aviation CO₂ emissions over its 2021 to 2035 lifetime. CORSIA has also stifled coverage of the EU's Emissions Trading System (ETS), which has a more reliable effect but has been severely constrained in its geographic application to air transport.

In addition, CORSIA is fragile and, being based on ICAO Assembly Resolutions and implemented through ICAO Standards and Recommended Practices, it will at no point be binding under international law.

China, India, Russia and South Africa amongst others are by no means committed to CORSIA.

The Scheme cannot currently be considered as a significant emissions mitigation measure. On the contrary, out-of-sector carbon offsetting needs to be discouraged in favour of real in-sector reductions in emissions. CORSIA may well continue to play a role, and one option presently under consideration - but reportedly facing strong opposition by some fossil fuel providers - would be for in-sector offsetting for funding of certified Sustainable Aviation Fuel products.

A fundamental issue is that ICAO specifies that CORSIA is to be the only global market-based measure applying to CO₂ emissions from international aviation. This severely constrains those countries with

greater ambition and is inconsistent with the Paris Agreement, which is founded on a “bottom-up” concept.

The above illustrates the increasingly urgent need for a quantum boost in action on aviation emissions mitigation, including a rethink of the global approach. The Kyoto Protocol has now effectively lapsed and international aviation is *de facto* encompassed by the Paris Agreement in the same way as any other sector and it needs to be treated as such.

Global air traffic levels - and with them emissions - are not expected to reach those of 2019 for several years, with a variety of expectations for different routes and markets. But if aviation is to make its requisite contribution to the Paris Agreement targets, emissions would have to be reduced by at least half from 2019 levels by 2030 and to zero carbon by 2050. In the meantime, even at the reduced traffic levels of 2020 and 2021, CO₂ continues to be added without limit to the atmosphere, where it remains for decades.

Electric and hydrogen powered aircraft are now in prototype or on the drawing board, with the potential to reduce air transport emissions substantially in the longer term. But given they will not have a major global market presence until close to mid-century, particularly at the long haul, there is a critical need for early address of other means of reducing aviation’s emissions, notably market-based measures and Sustainable Aviation Fuels. SAFs, notably waste-based fuels and synthetic e-fuels, are the primary and necessary means of bridging both time and emissions gaps. They are available right now and have the distinct advantage of being “drop-in”, requiring no significant changes in delivery or infrastructure. However, SAF production and take up are

negligible, with very high costs (three or more times than fossil jet fuels) and there is an urgent need for stimulative action.

SCOPING AVIATION EMISSIONS

In essence, the purchaser of any good or service is ultimately responsible as the source of the emissions. In the case of aviation, it is the passenger or the shipping initiator, but mitigation measures are generally addressed to the supplier of the good or service—and in aviation this is essentially the air carrier (along with associated airport and air navigation operations). At the same time, both the origins and destinations, as well as the air carrier, are economic beneficiaries. In the case of international aviation-related products, outgoing tourism is an import while outgoing freight is an export. If any part of a good or service includes imports, the relevant emissions are attributed to the exporting country, not the importing one. Reflecting the elemental root of the emissions has become feasible in recent years in the case of international air transport, with true origin and destination data and routings for passengers and freight routinely recorded by carriers. The emissions attributed to a country could be based on the originating market for passengers (round trip, which would tend to apportion towards more wealthy countries) and origin or destination market for freight. Consolidated data could be filed without breaching privacy, and public registries could be used for monitoring and verification. This approach could see aviation as an innovative leader in its treatment of exported and imported emissions

The aviation industry and ICAO frequently refer to a large economic ripple effect of air transport with its indirect, induced and tourism catalytic exceeding its direct contribution by a factor of as much as six.

But they do not equate this with a parallel emissions multiplier. Broader impacts of activity in many sectors are now reflected in scoping emissions. **The emissions quoted above are in fact only Scope 1**, that is direct emissions that occur from air transport. **They exclude Scope 2**, indirect emissions from the generation of purchased goods and services **and, much more significantly in the case of air transport, Scope 3**, which includes all other indirect emissions that occur in a company's value chain.

In particular, travel and tourism represents directly and indirectly about 10% of world GDP and employment and about 8% of greenhouse gas emissions (of which 40% come from aviation, 60% in the case of international tourism).

Tourism and aviation are in a symbiotic relationship, with many tourism destination markets highly, or even almost totally, dependent on air transport. And yet at the global level and in originating markets they have traditionally functioned in separate silos, often with traffic growth and market share as driving motivators, when combined economic and social prosperity should be the goal. There is an overwhelming need for revamping the structure towards quality, and notably to accommodate overarching global greenhouse gas emissions imperatives as well as economic recovery.

The approach to tourism is changing. Many destination countries are concerned about low retained revenue yield and negative impacts on local communities and facilities. The tourism industry has been devastated by the Covid-19 pandemic and a rethink of the tourism model is occurring in a number of destination markets (see [here](#), for example). One aim is also to restore balance between 'overtourism' and local

quality of life, including reflection of the local environmental and ecosystem sustainability promoted through welcoming international tourists. In a number of markets a focus on higher quality, higher priced tourism and less attention to traffic volume will have an impact on air transport.

From rich country perspectives, constraining international aviation means a reduction in services imports, particularly in the case of major tourist originating markets. But there are positive economic and social effects of responsible tourism in developing countries in particular – well managed, it can be one of the most effective means of transferring wealth from rich people to poorer ones.

Unfortunately, much tourism is not so responsible, with a low retained revenue yield in the destination country and negative impacts on local communities and facilities.

While the global contribution of aviation to climate change may be considered relatively small, the contribution to an individual traveler's total greenhouse gas emissions is very much higher and very often the dominant element. As its impact on climate change becomes more widely appreciated, air transport will undoubtedly be affected by *flygskam* (flight shame) – although at present the impact seems to be minor. Given climate change effects, travelers may also switch destinations to avoid, for example, too much heat or weather disturbances. For some years to come travel will also be affected by the perceived safety of different destinations in relation to Covid-19.

The air cargo component shows a different picture. After languishing for some years, the pandemic has revitalized the sector and the trend to on-line purchasing and “just in time” delivery with reduced local inventory

costs seems likely to continue. It is also a component which is essentially out of the influence of end consumers, the decision to use air transport being at the discretion of the dealer and not even generally known to the original purchaser. But it would be somewhat susceptible to more rational and equitable pricing of the air transport to include fuel or carbon taxes.

The need to take into account Common But Differentiated Responsibilities and respective capabilities

In 1992, the Rio Earth Summit formally recognized that both the volume of greenhouse gas emissions generated by countries and their ability to deal with them varied widely. The principle of “Common But Differentiated Responsibilities and respective capabilities” has been central to all subsequent climate negotiations and incorporated in the texts of the UNFCCC including the Paris Agreement. This principle has key applicability in international travel and tourism, with the volume of traffic generated by originating markets predominantly from rich countries. Many Least Developed Countries, Landlocked Developing Countries and Small Island Developing States are substantially dependent on revenues from international tourism and air transport. They require special treatment. They need a better mechanism for determining and realizing their national interest in weighing up the benefits and costs of aviation-dependent tourism, exploring the opportunities of being more selective in the market when air ticket prices start to rise due to the introduction of decarbonised fuels. Developing local production of decarbonised fuels may be an option for those countries able to generate sufficient green energy creating employment, revenue and improving the balance of payments by reducing imports and potentially increasing exports.

REVISITING THE UNFCCC-ICAO RELATIONSHIP

As a first, seminal, step forward, it is time to revisit the UNFCCC-ICAO relationship.

Any country can add international aviation to its carbon budget at its discretion and a number of countries are now including it in their NDCs. The UNFCCC at its COP26 in November could incentivise action on aviation emissions by mandating this approach. Several options for allocation of international aviation to Parties were on the table in Kyoto in 1997 before the conference ran out of time, and requisite data have since become much more readily available.

Bringing international aviation into the NDCs would give direct accountability and incentive for Parties to act on the related emissions, individually or through multilateral mechanisms such as CORSIA and the EU ETS. It would place international aviation more squarely in each national emissions context. Not only can it be difficult to separate domestic from international air transport operations, the two can share broader emissions generation aspects. For example, London's Heathrow Airport is the largest single source of CO₂ emissions in the United Kingdom, but the majority of those emissions are from local traffic and business, not from the flights themselves.

COP26 might also provide direction on not only allowing but encouraging greater ambition by individual Parties, complementary but in addition to multilateral sectoral arrangements on aviation emissions reduction such as CORSIA or the EU ETS (on the basis of 'bottom up' rather than the current 'top down' of ICAO), and empowering individual Parties to apply such instruments as fossil fuel levies and low-carbon fuel blending mandates. ICAO should certainly no longer be sanctioned to continue as

the sole regulatory policy framer for international aviation emissions – individual countries should be free to add their own more ambitious action as more generally promoted by the Paris Agreement. A “coalition of the more ambitious” is likely to be more influential than a global application of lowest common denominator.

None of the above is intended to be detrimental to ICAO’s fundamental role in aviation safety, security and air navigation and its very impressive work on raising the profile of the need for action on aviation emissions mitigation, development of environmental standards for aircraft certification, and the Monitoring, Reporting and Verification (MRV) of fuel consumption and emissions. These activities will continue to be fundamental. But surely issues such as fuel complete life-cycle and land use, or SAF blending mandates in individual countries, should not be in the remit of ICAO? The Organization’s recent series of Stocktaking Seminars has provided an impressive and comprehensive wealth of information but, given all the limits on ICAO and the widely differing national perspectives, it is difficult, if not impossible, to envisage how the Organization could turn this into effective policy on its own.

Responsibility for global climate *policy* on international aviation, and criteria for determining the overall contribution of its emissions to climate change, should revert from ICAO directly to the UNFCCC. The present arrangements are entrenched, and changes would take time, but there should be critical examination. On the ICAO side an opportunity presents itself with the recent appointment of a new Secretary General who is committed to reform of the Organization.

A PACKAGE OF PROPOSED POLICY ACTIONS

There are a number of other policy actions by various parties under the very necessary global co-operation umbrella of the UNFCCC which would each contribute, in lesser or greater part, to reducing aviation's contribution to climate change. As indicated above, these go beyond the aviation silo to travel and tourism, trade and the economy at large in the new international order. A package of actions to be addressed by various parties is proposed below under the following classification:

1. The UNFCCC itself
2. ICAO
3. Regional and national regulatory authorities
4. The aviation industry
5. The tourism sector
6. Individual travelers and shippers of goods by air.

1. The UNFCCC should, starting at COP26 in November:

1.1 Decide to include international aviation emissions in the Paris Agreement's Nationally Determined Contributions (irrespective of any change in relationship between the UNFCCC and ICAO, which should be the subject of fundamental review in the post-COP26 negotiations)

1.2 Set a target of zero carbon 2050 for international aviation, with intermediate targets to be established at five-year intervals

1.3 Initiate address, directly by SBSTA (the UNFCCC's Subsidiary Body for Scientific and Technological Advice), of non-CO2 emissions from international aviation (including contrails) with a view to adoption of concurrent targets

1.4 Provide direction on not only permitting but advocating greater ambition by individual Parties on aviation emissions reduction,

complementary but in addition to any multilateral sectoral arrangements (such as ICAO's CORSIA and EU's ETS) including both empowering and encouraging individual Parties to apply fossil fuel levies and low emission fuel blending mandates

1.5 Lay the groundwork for a minimum aviation environmental charge globally according to distance (cf the G7 decision on minimum corporate taxes), with revenues to be ring-fenced as desired by individual Parties for Sustainable Aviation Fuel (SAF) production and investment in zero-carbon emission aviation technologies such as e-fuels, electric engines, hydrogen fuel systems and fuel cells. The United Kingdom, as host of COP26, might set an example by assigning revenues from its Air Passenger Duty accordingly

1.6 Strongly discourage out-of-sector carbon offsetting for aviation in favour of real in-sector reductions in emissions or of offsetting directly to SAF production and purchase and for evolution of e-fuel and hydrogen-powered aircraft, including transition of revenue generated from existing out-of-sector offsetting schemes to within sector arrangements.

2. ICAO should:

2.1 Co-operate with the UNFCCC to achieve the above

2.2 Pursue and develop its functions of Monitoring, Reporting and Verification of aviation emissions, including non-CO2 emissions

2.3 Reform CORSIA, aiming at application to ALL emissions (not just those from Carbon Neutral Growth and from CO2) and to in-sector offsetting (primarily to Sustainable Aviation Fuels) with discouragement of out-of-

sector offsetting, and not only to allow but actively to encourage greater emissions mitigation ambition by contracting States

2.4 Foster the development standardized carbon labelling of air travel, to the extent that both passengers and shippers become aware of the climate-harming emissions generated by various options for each journey concerned.

3. Regional and national regulatory authorities should:

3.1 As an urgent priority, provide a roadmap for the early development and application of Sustainable Alternative Fuels (against a criterion of a 70 per cent or greater reduction in CO₂ versus kerosene on a full life cycle basis) through:

- progressive SAF mandates
- tax credits for SAF suppliers (both producers and airports)
- levies on aviation fossil fuels, ring-fenced to SAF production and purchase
- SAF investment guarantees and green financing
- prioritization of applicable alternative fuel production to the aviation sector

3.2 Make every effort nationally and regionally to improve the efficiency of air traffic management and aircraft operations

3.3 Propound the development of carbon labeling of travel and tourism, notably for the air transport component, and ensure that it is made available at the outset of the booking process at point of purchase.

4. The air transport industry should:

4.1 Recognize and plan for the reduction of aviation emissions by at least half from 2019 levels by 2030 and to zero carbon by 2050

4.2 Discourage the offer of out-of-sector carbon offsets in favour of application of in-sector offsets, notably to Sustainable Aviation Fuels.

5. The tourism sector (industry and destinations) should:

5.1 Integrate international aviation emissions into assessments and actions to mitigate climate change

5.2 Work towards carbon labelling of travel and tourism at point of purchase (with aviation contributions broken out)

5.3 Promote the recognition by travelers of the substantial contribution that their air transport makes to their personally generated climate harming emissions and, in complementarity to industry-related mandates and actions, give them responsibility, accountability and choice regarding their emissions.

6. Individual travelers and shippers of goods by air should:

6.1. Make every effort to ascertain the contribution of air travel to their personal climate change impact and reflect this in their consideration of travel or shipping plans.

THE BOTTOM LINE

The photo at the outset of this article was taken by the author 20 years ago in the barrenlands of northern Canada, at the furthest point from human habitation in the world outside Antarctica, some 600km from the nearest hamlet. We rose to a clear blue sky, a little later it looked like this and by then end of the day it was completely covered by cirrus cloud.

The culprit was flights from Europe to the west coast of North America. The photo illustrates not only how pervasive air transport emissions are but also the need to assign direct responsibility for emissions of flights in transit over foreign territories and the high seas.



The left hand image above shows that the world was aware as far back as 1912 that burning coal contributed to climate change, but it is only in the last few years that action to phase out coal has been taken and that only with limited effect. The right hand image shows the IPCC's Special Report in 1999 on *Aviation and the Global Atmosphere* through which a scientific consensus confirmed that aviation was contributing significantly to climate change - but 22 years later that contribution has not fallen but rather has increased considerably.

Redress is needed as a matter of the highest priority. For an independent assessment of the increasingly urgent need to reduce or even eliminate climate-harming emissions from air transport see the interview with award-winning geneticist and broadcaster and world leader in sustainable ecology, [David Suzuki speaks with passion about why action to reduce aviation emissions is needed NOW! - YouTube](#).

Any delay in action increases the size of the problem. Ultimately there may well be a need to cap airline operations comprehensively or at least by route, in line with defined benefit criteria including emissions reduction targets. The reality is that if we procrastinate now, an increasing alternative – and perhaps the only one in the mid- to long-term – will be to reduce flying generally.

- CHRIS LYLE, AUGUST 2021 -

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