Mitigating aviation's non-CO_2 effects in the EU's Fit for 55 package

Time to address aviation's full climate impact in ReFuelEU Aviation and the EU ETS

April 2022

1. Aviation's full climate impact: CO_2 is just the tip of the iceberg

The Fit for 55 regulatory package proposed by the European Commission aims at decarbonising the European economy and aligning it with the goals set in the Paris agreement. Whilst decarbonising aviation must be a priority, the sector has an even bigger climate problem which has been flying under the legislative radar for a long time: non-CO_2 effects.

On top of CO_2, aircraft engines emit other gases (NO_x, SO_2 and H_2O) and particulate matter (soot). When released at high altitudes, these emissions affect atmospheric physical and chemical properties, resulting in an increase in greenhouse gases and the potential formation of persistent contrail cirrus, which causes a net warming effect on climate that is bigger than that of CO_2.

After decades left unlegislated, the EU has an opportunity to address aviation non-CO_2 effects through the following policy measures:

- **Monitoring and regulating the composition of jet fuel in ReFuelEU**
- **Monitoring and pricing non-CO_2 effects in the EU ETS**

Non-CO_2 effects represent two thirds of aviation's full climate impact

The European Commission tasked the European Union Aviation Safety Agency (EASA) with analysing non-CO_2 effects of aviation. After careful review of the latest available science, the results were published in a 2020 landmark report, confirming that the climate impact of non-CO_2 effects is two thirds of the total aviation's climate impact, and proposing some mitigation policy measures.

2. Fit for 55: the right opportunity for non-CO_2 policy measures

When reading the Fit for 55 regulatory package proposal from the European Commission, in particular ReFuelEU Aviation and EU ETS, there is little mention of aviation's non-CO2 effects or of the policy measures to address them proposed in the EASA report.

Failing to address non-CO_2 effects in Fit for 55 would be missing a precious opportunity, and the EU cannot afford wasting any more time in tackling the biggest part of aviation climate impact. Policy solutions do exist and can be implemented immediately in the proposal, including in the EU's future sustainable fuel mandate (ReFuelEU Aviation) and its updated carbon market rules (EU ETS).

2.1. ReFuelEU Aviation: Optimise the aromatic and sulphur content of jet fuel to reduce persistent contrails and improve air quality

The properties of the jet fuel burnt in aircraft engines have an impact on non-CO_2 effects. In particular, the concentration of sulphur and some hydrocarbon molecules usually present in fossil jet fuels (aromatics, naphthalene) is closely linked with the emission of soot particles, which in turn leads to lower air quality and the formation of persistent, warming contrail cirrus.

Sustainable Aviation Fuels (SAFs) usually contain no aromatics, so promoting SAF uptake is a key measure that reduces both CO_2 and non-CO_2 emissions. However, this can be seen as a mid- to long-term solution to non-CO_2 effects, as the bulk of aviation's jet fuel will continue to be fossil in the foreseeable future given the slow expected scale up of SAF production.

While fossil kerosene is still around, the reduction of aromatics, naphthalene and sulphur in fossil jet fuel is a technically and economically viable solution, which will reduce aviation's climate impact and improve air quality. This has been confirmed both by the EASA's non-CO_2 report and a follow-up study on fuels, conducted by CE Delft for the Dutch Ministry of Transport and Water Management. ReFuelEU Aviation can support this solution by introducing the following measures: an impact assessment study on the optimisation of aromatics, naphthalene and sulphur content in jet fuel to prepare for legislation on fuel quality, as well as reporting obligations on the aromatic, naphthalene and sulphur content of current jet fuel supplied across the EU.

2.1.1. A European Commission impact assessment study on the reduction of aromatics, naphthalene and sulphur content in fossil kerosene, to prepare for legislation on fuel quality

ReFuelEU should request the European Commission, to publish an impact assessment study, by 31 December 2023, outlining technical, economic and legislative pathways to lower the aromatics, naphthalene and sulphur content of fossil kerosene in order to mitigate contrail cirrus formation and improve air quality.

The results from this impact assessment study shall form the basis of legislation on lowering aromatic, naphthalene and sulphur content in fossil jet fuel to the lowest possible level, with due respect of safety

and in consideration of state-of-the-art aircraft engine technologies, which are expected to be able to run with aromatics-free fuel in the coming years. This legislation should be proposed by the European Commission by the end of 2024.

2.1.2. Reporting of aviation fuel properties

Within its reporting obligations for fuel suppliers (Article 9), ReFuelEU Aviation should introduce a mandate for fuel suppliers to report annually to EASA the average aromatics, naphthalene and sulphur contents of the aviation jet fuel supplied by them, and to make this data public. This information is already available to fuel suppliers, and sharing it publicly would significantly improve our understanding of fuel properties and non-CO_2 effects without creating significant burdens, as a reporting obligation is already included in ReFuelEU Aviation.

2.2. EU ETS: Monitor and price non-CO_2 effects to address their climate impact

Today, non-CO_2 effects are not included in the EU ETS, giving no price incentives to airlines to address them through the use of cleaner fuel or operational contrail avoidance measures. The 2017 reform to the EU ETS included language that required the European Commission to come up with "an updated analysis of the non-CO_2 effects of aviation, accompanied, where appropriate, by a proposal on how best to address those effects''. This resulted in EASA's non-CO_2 report, estimating the precise climate impact of non-CO_2 effects and mitigation potential, including the pricing of these emissions under the EU ETS.

In spite of uncertainties, the level of scientific understanding of aviation's non-CO_2 effects is very thorough, and robust enough to finally require the EU ETS to monitor and price them effectively.

2.2.1. Monitoring, Reporting and Verification (MRV) scheme

The EU ETS should require the creation of a pilot Monitoring, Reporting and Verification (MRV) scheme similar to the one existing today for CO_2 emissions, but with the objective to establish a methodology adapted to the specificities of non-CO_2 emissions and their climate impact with a robust CO_2 equivalence calculation for non-CO_2 effects. All collected data would lead to a better understanding of the flights that cause the most non-CO_2 impact (where do contrails persist, under what atmospheric conditions, at what time). This system would not only further research and scientific understanding in the area but also prepare the ground for effective pricing of these effects on a per flight basis.

This MRV should be developed within 6 months of the entry into force of the revised ETS, data then annually published and submitted to the European Commision, the EASA, the EEA and the European Parliament. The elements to monitor, report and verify would be the following:

A. fuel flow-mass of aircraft;
B. latitude, longitude and altitude;
C. humidity and temperature;
D. emission indices for CO_2, H_2O and NO_x;
E. CO_2 equivalents per flight.

2.2.2. Non-CO_2 multiplier until an effective monitoring system is in place

Until a robust monitoring system is in place to report non-CO_2 effects on a per flight basis, the EU ETS should introduce a multiplier on aviation emissions and require aircraft operators to surrender two allowances for each ton of CO_2 emissions, as demanded at the time by the European Parliament already back in 2007. Aircraft operators participating in the pilot MRV scheme could be exempt from this multiplier. Not only would this multiplier further incentivise aircraft operators to use SAFs or reduce their fuel burn through operational measures or new aircraft technology (which help reduce CO_2 and non-CO_2 emissions) it could also incentivise them to already start monitoring their non-CO_2 effects.

2.2.3. European Commission study on pricing non-CO_2 effects on a flight basis

By 2025, the European Commission should present a report on the results of the MRV pilot project and specify the amount of ETS allowances required to cover for the CO_2 equivalent per flight calculated under its pilot MRV. This report shall be accompanied by a legislative proposal to amend the EU ETS directive to introduce MRV requirements for non-CO_2 aviation emissions, as well as calculation methodologies to expand the scope of the ETS to non-CO_2 aviation emissions.

3. Conclusions & policy recommendations

Non-CO_2 effects have been studied for decades, but complexity and uncertainties have been used as excuses to sweep them under the carpet and not legislate on them. However, our level of understanding has significantly increased with the years, and the most recent developments show that technical and policy solutions do exist.

At a time when bold, ambitious climate action is needed, the EU cannot accept that two thirds of aviation's climate impact continue to fly under the legislative radar. The Fit for 55 package offers a historic opportunity to reverse this trend and to finally address aviation non-CO_2 effects.

T&E recommends that policy makers take into account the policy recommendations below for the revision of ReFuelEU Aviation and EU ETS. These measures are inspired by the latest available science, and build on collaboration and research, to give a clear, no-regrets way forward to start dealing with aviation's enormous yet hidden climate problem.

- **ReFuelEU: monitoring and regulating the composition of jet fuel.** ReFuelEU should assess the impact of reducing aromatics, naphthalene and sulphur in fossil jet fuel, in order to optimise their content in fossil jet fuel, while mandating the reporting of the properties of jet fuel currently supplied in the EU.
- **EU ETS: monitoring & pricing non-CO2 effects.** The revision of the EU ETS should create a Monitoring, Reporting and Verification (MRV) pilot scheme for non-CO_2 effects, publishing its results by 2025 and legislation to price those effects under the scheme; until then, introducing a non-CO_2 multiplier for operators not participating in the MRV pilot scheme.

Further information

Matteo Mirolo
Aviation Policy Officer
Transport & Environment
matteo.mirolo@transportenvironment.org
+32(0)4 84 32 00 45

Carlos López de la Osa
Technical Advisor
Transport & Environment
carlos.lopez@transportenvironment.org

Sources

- European Union Aviation Safety Agency (EASA), (2020). Updated analysis of the non-CO_2 effects of aviation. Retrieved from: https://www.easa.europa.eu/downloads/120860/en
- Transport & Environment (T&E), (2022). Roadmap to Climate Neutral Aviation in Europe (pp. 63-72). Retrieved from: https://www.transportenvironment.org/wp-content/uploads/2022/03/TE-aviation-decarbonisation-roadmap-FINAL.pdf
- Transport & Environment (T&E), (2022). High-level summit on non-CO_2 effects of aviation. Recording: https://www.transportenvironment.org/non-co2-effects-time-to-finally-address-aviations-full-climate-impact/
- CE Delft, (2022). Potential for reducing aviation non-CO_2 emissions through cleaner jet fuel. Retrieved from: https://cedelft.eu/publications/potential-for-reducing-aviation-non-co2-emissions-through-cleaner-jet-fuel/