

## 【欧州】 【航空】

# Aviation - Gas emissions: Latest numbers of commercial flights in the EEA and verified CO<sub>2</sub> aviation emissions data confirm upward trend in GHG emissions from aviation

Andrea Antolini Former Researcher JTTRI

### 【概要 : Summary】

In the past two years, the COVID-19 pandemic has had an unprecedented negative impact on the global, intra-EU and domestic aviation regarding the number of air passengers and flights. However, at the same time, the GHG emissions from aviation dropped significantly. While the pandemic continues to have a negative impact on economic development in the aviation sector, the air passenger numbers and flights experienced a partial recovery in 2021, based on the partial lifting of travel restrictions. Consequently, also the GHG emissions from aviation started to increase again in 2021.

According to the latest data on verified emissions published in the European Union Transaction Log (EUTL), the central EU-ETS reporting tool, in 2021, verified emissions from aircraft operators amounted to 26.87 million tonnes of CO<sub>2</sub>, indicating an increase of about 8.7% compared to 2020. However, these 2021 CO<sub>2</sub> emissions from aviation are still 61% lower than the CO<sub>2</sub> emitted in the last pre-pandemic year 2019. Since the pandemic related restrictions of the free movement of people are basically phased out within the EU and also beyond, it can be expected that the CO<sub>2</sub> emissions from aviation will continue to rise in 2022 and will reach pre-pandemic levels in the next years, if no other

significant change in the pandemic or an escalation of the Russian war in Ukraine will change again the general preconditions for the aviation sector in the EU.

As the partial recovery of air traffic in 2021 and the related resurgence in the aviation sector's CO<sub>2</sub> emissions shows, the acceleration of the recovery of commercial flights in 2022 can be expected to lead to an unrestrained upward trend of the aviation sector's GHG emissions. This unrestrained increase can be expected to continue, as emission reduction measures such as the introduction of significantly larger amounts of Sustainable Aviation Fuels (SAFs) or any groundbreaking, aircraft related technical changes cannot be expected to be deployed in the near future.

### 【記事 : Article】

#### 1. The revision of the EU-ETS legislation for aviation and the CORSIA scheme

The EU Emissions Trading System (EU-ETS) was introduced in 2005 and is one of the main tools for reducing GHG emissions in several sectors' stationary installations in the EU. The EU-ETS covers most manufacturing industries, including the power sector. The EU-ETS covers about 36% of the EU's total GHG emissions (EEA 2022). Since 2012, it also covers the CO<sub>2</sub> emissions of aircraft

operators on intra-European Economic Area (EEA) flights in the EU-27 Member States plus Norway, Iceland, and Liechtenstein (EEA 2022).

At present, aviation is one of the few sectors with fast-growing GHG emissions. Therefore, the EU has the objective to reduce aviation emissions in Europe but is also working with the International Civil Aviation Organisation (ICAO) to develop measures with global reach to lower GHG emissions from the aviation sector. Therefore, besides the EU-ETS for aviation, the European Commission plans to transpose the ICAO's CORSIA scheme into EU law.

Based on Regulation No. 421/2014 and Regulation (EU) 2017/2392, the EU-ETS will continue until 2023 and then the EU-ETS legislation will be reviewed for also covering the ICAO's Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) ((EEA n.y.a, European Commission 2021a). Moreover, due to the UK's withdrawal from the EU, it is not included in the EU-ETS anymore since the ending of the Brexit transition period on 31 December 2020.

On 14 July 2021, the European Commission proposed several drafts to revise the EU-ETS aviation rules, as part of the "Fit for 55" legislative proposals to achieve the net GHG emission reduction target of at least 55% by 2030, based on 1990 levels (European Commission n.y.c). The presented proposals under the "Fit for 55" package cover COM (2021) 551 final and COM (2021) 552 final have also some impact on the EU's aviation sector.

The "Proposal for a Directive of the European Parliament and of the Council amending Directive 2003/87/EC establishing a system for greenhouse gas emission allowance trading within the Union, Decision (EU) 2015/1814 concerning the establishment and operation of a market stability reserve for the Union greenhouse gas emission trading scheme and Regulation (EU) 2015/757 " (COM (2021) 551 final) and also the

"Proposal for a Directive of the European Parliament and of the Council amending Directive 2003/87/EC as regards aviation's contribution to the Union's economy-wide emission reduction target and appropriately implementing a global market-based measure " (COM(2021) 552 final) implement the legislative changes for transposing the ICAO's CORSIA for emissions legislation into EU law (European Commission n.y.c). Furthermore, also the EU-ETS for aviation is revised to reduce the number of free allowances allocated to aircraft operators to progressively reach full auctioning by 2027.

The European Commission also proposed the ReFuelEU Aviation initiative (COM (2021) 561 final) to increase the share of renewable and sustainable fuels in aviation, as well as a review of the tax regime in aviation, based on the Energy Taxation Directive (ETD) (COM (2021) 563 final). The revision of the legislation regarding the GHG emissions from the aviation sector will lead to the parallel existence of the two systems, CORSIA and EU-ETS for aviation. Since the CORSIA scheme is not expected to significantly reduce the CO<sub>2</sub> emissions from aviation, it is envisaged that flights within the European Economic Area (EEA) will continue to be covered by the EU-ETS for aviation in parallel.

Therefore, the EU-ETS for aviation will remain an important tool to help achieving the EU's climate objectives of the net-zero GHG emission level by 2050 and to reach the 90% reduction of GHG emissions from the transport sector (European Commission n.y.c). The legislative proposals will be transmitted to the European Parliament, the Council, the Economic and Social Committee and the Committee of the Regions for further consideration under the ordinary legislative procedure (European Commission n.y.c).

## 2. The COVID-19 pandemic's impact on the aviation sector's GHG emissions

Under the impact of the COVID-19 pandemic, which reached Europe in early 2020, the aviation sector severely suffered of the general or partial shutdown of aviation operations, caused by the restrictions in the free movement of people. The pandemic's impact became visible in commercial air transport in March 2020, with a -44% decrease in the total number of commercial flights in the EU, compared with the same month in 2019 (Eurostat 2021a). The most substantial reduction in the number of commercial flights was recorded in April 2020 with a reduction of -91% compared with the same month in 2019 (Eurostat 2021a). In May 2020 a -90% reduction followed and -84% in June 2020, compared to the same months in 2019 (Eurostat 2021a).

In parallel to the steep decline in the number of commercial flights in the EU also the intra-EEA flights' GHG emissions show a significant decline in 2020, reflecting the air traffic's temporary suspension in 2020. The suspension of flights due to the COVID-19 pandemic resulted in a verified reduction of GHG emissions from aviation by -63.5% between 2019 and 2020, from 68MtCO<sub>2e</sub> to 25MtCO<sub>2e</sub> (ETC/CME 2021). Due to the related restrictions in the free movement of people, the several lockdown periods in 2020 had wide-ranging impacts on the free movement and periodically continued during the first half of 2021. In the EU, the number of flights showed a reduction of -68% in January 2021 compared with same month in 2019 (Eurostat 2021b). In February 2021, compared to the same month in 2019, the number of flights decreased by -73%, in March by -71% and in April 2021 by -70%. There was no sign of recovery, due to the renewed and periodical introduction of travel restrictions in 2020 and 2021 (Eurostat 2021b). The first improvement became visible in the number of commercial flights in June 2021, when the number of commercial flights decreased to a lesser extent than compared to the same months in 2019. In June

2021, the number of commercial flights decreased by -54% compared to pre-pandemic figures in 2019. Although it was still a more than 50% drop compared to the same month in 2019, it was a first sign of improvement compared to the number of flights in the previous months in 2021 and the number of commercial flights in the EU increased by 48% compared with August 2020 (Eurostat 2021a, Eurostat 2021b). Thereby, the COVID-19 pandemic still continued to have a negative impact on the transport of people and transport of goods in 2021, although to a less severe extent.

According to the Eurostat 2022 and Eurocontrol figures for the first quarter 2022, in March 2022, in parallel to the further easing of pandemic-related restrictions and the reinstated free movement of vaccinated, recovered, and tested people, the aviation sector showed signs of recovery with the number of commercial flights with an increase by 156% in the EU, compared to March 2021 (Eurostat 2022).

However, this figure is still -27% below the pre-pandemic levels of March 2019 (Eurostat 2022). Nevertheless, this narrowed decrease of the EU's passenger numbers in March 2022 compared to the same month in 2019 is best result since the onset of the pandemic and since the start of restrictions of free movement in the EU in March 2020 (Eurostat 2022).

Regarding the absolute number of commercial flights, which stood at 389,181 in March 2022, according to Eurostat (2022) and compared with 151,986 in March 2021, and 296,362 in March 2020 and 530,400 in March 2019, it confirms a partial recovery of the aviation sector in the current phase of the pandemic (Eurostat 2022).

The EU Member States Croatia (-6%), Portugal (-8%) and Greece (-12%) showed the most narrowed decreases in the number of commercial flights in March 2022, compared with March 2019. In contrast, the highest decrease in flights in March 2022 compared to March 2019 took place in Slovenia (-

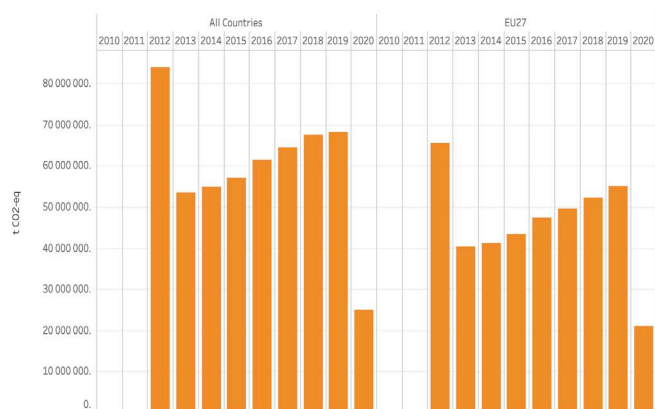
56%), Sweden (-45%), Latvia (-43%), Czechia (-42%) and Finland (-41%) (Eurostat 2022). Furthermore, also the number of commercial flights in the top 10 extra-EU countries including UK, Switzerland, Turkey, U.S., and Norway, is on the way to recovery (Eurostat 2022).

Compared with March 2019, commercial flights in 2022 remain below the pre-pandemic levels, most noticeably in Norway (-34%), the UK (-29%), Israel (-28%), Switzerland (-24%) and Egypt (-19%) (Eurostat 2022). However, when compared with March 2021, there is a clear increase in traffic visible in eight countries including UK (+599%), Norway (+375%), Israel (+366%), Morocco (+236%), Switzerland (+230%), Egypt (+192%), Turkey (+121%), and the U.S. (+77%) (Eurostat 2022). Moreover, most recently, also the Russian invasion in the Ukraine in March 2022 could have some impact on commercial flights, since due to the ongoing conflict, commercial flights with Russia and Ukraine came to a standstill. Compared with March 2019, when there were 14,493 flights with Russia and 5,414 with Ukraine and in 2021, those numbers decreased -77% for Russia and -71% for Ukraine compared to 2019, due to the pandemic. However, in March 2022, there were 52 flights left with Russia and zero with Ukraine due to the Russian war in Ukraine (Eurostat 2022).

While the aviation sector welcomes the recent increase of commercial flights within the EU and in the top-10 extra-EU countries, this increase will unavoidably lead to a resurgence of GHG emissions in aviation. In fact, while emissions from stationary installations have continuously decreased by -33% since the start of the EU-ETS in 2005, GHG emissions from the aviation sector under the EU-ETS showed a steady increase before the onset of the COVID-19 pandemic since 2012. Only due to the pandemic in 2020, for the first time since 2013, the verified CO<sub>2</sub> emissions from aviation were lower within the EEA, for intra-

EU flight emissions due to the COVID-19 pandemic's impact. Under the scope of the EU-ETS for aviation, every year, all commercial and non-commercial aircraft operators must surrender allowances at least equal to their verified CO<sub>2</sub> emissions of the previous year for their emissions from flights within the European Economic Area (EEA).

Fig. 1: Verified GHG emissions in aviation, all countries covered and EU27, 2012-2020, in tCO<sub>2</sub>-eq



Source: <https://www.eea.europa.eu/data-and-maps/dashboards/emissions-trading-viewer-1>

To make the trading of allowances possible under the EU-ETS, a system to account and transfer of allowances has been introduced under the European Union Transaction Log (EUTL) (Abrell 2021). The EUTL is the central reporting tool of the EU-ETS and all operators including stationary installations and airlines are required to report their verified emissions for the year the following year by 31 March and the verified emissions are then published on the website of the European Union Transaction Log (EUTL). The EUTL automatically checks, records, and authorises all transactions between accounts in the Union Registry and thereby ensures that all transfers comply with EU-ETS rules (European Commission n.y.a). In 2016, aviation was accountable for 3.6% of the total EU-28 GHG emissions and for 13.4% of the emissions from transport and GHG emissions from aviation in the

EU have more than doubled since 1990, when it accounted for 1.4% of the EU's total CO<sub>2</sub> emissions (EASA n.y.). The highest level of CO<sub>2</sub> emissions in aviation was so far reached in 2019, while excluding the year 2012, which also covered CO<sub>2</sub> emissions of third countries' aircraft operators. In fact, the limitation of the EU-ETS to flights within the EEA from 2013 was agreed in Regulation No. 421/2014 and extended until the end of 2023 by Regulation (EU) 2017/2392.

Between 2019 and 2020, the verified CO<sub>2</sub> emissions from aviation dropped sharply by -63.5%, as air travel mostly halted during the pandemic (ETC/CME 2021, EEA 2022). This sudden drop of GHG emissions in aviation in 2020 is attributed to the COVID-19 pandemic's impact and the restrictions of free movement of people, which led to the nearly complete suspension of flights and the steep decline of GHG emissions from aviation.

### 3. Changes in the aviation sector's CO<sub>2</sub> emissions in 2021

Regarding the reporting of CO<sub>2</sub> emissions for 2021 under the EU-ETS, the reporting has been above 95% for most sectors and countries (EEA n.y.a). All airline operators were required to report their verified CO<sub>2</sub> emissions for the year of 2021 by 31 March 2022. The verified data was published on the website of the EUTL on 1 April 2022 (European Commission 2022).

In 2021, the total GHG emissions covered by the EU-ETS increased again by 7.3% compared to 2020 levels. This 7.3% increase results from an 8.3% increase in emissions from the power sector, an increase of 5.2% from main industrial sectors, and an increase of 8.7% of CO<sub>2</sub> emissions from the aviation sector, based on verified data as accounted by March 2022 in the EU log (European Commission 2022). This increase of 8.7% followed a decrease of -61% for aviation in 2021 compared to 2019 (European Commission 2022). Verified emissions from aircraft operators amounted to

26.87 million tonnes of CO<sub>2</sub> in 2021 (European Commission 2022). This represents an approximately 8.7% increase compared to the 24.71 million tonnes reported in 2020, but it is still -61% lower than the 68.2 million tonnes of CO<sub>2</sub> emissions in the last pre-pandemic year 2019 (European Commission 2022).

It is also important to note that as of 2021, the EU-ETS for aviation no longer covers flights arriving from the UK, due to the UK's withdrawal from the EU and the ending of the Brexit transition period on 31 December 2020. Taking this scope change into account, and that CO<sub>2</sub> emissions of the UK's aviation sector are no longer covered by the EU-ETS for aviation in 2021, while it still was included in 2020, the CO<sub>2</sub> emissions from aviation covered without the UK in 2021 still decreased by -50% as compared with 2019 (European Commission 2022). Therefore, with the recovery of commercial flights in 2022, it will be only a matter of time that the GHG emissions of aviation will bounce back to pre-pandemic levels. Therefore, it is expected that under current and planned measures, the CO<sub>2</sub> emissions will only decrease in the coming decade, if significant efforts are taken, in particular in the aviation sector.

According to the EU Member States' GHG projections in accordance with EU legislation, the overall EU-ETS emissions are expected to decrease by between -41% and -48% by 2030, and by between -55% and -62% by 2040, compared to 2005 levels (EEA 2022). However, it will need decisive measures to reduce GHG emissions in particular from the aviation sector as otherwise, the GHG emissions in this sector will continue to increase (EEA n.y.b). In fact, in mid-term, it will highly depend on the thorough introduction of measures related to the increase in the use of SAF under the planned ReFuelEU Aviation regulation and on the technical development of alternative propulsion systems for aircraft, as



well as on the reform of the taxation system related to aviation (EEA n.y. b).

#### 4. Conclusion

Based on the recent figures of verified CO<sub>2</sub> emissions of the aviation sector in the EEA, aircraft operators showed a decrease of verified CO<sub>2</sub> emissions of -61% in tonnes of CO<sub>2</sub> in 2021 compared to 2019. This decrease is attributed to the fact, that in 2021, air traffic only increased temporarily and remained at a significantly lower level than in the last pre-pandemic year 2019. However, the beginning of a resurgence of commercial flights in the EEA in 2021 already caused a visible increase in CO<sub>2</sub> emissions from aviation. The fact that some of the EU Member States have already nearly completely narrowed the gap regarding the the number of commercial flights in March 2022, compared with March 2019, indicates that not only the number of flights will soon reach pre-pandemic levels. With the further increase in the number of commercial flights, also the GHG emissions will subsequently reach pre-pandemic level. It can be expected that with the recovery of commercial flights in 2022, it will be only a matter of time that the GHG emissions of aviation will bounce back to pre-pandemic levels and increase even beyond.

It remains to be seen if the European Commission's proposed ReFuelEU Aviation regulation, mandating a minimum SAF blending volume in aviation fuel, with the target of reaching a share of SAFs of 2% in 2025, 5% in 2030 and 63% in 2050, will achieve a significant reduction of CO<sub>2</sub> emissions in aviation. However, it can be expected that the aviation sector will need even more decisive measures to persistently and sustainably reduce its GHG emissions.

#### References

Abrell, Jan: Database for the European Union Transaction Log. In:

[https://euets.info/static/download/Description\\_UTL\\_database.pdf](https://euets.info/static/download/Description_UTL_database.pdf), May 21, 2021

COM (2021) 551 final: Proposal for a Directive of the European Parliament and of the Council amending Directive 2003/87/EC establishing a system for greenhouse gas emission allowance trading within the Union, Decision (EU) 2015/1814 concerning the establishment and operation of a market stability reserve for the Union greenhouse gas emission trading scheme and Regulation (EU) 2015/757 “(COM (2021) 551 final). In: [https://ec.europa.eu/info/sites/default/files/re-vision-eu-ets\\_with-annex\\_en\\_0.pdf](https://ec.europa.eu/info/sites/default/files/re-vision-eu-ets_with-annex_en_0.pdf), 14 July 2021, accessed on 17 January 2022

COM(2021) 552 final: Proposal for a Directive of the European Parliament and of the Council amending Directive 2003/87/EC as regards aviation's contribution to the Union's economy-wide emission reduction target and appropriately implementing a global market-based measure (COM (2021) 552 final). In: [https://ec.europa.eu/info/sites/default/files/re-vision\\_of\\_the\\_eu\\_emission\\_trading\\_system\\_for\\_aviation.pdf](https://ec.europa.eu/info/sites/default/files/re-vision_of_the_eu_emission_trading_system_for_aviation.pdf), 14.7.2021, accessed on 20 July 2021

COM (2021) 561 final: Proposal for a REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on ensuring a level playing field for sustainable air transport. COM (2021) 561 final. In: [https://ec.europa.eu/info/sites/default/files/re-fueleu\\_aviation\\_-\\_sustainable\\_aviation\\_fuels.pdf](https://ec.europa.eu/info/sites/default/files/re-fueleu_aviation_-_sustainable_aviation_fuels.pdf), accessed on 20 July 2021

EASA (n.y.): Emissions. In: <https://www.easa.europa.eu/eaer/topics/overview-aviation-sector/emissions>, accessed 3 May 2022

ETC/CME (2021): Nissen, C.; Cludius, J.; Graichen, V.; Graichen, J.; Gores, S.: Trends and projections in the EU ETS in 2021. The EU Emissions Trading System in numbers. In: <https://www.eionet.europa.eu/etcs/etc-cme/products/etc-cme-report-9-2021-trends-and-projections-in-the-eu-ets-in-2021-the-eu-emissions-trading-system-in-numbers>, ETC/CME

Eionet Report | 9/2021, December 2021, accessed on 17 January 2022

European Commission (n. y. a): Union Registry. In: [https://ec.europa.eu/clima/eu-action/eu-emissions-trading-system-eu-ets/union-registry\\_en#tab-0-1?languageCode=en](https://ec.europa.eu/clima/eu-action/eu-emissions-trading-system-eu-ets/union-registry_en#tab-0-1?languageCode=en), no year, accessed 3 May 2022

European Commission (n. y. b): Reducing emissions from aviation. In: [https://ec.europa.eu/clima/eu-action/transport-emissions/reducing-emissions-aviation\\_en#aviation-emissions](https://ec.europa.eu/clima/eu-action/transport-emissions/reducing-emissions-aviation_en#aviation-emissions), no year, accessed 3 May 2022

European Commission (n. y. c): Aviation and the EU ETS. In: [https://ec.europa.eu/clima/eu-action/european-green-deal/delivering-european-green-deal/aviation-and-eu-ets\\_en](https://ec.europa.eu/clima/eu-action/european-green-deal/delivering-european-green-deal/aviation-and-eu-ets_en), no year, accessed 3 May 2022

European Commission (2021a): Questions and Answers - Emissions Trading - Putting a Price on carbon. In: [https://ec.europa.eu/commission/presscorner/detail/en/qanda\\_21\\_3542](https://ec.europa.eu/commission/presscorner/detail/en/qanda_21_3542), 14 July 2021, accessed 6 May 2022

European Commission (2022): Emissions trading: greenhouse gas emissions up by 7.3% in 2021 compared with 2020. In: [https://ec.europa.eu/clima/news-your-voice/news/emissions-trading-greenhouse-gas-emissions-73-2021-compared-2020-2022-04-25\\_en](https://ec.europa.eu/clima/news-your-voice/news/emissions-trading-greenhouse-gas-emissions-73-2021-compared-2020-2022-04-25_en), 25 April 2022, accessed 2 May 2022

European Environment Agency (EEA) (n. y. a): Climate and Energy in the EU. Intro. In: <https://climate-energy.eea.europa.eu/topics/climate-change-mitigation/european-trading-system-emissions/intro>, no year, accessed on 6 May 2022

European Environment Agency (EEA) (n. y. b): Climate and Energy in the EU. Data. In: <https://climate-energy.eea.europa.eu/topics/climate-change-mitigation/european-trading-system-emissions/data>, no year, accessed on 6 May 2022

[emissions/data](#), no year, accessed on 17 January 2022

European Environment Agency (EEA) (2021): EU Emissions Trading System (ETS) data viewer. In: <https://www.eea.europa.eu/data-and-maps/dashboards/emissions-trading-viewer-1>, 5.8.2021, accessed 3 May 2022

European Environment Agency (EEA 2022): The EU Emissions Trading System in 2021: trends and projections. In: <https://www.eea.europa.eu/publications/the-eu-emissions-trading-system-2>, 12 Jan 2022, accessed 6 May 2022

Eurostat (2021a): Commercial air transport in June 2021: preparing for take-off? In: <https://ec.europa.eu/eurostat/web/products-eurostat-news/-/ddn-20210712-1>, 12/07/2021, accessed on 17 January 2022

Eurostat (2021b): Commercial air transport in August 2021: in recovery. In: <https://ec.europa.eu/eurostat/web/products-eurostat-news/-/ddn-20210914-1>, 14/09/2021, accessed on 17 January 2022

Eurostat (2022): Commercial flights in December 2021: closest yet to 2019 figures. In: <https://ec.europa.eu/eurostat/en/web/products-eurostat-news/-/ddn-20220112-1>, 12/01/2022, accessed on 18 January 2022

Eurostat (2022): Commercial flights see some improvement in March 2022. In: <https://ec.europa.eu/eurostat/web/products-eurostat-news/-/ddn-20220414-1>, 14/04/2022, accessed 3 May 2022