Scoping voluntary corporate climate action in the European aviation sector

Report prepared by Öko-Institut for Carbon Market Watch (CMW)

Berlin, July

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Executive Summary

Over the past two decades, CO_2 emissions from aviation have increased rapidly to around 1,000 Mt in 2019. Although the energy intensity of commercial passenger aviation has declined, due to improvements in the operational and technical efficiency measures adopted by airlines, this has been more than offset by the CO_2 emissions resulting from the rapid growth in passenger numbers. Despite a sudden decline in CO_2 emissions to 600 Mt in 2020, as a consequence of the Covid-19 pandemic, CO_2 emissions returned to growth again in 2021 reaching 720 Mt and accounting for over 2 % of global energy-related CO_2 emissions. The IEA expects that this trend will continue and that CO_2 emissions from global aviation will surpass the 2019 level in the next few years.[1]

In response to environmental concerns, airline operators have recently started to facilitate the offsetting of emissions of both their employee and passenger flights. Beyond value chain mitigation (BVCM) refers to "mitigation action or investments that fall outside of a company's value chain, [which,] includes activities that avoid or reduce greenhouse gas emissions, and those that remove and store greenhouse gases from the atmosphere."[2] The need for the aviation sector in particular to consider BVCM approaches reflects the fact that the sector is characterised by a steep abatement cost curve. As a consequence, efforts to offset emissions will be necessary in the short term until more innovative abatement options in the aviation sector become viable both technically and economically.

The BCVM approaches for eight European airlines (i.e. easyJet, Ryanair, Lufthansa, British Airways, Air France, KLM, Wizz Air and SAS Airlines), which were collectively responsible for over half of the total CO_2e emissions of the aviation sector in the EU in 2019,[3] were assessed in this study to provide insights with regards to both the scale and quality of efforts, beyond the value chain, to mitigate the negative environmental impacts associated with air travel. Following a comprehensive review of the literature, a series of indicators were developed that could be replicated for each airline in order to provide the means of comparison between the different BVCM approaches adopted. Key findings from the study include:

- The average estimated price for the carbon credits purchased is varied but are still all well below the cost of abatement in the aviation sector. It is not, however, the only consideration for determining the quality of a carbon credit.
- Carbon credits are not a homogenous product. Airline operators often cite the certification of the projects within their offset portfolio (i.e. Gold Standard, Verified Carbon Standard) as a means of providing a level of reassurance regarding the quality of the carbon credits used to offset their emissions from flights. However, while such certification standards produce much needed oversight, the reliance upon relatively cheap forestry projects in developing countries by nearly all of the airlines assessed in this study is potentially a concern depending on the type of forestry project.
- There is a lack of transparency in the reporting of the BCVM approaches adopted by the airline operators under consideration in this study. The lack of information undermines consumer confidence and should be urgently addressed and perhaps even regulated by Member States in order to mandate greater transparency.

1 https://www.iea.org/reports/aviation
2 https://sciencebasedtargets.org/resources/files/Beyond-Value-Chain-Mitigation-FAQ.pdf
3 Calculation based upon data extracted from the EUTL dataset in July 2022.

- The volume of carbon credits purchased is strongly influenced by the degree to which the airline's emissions are offset. Indeed, the most ambitious BCVM approach, with regards only to the volume of carbon credits purchased to offset emissions, is currently provided by easyJet. The airline directly offsets all of the CO_2e emissions associated from passenger flights on behalf of its customers automatically and at no additional cost. For offset provisions that rely completely upon the action of the consumer such as Ryanair and Wizz Air, the volume of carbon credits purchased are considerably less due to a low rate of uptake.

Next to these findings, it should be noted that voluntary use of carbon credits to offset the emissions of the aviation sector may suggest to customers that it is possible to fly in a 'carbon neutral' manner which could lead to an increase in passenger air traffic at exactly the time when the scientific community is urging us all to fly less. As this is not compatible with the business models of the airline operators, offsetting may be a convenient solution that, however, will not actually contribute to decarbonizing the aviation sector through the use of sustainable aviation fuels (SAF) whilst increasing air passenger traffic. Some airline operators may offer the voluntary option for customers to contribute to the development of SAF but no airline fully discloses how many customers actually take up this offer. The quality of some of the carbon credits used by the airlines assessed in this study has been questioned and this inevitably will lead to further questions regarding whether the BCVM approaches adopted by airlines will only be sustainable in the longer term if carbon credits are secured at low prices. If so, will this BCVM approach actually encourage the change required to travel by air sustainably? Offsetting can undoubtedly empower consumers to make better choices, however voluntary action alone is unlikely to be sufficient to encourage the scale of change required to deliver a low carbon aviation sector.

1 Introduction

Over the past two decades, CO_2 emissions from aviation have increased rapidly to around 1,000 Mt in 2019. Although the energy intensity of commercial passenger aviation has declined, due to improvements in the operational and technical efficiency measures adopted by airlines, this has been more than offset by the CO_2 emissions resulting from the rapid growth in passenger numbers. Despite a sudden decline in CO_2 emissions to 600 Mt in 2020, as a consequence of the Covid-19 pandemic, CO_2 emissions returned to growth again in 2021 reaching 720 Mt and accounting for over 2 % of global energy-related CO_2 emissions. The IEA expects that this trend will continue and that CO_2 emissions from global aviation will surpass the 2019 level in the next few years.[4]

The Paris Agreement set the global ambition for the level of emissions reduction necessary to prevent global temperature rising in excess of 1.5 C°. International aviation is not specifically mentioned in the final text; however emission reductions will be required if the economy wide target is to be achieved. The Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) was therefore adopted by the International Civil Aviation Organisation (ICAO) in 2016 and is considered complementary to a broader package of measures to help the aviation sector achieve carbon-neutral growth from 2020 onwards. CORSIA relies on the use of emissions units from the carbon market to offset the amount of CO_2 emissions that cannot be reduced through the use of technological and operational improvements, and sustainable aviation fuels (SAF). The EU confirmed in 2020 that it would participate in the pilot phase of CORSIA from 2021 onwards which now applies to all extra-EEA flights. The EU ETS applies to all intra-EEA flights and negotiations on a revision to the EU ETS for Phase IV are ongoing and could potentially lead to a phasing out of the free allocation that is currently received by airline operators.

In addition to top-down regulation from ICAO and the EU, airline operators have also become increasingly under pressure from bottom-up movements (i.e. flight shame or flygskam) to be more proactive and respond to the emerging consumer need for a more sustainable aviation industry. In response to these developments, airline operators have recently started to facilitate the offsetting of emissions of both their employee and passenger flights. Beyond value chain mitigation (BVCM) refers to "mitigation action or investments that fall outside of a company's value chain, [which,] includes activities that avoid or reduce greenhouse gas emissions, and those that remove and store greenhouse gases from the atmosphere."[5] The need for the aviation sector in particular to consider BVCM approaches (i.e. such as the purchase of REDD + carbon credits or the investment in carbon dioxide removal (CDR) technologies) reflects the fact that the sector is characterised by a steep abatement cost curve.

The aim of this study is to assess the BVCM approaches that have been adopted by the leading airlines in the EU to understand how they vary in terms of both scale and quality. The process for selecting the airlines of interest in this study is outlined in the methodology in Section 2 along with an overview of the key indicators that were collected as part of the review of the literature. The results for each of the selected airlines in this assessment will then be presented separately in Section 3 and will be followed by a discussion of the key findings of the assessment in Section 4 The main output of the study is the Airline Operator BVCM matrix (provided at the end of Section 4), which provides a summary of the key indicators in order to transparently assess the adoption of BVCM approaches across the aviation sector in the EU.

4 https://www.iea.org/reports/aviation
5 https://sciencebasedtargets.org/resources/files/Beyond-Value-Chain-Mitigation-FAQ.pdf

2 Methodology

The objective of this study was to assess the scale and quality of the BVCM approaches that have so far been adopted by airline operators in the EU. The assessment was carried out as follows:

1) The first step of the methodology involved the identification of the largest European airlines taking into account both passenger numbers in 2021 obtained from Statista and verified CO_2e emissions accessed from the EUTL. The focus of the study was on the BVCM approaches of airline operators rather than larger airline groups. We therefore selected the largest and most relevant airline operator from both the Lufthansa Group and IAG to act as representatives.

2) The second step of the methodology involved a comprehensive literature review to document the BVCM approaches adopted by each airline operator selected for the study. Information was collected from a range of publicly available sources (i.e. such as annual reports or other publications from operator websites) and summarised, building upon previous research undertaken. The summary includes information on the approach of each airline towards the offsetting of both the emissions associated with their corporate and customer flights.

3) The third step of the methodology involved an assessment of the scale and quality of the BVCM approaches adopted by the selected airline operators. A combination of information and indicators were developed that could be produced for each airline in order to provide the means of comparison between the different BVCM approaches adopted. Information collected and indicators developed included:

    a. **Level of ambition**

        i. *Emissions offset by the airline operator:*

            - Offset all emissions associated with commercial flights;
            - Offset all emissions associated with domestic flights.

        ii. *Emissions offset by the airline passenger:*

            - Offset related to the emissions of the flight or just a flat fee;
            - Choice of options for offsetting such as projects or SAF options.

    b. **Estimation of carbon obligation**

        i. *Includes CO_2 emissions only or also takes into account non-CO_2 emissions and their impact at higher levels of altitude;*

        ii. *Ex-post calculation based on actual data;*

        iii. *Ex-ante estimation based on several assumptions;*

        iv. *Adjustments to avoid double counting.*

    c. **Information on carbon credits**

        i. *Volume;*

ii. *Estimated average price derived from the information provided by the carbon calculator of each airline;*

iii. *Transparency based upon the volume of credits that have been retired on behalf of the airline operator;*

iv. *Quality based upon project type, location and standard of certification:*

   - Where applicable the online tool provided by the Carbon Credit Quality Initiative (CCQI)[6] was used to provide a first indication of the quality of a BVCM based on the types of projects included in their portfolio. It is important to emphasise that this is not an assessment of specific projects, which is beyond the scope of this study, but simply provides insights into the quality of a generic project type.

4) The final step of the methodology involved the creation of an Airline Operator BVCM matrix to provide an illustrative summary for comparison purposes of the different approaches undertaken by the largest European Airlines considered in the study. The intention is to provide an accessible format to inform consumers on the similarity and differences between the leading airline operators within the EU.

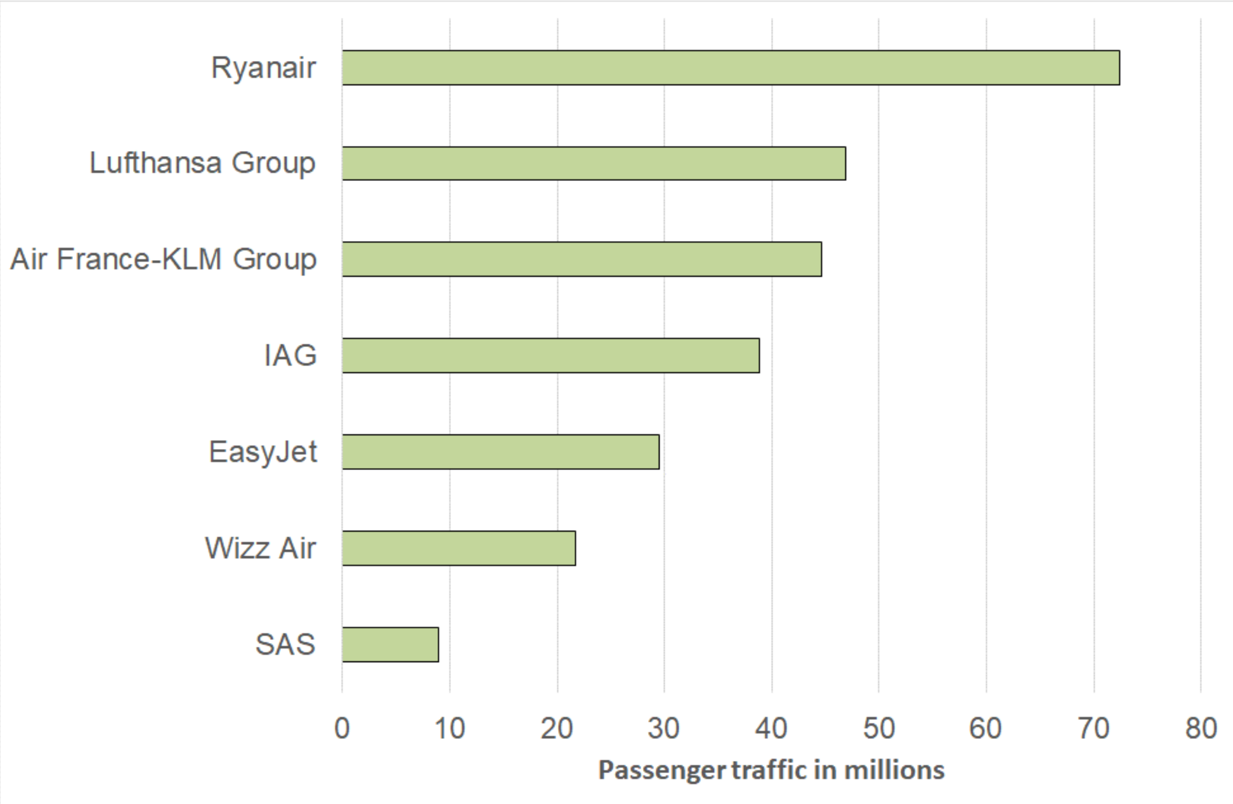
[6] https://carboncreditquality.org/index.html

3 Results

3.1 Selection of airline operators

Figure 3-1 provides an overview of the largest airlines (or airline groups) based on passenger numbers in Europe in 2021. The information collected by Statista from a variety of secondary sources included airline operators from Russia (i.e. Aeroflot, S7 Airlines) and Turkey (i.e. Turkish Airlines, Pegasus Airlines). However, the focus of this study is on airline operators based within the EU in order to compare verified emissions from the EUTL with the volume of emissions offset via their BVCM approaches. As a consequence, Russian and Turkish airlines were not considered in this study despite their high level of passenger traffic in Europe in 2021. The information provided by Statista is not disaggregated beyond the airline groups shown in Figure 3-1.

Figure 3-1: Largest airlines in the EU based on passenger traffic in Europe in 2021

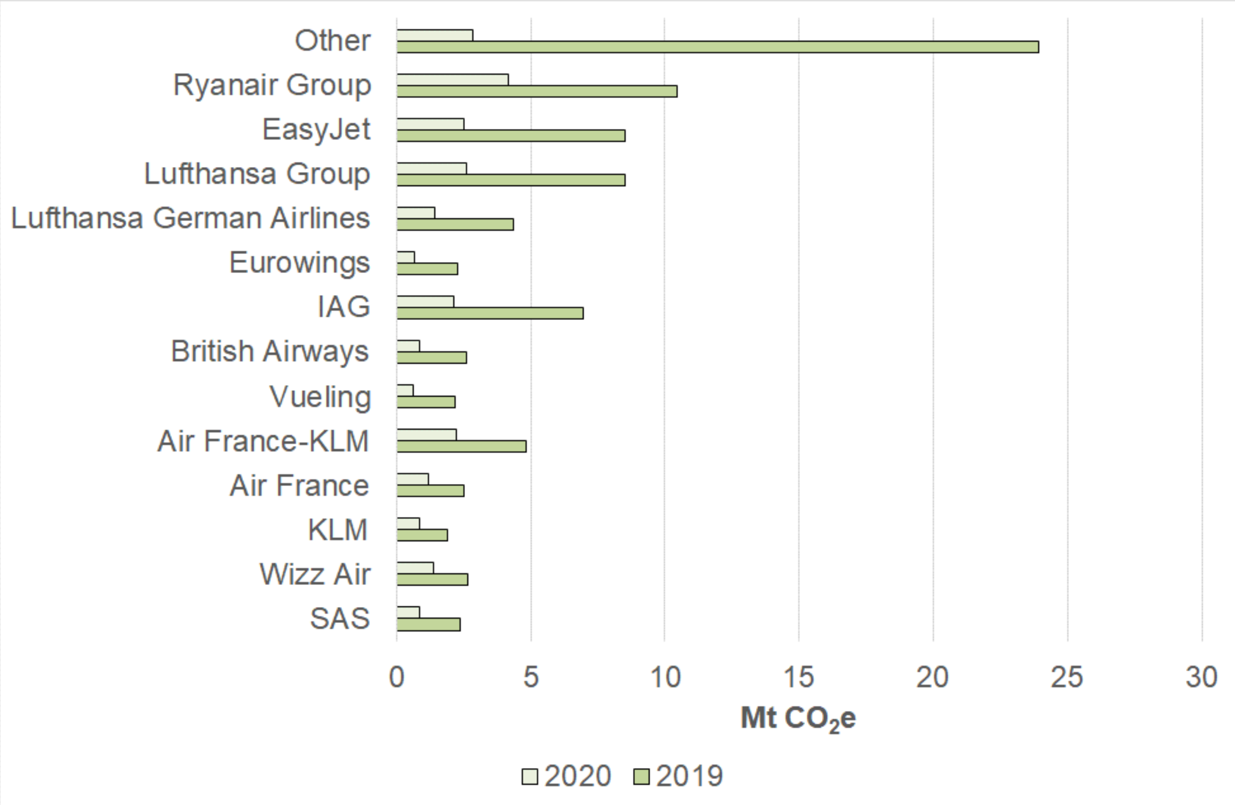


Source: https://www.statista.com/statistics/1094759/largest-airlines-in-europe-based-on-passengers/

Figure 3-2 provides the CO_2e emissions of the largest airlines (or airline groups) in the EU that were identified previously based on passenger traffic from the EUTL. It is important to acknowledge that not all emissions are covered within the scope of the EU ETS (i.e. such as for flights entering and exiting Europe).[7]

[7] Refer to https://carbonmarketwatch.org/2021/03/29/lufthansa-ba-air-france-were-europes-most-polluting-airlines-pre-covid/

Figure 3-2: Verified emissions of the largest airlines subject to the EU ETS



Note: Refers to the CO_2e emissions of airline operators that are covered under the EU ETS. Attribution of installation IDs within the EUTL dataset to airline operators based on expert judgement.

Source: EUTL (2022), Own calculation.

For the airline groups, the larger airlines in terms of the CO_2e emissions covered under the EU ETS are also included in Figure 3-2 in order to determine which airlines from each airline group should be selected for further consideration in this study.

- The **Lufthansa Group** includes the network airlines (i.e. Lufthansa German Airlines, SWISS, Austrian Airlines and Brussels Airlines). Eurowings is also within the Lufthansa Group and focuses on short-haul traffic in European point-to-point traffic. Lufthansa German Airlines and Eurowings accounted for 51 % and 27 % respectively of the 2019 emissions of the Lufthansa Group. Both airlines use Compensaid to provide offsets to their customers that are delivered by the project portfolio managed by myclimate on behalf of the Lufthansa Group. However, given that Lufthansa German Airlines accounted for the largest share of CO_2e emissions for the Lufthansa group, it was the airline selected for further assessment.
- The **International Airlines Group (IAG)** includes Aer Lingus, British Airways, Iberia, Level and Vueling. British Airways and Vueling Airlines accounted for 37 % and 32 % respectively of the 2019 emissions of the IAG Group. While British Airways provides customers with the option to offset emissions via the Pure Leapfrog platform, Vueling does not provide a similar option to its customers preferring to focus on improving the CO_2 efficiency of their

operations.[8] Given that information on offsetting is only aggregated to IAG as a whole we present this information and then provide examples from British Airways in this study.

- The **Air France-KLM group** includes Air France, KLM and Transavia Airlines. Air France and KLM accounted for 52 % and 39 % respectively of the 2019 emissions of the Air France-KLM group. Given that these two airline operators account for a large share of the total emissions of the group we included both airlines in the assessment.

The final selection of airlines after the screening process included the following:

- Ryanair;
- easyJet;
- Lufthansa Group (Lufthansa German Airlines);
- IAG (British Airways);
- Air France;
- KLM;
- Wizz Air;
- SAS.

This selection accounts for around 65 % of the verified EU ETS emissions for the aviation sector including the emissions of the airline groups (i.e. Lufthansa Group, IAG and Air France-KLM).

3.2 Offset program and project profiles by carrier

3.2.1 Ryanair

3.2.1.1 Corporate offsetting:

Within the Ryanair Sustainability Report for 2021, it is specifically stated that carbon credits will be purchased to contribute towards the achievement of a net zero target for 2050.[9] However, no offsetting of corporate emissions were documented.

3.2.1.2 Customer offsetting:

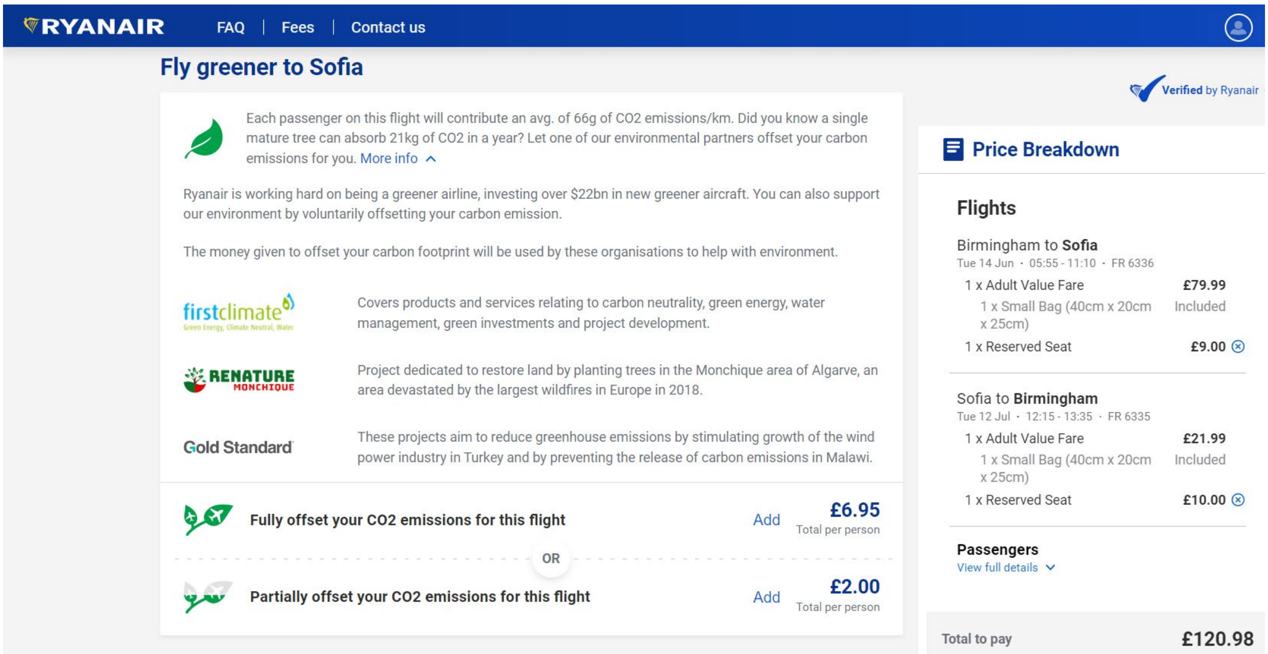
Over the last few years, the approaches of Ryanair to beyond value chain mitigation have evolved from simply enabling its customers to make a voluntary carbon offset contribution, which was initially set at a flat rate of only £1 per booking (subsequently this was increased to £2 per booking in April 2020), to an offering as of 2022 that also allows customers to voluntarily offset their entire emissions from a flight. The total CO_2 emissions is calculated automatically during the online booking process taking into account both the distance of the flight in kilometers and the average CO_2 intensity per passenger per km. Currently a value of 66g of CO_2 per passenger per km is assumed by the carbon calculator and this is based on an average value published for the FY 2019.[10] However, higher CO_2 intensities were reported in 2020 and 2021 reflecting the impact of Covid-19 and the lower load

8 Sustainability - Vueling
9 2021-Sustainability-Report_Spreads.pdf (ryanair.com)
10 Our Emissions | Ryanair's Corporate Website

factors of flights. The extent to which the CO_2 intensity value is updated within the carbon calculator will have a crucial impact on the environmental integrity of the offsetting scheme.

Figure 3-3 shows the two offsetting options available to a Ryanair customer for a flight from Birmingham to Sofia i.e. a partial offset option of a £2 flat fee or a full offset option of £6.95 based on the result of Ryanair's carbon calculator. Given that the distance between Birmingham and Sofia is 2,165 km[11] each way, it is possible to estimate an approximate cost per tonne of CO_2 to the customer of £24 by firstly multiplying the flight distance by the average CO_2 intensity per passenger per km and then secondly dividing the resulting CO_2 emissions by the cost of the full offset option.

Figure 3-3: Current options for offsetting at Ryanair[12]



Source: Ryanair (2022).

The majority of the carbon credits purchased on behalf of Ryanair customers are delivered by the following four projects:

1) Reforestation in the Algarve (Renature Monchique);
2) Ugandan cookstove (Gold Standard) project (First Climate);
3) Wind Power project (Gold Standard) in Turkey (Enerjisa Enerji);
4) Improved Kitchen Regimes project (Gold Standard) in Malawi (CO_2 Balance).

According to Ryanair's Sustainability Report for 2021, the carbon offset scheme has raised €3.5m so far, with 3 % of customers having contributed to date.[13] The volume of offsets purchased for each project is, however, not fully documented by Ryanair. It appears that €488,000 of the money raised

11 Birmingham to Sofia distance (BHX to SOF) | Air Miles Calculator
12 Booking information was obtained from the Ryanair website in June 2022.
13 2021-Sustainability-Report_Spreads.pdf (ryanair.com)

from the carbon offset scheme has been allocated for the Reforestation in the Algarve project[14] that is not verified under a certification standard and no claims are made by Ryanair with regards to the associated emission reductions from the planting of over 135,000 trees.[15] The emission reductions of the remaining projects are all verified by either the Gold Standard or the Verified Carbon Standard and if we divide the previously calculated cost per tonne of CO_2 to the customer of £24 (converted to €28)[16] to the remaining money raised by the carbon offset scheme, it is possible to approximate that around 106,000 carbon credits were purchased by Ryanair on behalf of their customers, which we simply assume is evenly distributed over 2019-21. This is considerably lower in magnitude than the verified emissions of the airline operator (refer to Figure 3-2) and reflects the low level of adoption of the offsetting option by Ryanair customers.

A detailed assessment of the quality of the credits purchased by Ryanair is beyond the scope of the study, however, we can make some general observations based upon the output from the recently published Carbon Credit Quality Initiative (CCQI). Table 3-1 shows the quality rating of a generic cookstove project based in Uganda that has a Gold Standard certification. While the environmental and social impacts of such an offset project score highly under the CCQI, it is evident that there are challenges with regards to how GHG emission reductions are determined and especially with regards to addressing the issue of non-permanence (i.e. natural disturbance risks may reverse emission reductions from the reduced demand for non-renewable biomass). It is expected that the Improved Kitchen Regimes project in Malawi that is also certified under the Gold Standard would share very similar characteristics with regards to credit quality as the generic cookstove project shown in Table 3-1.

Table 3-1: Assessment of the quality of the carbon credits from cookstove projects in Uganda by the Gold Standard based on CCQI

Quality criteria	Rating
Robust determination of the GHG emission impact	2
Avoiding double counting	2
Addressing non-permanence	1
Facilitating transition towards net zero emissions	4
Strong institutional arrangements and processes	3
Environmental and social impacts	4
Host country ambition	N/R

Note: The country input into the CCQI tool for this example is Uganda, however results do not relate to a specific project and are only illustrative in nature based on project type.
Source: CCQI (2022).

[14] This value is calculated based on the money in 2019-2020 (refer to PowerPoint Presentation (geota.pt)) and 2020-21 (refer to PowerPoint Presentation (geota.pt))
[15] 2021-Sustainability-Report_Spreads.pdf (ryanair.com)
[16] Based on a conversion rate of £1 = €1.17 as of 12th of June 2022 (taken from www.xe.com)

The CCQI initially only covers a limited number of project types, which does not include wind power projects. However, the additionality of wind power projects in the CDM has previously been questioned with the revenue generated from the purchase of carbon credits argued to have only a limited impact on the profitability of wind power plants. Support schemes are often the main financial incentive to encourage the development of wind power and investment costs have decreased significantly in recent years further limiting the impact of revenue from carbon credits.[17] The additionality of the carbon credits purchased by Ryanair from the wind power project in Turkey should therefore be further assessed to ease any concerns regarding their environmental integrity.

3.2.2 easyJet

3.2.2.1 Corporate offsetting:

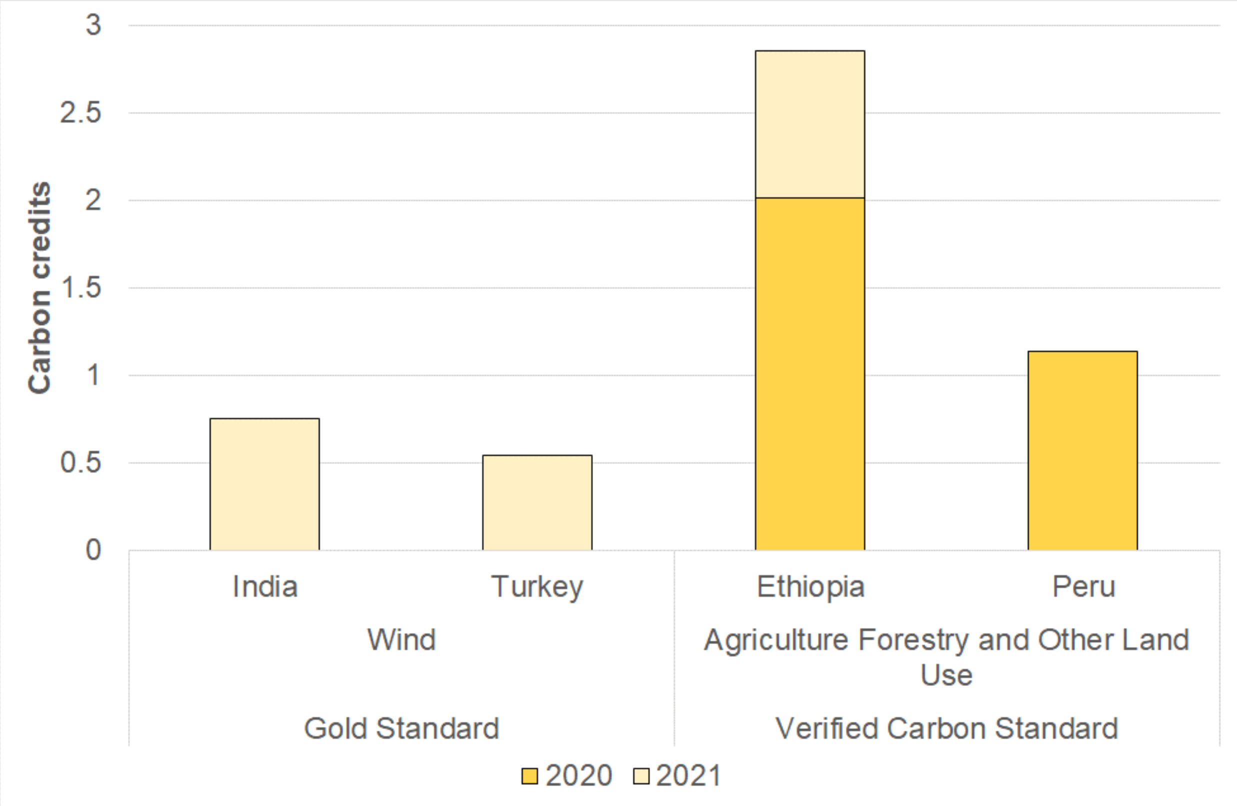
In November 2019, easyJet was the first airline operator to announce that they would offset 100 % of their CO_2e emissions from fuel and operations. Carbon credits are purchased from a portfolio of projects and retired on behalf of the consumer and at no additional cost. The CEO of easyJet has previously remarked that the airline operator has secured carbon credits for the offset programme at a relatively low cost of around £3 / tCO_2e by negotiating a three year forward contract and locking in 'wholesale' prices.[18] A company report stated in 2020 that easyJet has contractual commitments to purchase Verified Emission Reductions (VERs) worth £29 million in total until the end of 2022.[19] The portfolio of projects that easyJet purchases carbon credits from are transparently documented on their website[20] with certificates also provided to demonstrate when retirements have been made by the airline operator. Since November 2019, easyJet have retired 5.27 million carbon credits. This volume takes into account both CO_2 emissions and the carbon equivalent of non-CO_2 emissions.[21] The projects within the current portfolio can be categorised as follows:

1) REDD+ (Verified Carbon Standard) project in the Bale Mountains in Ethiopia;
2) REDD+ (Verified Carbon Standard) project in Madre de Dios in Peru;
3) Wind power (Gold Standard) projects in India;
4) Wind power (Gold Standard) projects in Turkey.

Figure 3-4 shows the volume of carbon credits that have been retired for easyJet to offset their CO_2e emissions for the years 2020 and 2021. In 2020, 100 % of the carbon credits purchased by easyJet were from REDD + projects in Ethiopia and Peru. However, in 2021 this declined to around 40 % with carbon credits no longer being purchased from Peru with a larger share of certificates instead purchased from wind power projects from India.[22] The discontinuation of purchasing REDD+ credits from Peru may reflect concerns raised over the fact that the project was being run by two logging companies that, although certified by the Forest Stewardship Council, were criticised for cutting down "old shihuahuaco trees that can take 1,000 years to reach full maturity".[23]

17 clean_dev_mechanism_en.pdf (europa.eu)
18 EasyJet to offset carbon emissions from all its flights | easyJet | The Guardian
19 h1-2020-results-full-rns.pdf (easyjet.com)
20 https://corporate.easyjet.com/corporate-responsibility/sustainability
21 https://www.easyjet.com/en/help/boarding-and-flying/sustainability
22 https://corporate.easyjet.com/corporate-responsibility/sustainability
23 Top airlines' promises to offset flights rely on 'phantom credits' - Unearthed (greenpeace.org)

Figure 3-4: Retirements of carbon credits by project type and by country for easyJet



Source: easyJet (2022); Own calculation.

A detailed assessment of the quality of the carbon credits purchased by easyJet is beyond the scope of the study, however, we can make some general observations based upon the output from the recently published CCQI. Table 3-2 shows the quality rating of a generic reforestation project based in Peru that has a Verified Carbon Standard certification. While this project type scores highly on facilitating transition towards net zero emissions under the CCQI on account that it can deliver negative emissions, there are challenges with regards to addressing the issue of non-permanence. Indeed, the VCS Standard, version 4.0 from September 2019, paragraph 3.2.17 allows project owners to re-establish the baseline in the case of catastrophic events. There are no limitations as to how the baseline is adjusted. The program is thus assigned a score of 1.

The CCQI initially only covers a limited number of project types, which does not include wind power projects. However, the additionality of wind power projects in the CDM has previously been questioned with the revenue generated from the purchase of carbon credits argued to have only a limited impact on the profitability of wind power plants. Support schemes are often the main financial incentive to encourage the development of wind power and investment costs have decreased significantly in recent years further limiting the impact of revenue from carbon credits.[24] The additionality of the carbon credits purchased by easyJet from the wind power project in India and Turkey should be further assessed to ease any concerns regarding their environmental integrity.

[24] clean_dev_mechanism_en.pdf (europa.eu)

Table 3-2: Assessment of the quality of the carbon credits from reforestation projects in Peru certified by the Verified Carbon Standard

Quality criteria	Rating
Robust determination of the GHG emission impact	1
Avoiding double counting	4
Addressing non-permanence	1
Facilitating transition towards net zero emissions	5
Strong institutional arrangements and processes	4
Environmental and social impacts	1
Host country ambition	N/R

Note: The country input into the CCQI tool for this example is Peru, however results do not relate to a specific project and are only illustrative in nature based on project type.
Source: CCQI (2022).

3.2.2.2 Customer offsetting

There is no option for customer offsetting as easyJet took the decision in November 2019 to offset the carbon emissions from the fuel used for all of its flights.

3.2.3 Lufthansa German Airlines

3.2.3.1 Corporate offsetting

According to the sustainability factsheet for 2019[25] and 2020,[26] the Lufthansa Group and its customers offset in total 181,000 and 105,000 tCO_2 respectively. For 2019, the Lufthansa Group directly offset 151,000 tCO_2 with the remainder customer contributions. No further disaggregation of the total volume is available for 2020. We estimate the offset volume for the Lufthansa German Airlines based on the simple assumption that it is proportional to their share of the verified total emissions of the Lufthansa Group (i.e. 51 % in 2019 and 55 % in 2020) and this results in an estimated offset volume of 92,310 tCO_2 in 2019 and 57,750 tCO_2 in 2020.

3.2.3.2 Customer offsetting:

The Compensaid platform, which was developed by the Lufthansa Innovation Hub in 2019, provides customers with two options for offsetting the emissions from their flight:

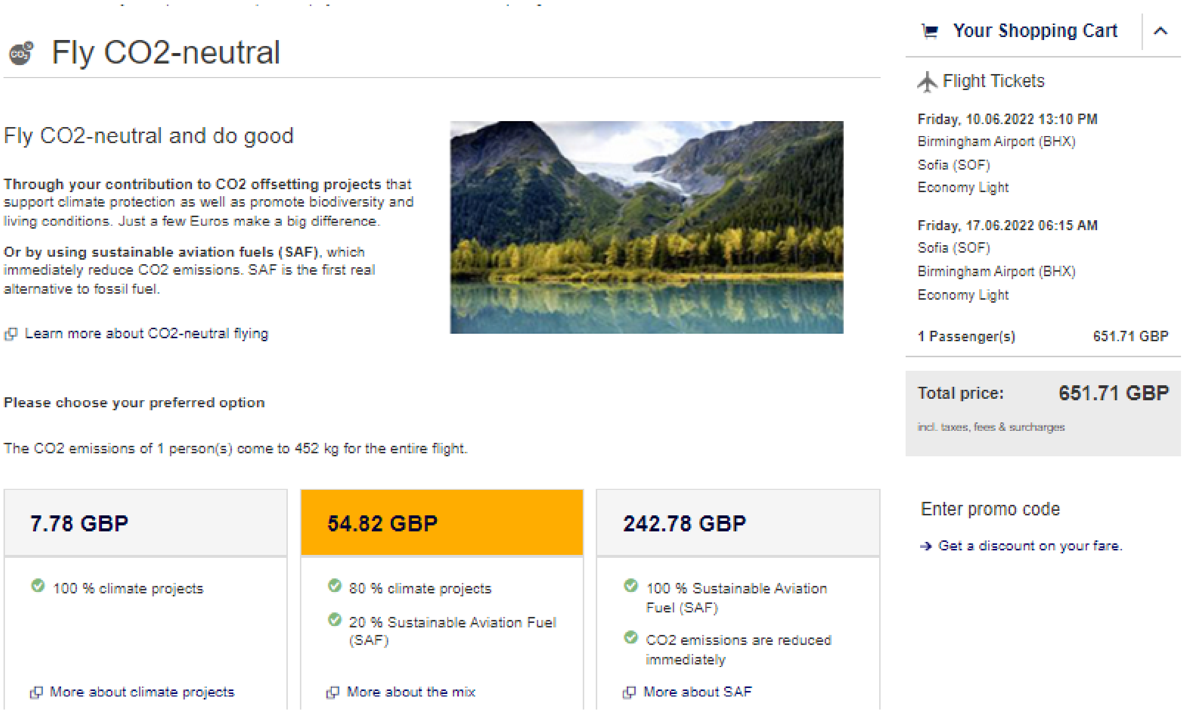
1) Replace fossil aviation fuels with Sustainable Aviation Fuel (SAF);

[25] LH-Factsheet-Sustainability-2019.pdf (lufthansagroup.com)
[26] LH-Factsheet-Sustainability-2020.pdf (lufthansagroup.com)

2) Support projects of the Swiss climate protection organization myclimate.

The total CO_2 emissions are calculated automatically during the online booking process. Figure 3-5 shows that the CO_2 emissions for one person on a return flight from Birmingham to Sofia by Lufthansa German Airlines is currently estimated to be 452 kg. This estimate only takes into account CO_2 emissions.[27] Based on the information provided it is possible to estimate an approximate cost per tonne of CO_2 to the customer of €17 by dividing the calculated carbon cost of the return flight (i.e. €7.78) by the CO_2 emissions associated with the return flight that have been converted into tonnes.[28] Given that the distance of a flight from Birmingham to Sofia is 2,165 km each way, it is possible to back calculate that the CO_2 intensity value per passenger per km was 104 gCO_2 /km.

Figure 3-5: Current options for offsetting at Lufthansa German Airlines[29]



Source: Lufthansa Group (2022).

The portfolio of carbon credits purchased by myclimate on behalf of the Lufthansa Group's customers include:[30]

1) Kakamega stove (Gold Standard) project in Kenya;

2) Improved cookstoves and clean water (Gold Standard) programme in Rwanda;

3) Solar and efficient stoves (Gold Standard) project in Madagascar;

27 https://compensaid.com/faq
28 Myclimate customers can offset their emissions from a return flight from Birmingham to Sofia (estimated to amount to 0.783 t) for around €23 by supporting offset projects in developing and newly industrialising countries.
29 Booking information was obtained from the Lufthansa website in June 2022.
30 https://compensaid.com/projects/portfolio

4) 60 MW Solar PV - Monte Plata (Gold Standard) project in the Dominican Republic;
5) BK Energia Itacoatiara (Gold Standard) biomass project in Brazil;
6) Community Reforestation (Plan Vivo) project in Nicaragua;
7) Königsmoor (Schleswig-Holstein) (Moors Futures) project in Germany;
8) Gelliner Bruch (Moors Futures) project in Germany.

According to sustainability reporting by the Lufthansa Group for 2021, their customers offset over 85,000 tonnes of CO_2 with climate protection projects between 2019 and 2021.[31] However, the contribution of customers is not clear for 2020 and 2021. The volume of offsets purchased for each project within its portfolio is also not published online by Lufthansa.

A detailed assessment of the quality of the credits purchased by the Lufthansa Group is beyond the scope of the study, however, we can make some general observations based upon the output from the recently published CCQI. Table 3-3 shows the quality rating of a generic cookstove project based in Kenya that has a Gold Standard certification. While the environmental and social impacts of such an offset project score highly under the CCQI, it is evident that there are challenges with regards to how GHG emission reductions are determined and especially with regards to addressing the issue of non-permanence (i.e. natural disturbance risks may reverse emission reductions from the reduced demand for non-renewable biomass). Based upon the CCQI methodology a cookstove project in Kenya is rated slightly lower in quality with regards to its environmental and social impacts than a similar project in Uganda (refer to Table 3-1) as it is not classified as either a Least Developed Country (LDC) or a Small Island Development State (SIDS).

Table 3-3: Assessment of the quality of the carbon credits from cookstove projects in Kenya by the Gold Standard based on CCQI

Quality criteria	Rating
Robust determination of the GHG emission impact	2
Avoiding double counting	2
Addressing non-permanence	1
Facilitating transition towards net zero emissions	4
Strong institutional arrangements and processes	3
Environmental and social impacts	3
Host country ambition	N/R

Note: The country input into the CCQI tool for this example is Kenya, however results do not relate to a specific project and are only illustrative in nature based on project type.
Source: CCQI (2022).

31 LH-Factsheet-Sustainability-2021.pdf (lufthansagroup.com)

3.2.4 British Airways

3.2.4.1 Corporate offsetting:

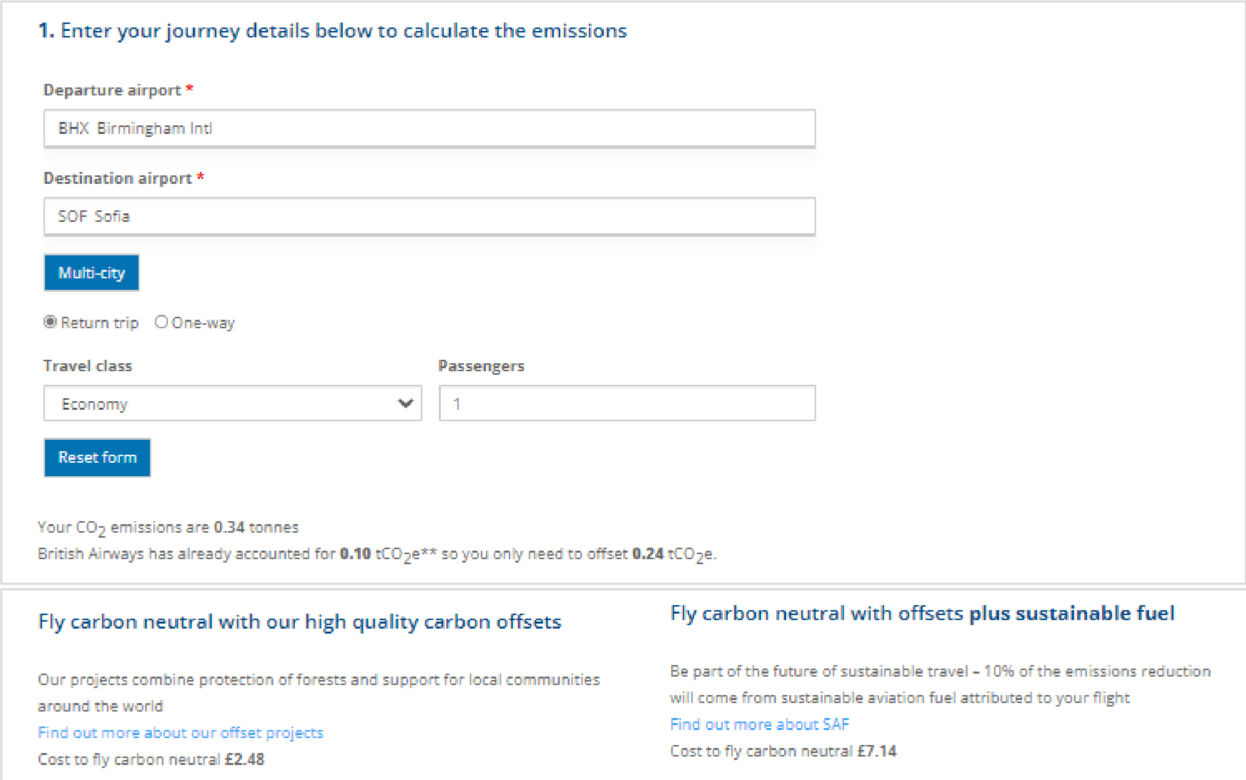
From 1 January 2020, British Airways will begin offsetting carbon emissions on all its flights within the UK, as part of the airline's commitment to achieving net zero carbon emissions by 2050. The domestic emissions of British Airways is estimated to be around 400,000 tCO_2 per year before the impact of the Covid-19 pandemic.[32] The airline operator clarifies that the offsetting of domestic emissions will only relate to those not already covered under government regulation.[33] Based upon the Annual Report of IAG for 2021, the net emission reductions via the voluntary funding (from IAG or customers) of internationally verified offsets or carbon removal projects in the UK amounted to 168,000 tCO_2e and 197,000 tCO_2e in 2020 and 2021 respectively.[34] Given that this net reduction relates to the whole IAG Group and includes customer offset contributions via the Leap Frog platform, it is unclear based on the information available if, and how, British Airways fulfil their pledge of offsetting their domestic emissions. More transparency would certainly be helpful to enhance the confidence of the consumer that the impacts of their domestic flights have been offset. Indeed, without greater levels of transparency then criticism[35] regarding the airline's funding of certain offset projects that may have over-estimated the potential impact of deforestation such as the REDD + project in the Cordillera Azul national park in Peru[36] are more difficult to dismiss.

3.2.4.2 Customer offsetting

British Airways offers customers the option to offset the emissions from their international flights via the Pure Leapfrog platform. Figure 3-6 shows that the CO_2e emissions for one person on a return flight from Birmingham to Sofia is estimated to be 340 kg.[37] Based on the information provided it is possible to estimate an approximate cost per tonne of CO_2e to the customer of £10[38] (converted to €12)[39] by dividing the calculated carbon cost of the return flight (i.e. £2.48) by the CO_2e emissions associated with the return flight minus the emissions already accounted for by British Airways (the airline operator prevents the double counting of carbon credits by adjusting the CO_2e emissions to be offset by the customer to take into account obligations under the UK and EU ETS and CORSIA). Given that the distance of a flight from Birmingham to Sofia is 2,165 km each way, it is possible to back calculate that the CO_2e intensity value per passenger per km was 79 gCO_2e /km. The carbon calculator uses average historical British Airways data from the most recent year. Given the scientific uncertainty in the further impacts of non-CO_2 emitted at high altitude (i.e. the contribution of aircraft emissions to the formation of additional cirrus clouds) a radiative forcing index of 1 is applied by British Airways. This is likely to under-estimate the CO_2e emissions that need to be offset given that higher values have been recommended in the scientific literature.[40]

32 British Airways to become first UK airline to offset carbon emissions on flights within the UK from 2020 (ba-groups.com)
33 British Airways | BRITISH AIRWAYS' UK OFFSETTING SCHEME TAKES OFF
34 annual-report-and-accounts-2021.pdf (iairgroup.com)
35 Top airlines' promises to offset flights rely on 'phantom credits' - Unearthed (greenpeace.org)
36 Cordillera Azul | Leapfrog (pureleapfrog.org)
37 "The emission metric British Airways use is the carbon dioxide equivalent (CO_2e) which takes into account other greenhouse gas emissions produced by aircraft" (refer to BA Carbon Neutral FAQs | Leapfrog (pureleapfrog.org)).
38 Our calculation is within the range of carbon prices documented here BA Carbon Neutral FAQs | Leapfrog (pureleapfrog.org)
39 Based on a conversion rate of £1 = €1.17 as of 12th of June 2022 (taken from www.xe.com)
40 https://www.easa.europa.eu/document-library/research-reports/report-commission-european-parliament-and-council

Figure 3-6: Current options for offsetting at British Airways[41]



Source: British Airways (2022).

The portfolio of carbon credits purchased by Pure Leapfrog on behalf of British Airways include:

1) The Mai Ndombe REDD+ (Verified Carbon Standard) project in western DRC;

2) Promoting improved cooking practices (Gold Standard) project in Nigeria.

It is also possible for the customer to increase the cost of their offset contribution to fund sustainable aviation fuel albeit limited to 10 % of the emission reduction.

A detailed assessment of the quality of the credits purchased by the British Airways is beyond the scope of the study, however, we can make some general observations based upon the output from the recently published CCQI. The REDD + project in western DRC and the cookstove project in Nigeria shares similar qualities at the project type level as those projects previously illustrated in Table 3-2 and Table 3-3 respectively. In general, both offset projects have concerns regarding the determination of GHG emissions and their permanence whilst are both potentially beneficial with regards to negative emissions and facilitating the transition towards net zero emissions. However more detailed research would be required to provide further insights into the quality of the offset projects currently provided by British Airways to their customers.

[41] Booking information was obtained from the British Airways website in June 2022.

3.2.5 Air France

3.2.5.1 Corporate offsetting:

Since January 1, 2020, Air France has been proactively offsetting 100 % of the CO_2 emissions generated by its domestic flights. Given that information on Air France's emissions are not public it was necessary to estimate the magnitude of the offset volumes based upon the following statements reported by the NGO Transport and Environment:

- For flights within Europe, Air France emitted 2.5 $MtCO_2$ in 2019;[42]
- Non-domestic flights are responsible for 90 % of airline emissions in Europe.[43]

Based upon these statements we can estimate that the domestic emissions of Air France were in the magnitude of around 250,000 tCO_2 to offset per year. The Annual Report for 2021 states that "Air France has compensated the CO_2 emissions of its customers on the French domestic routes. The purchase of credits representing the carbon compensation are accounted for as intangible assets, for an amount of €2 million as of December 31, 2021 (€2 million as of December 31, 2020)." [44] If we interpret this as an annual spend of around €2 million then the average cost of carbon credits purchased may be around €8 /tCO_2. If correct, this is considerably lower than the estimated offset price offered to Air France customers (refer to Section 3.2.5.2). The carbon credits purchased originate from certified projects in South America (Brazil, Columbia, Peru), Africa (Kenya) and Asia (India, Cambodia), selected with EcoAct. In addition, Air France and EcoAct will develop two projects in France, within the framework of a new low-carbon label.[45]

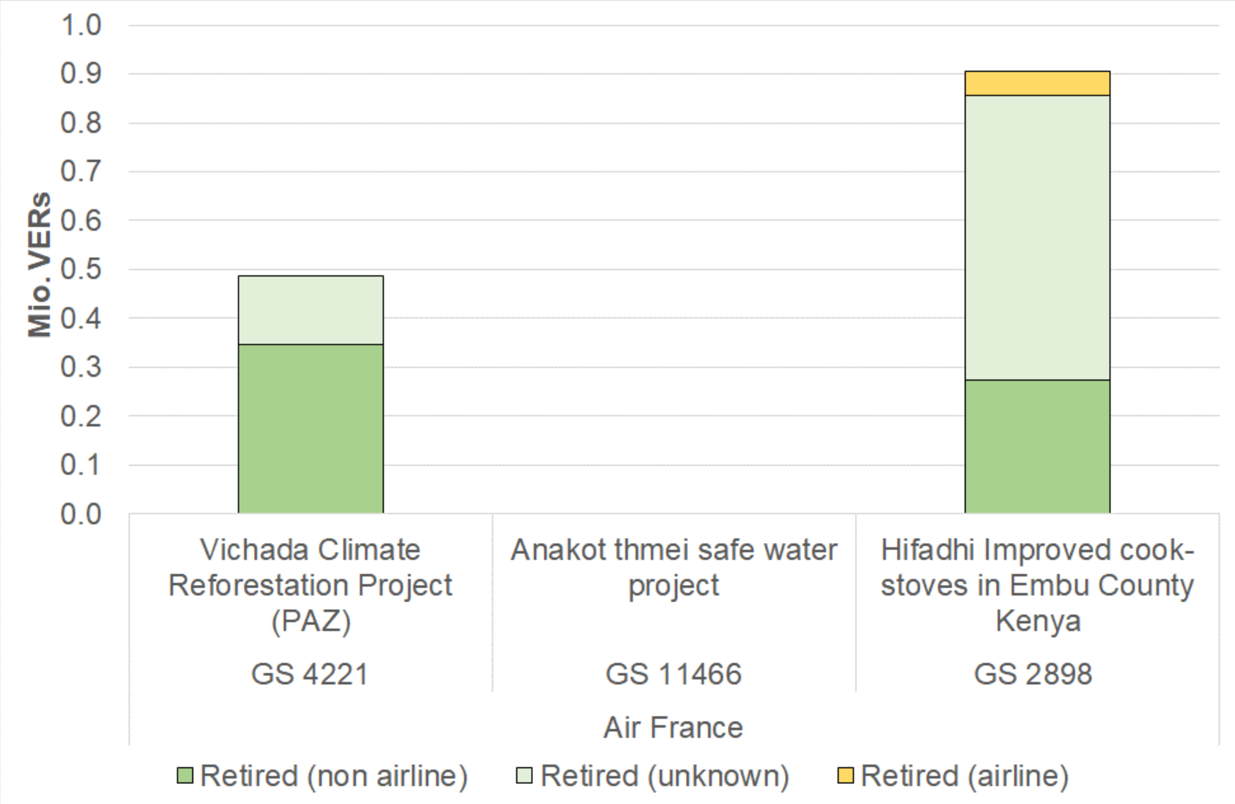
1) Vichada climate reforestation (Gold Standard) project in Columbia;[46]
2) Madre de Dios Amazon REDD+ (Verified Carbon Standard) project in Peru;
3) Anakot thmei safe water (Gold Standard) project in Cambodia;
4) Pawan urja vistaran: Wind power (Verified Carbon Standard) project in India;
5) Hifadhi improved cook-stoves in embu county (Gold Standard Project) in Kenya;
6) Ecomapua Amazon REDD+ (Verified Carbon Standard) project in Brazil.

Information on the volume of carbon credits retired to offset the domestic emissions of Air France is not publically documented by the airline operator, however, it is possible to see in the Gold Standard Impact Registry that around 50,000 carbon credits have so far been retired on their behalf from the Hifadhi improved cook-stove project in Kenya (Figure 3-7). The quality of credits from such a project type has been discussed previously. It is not compulsory to provide additional information on who is retiring the carbon credits within the Gold Standard Impact Registry so it may be the case that the volume retired by Air France may be higher. Information on the volumes of credits from the Verified Carbon Standard projects listed above are not publicly available. It will be of interest to know what

[42] https://www.transportenvironment.org/wp-content/uploads/2021/07/2020_06_air-france-rescue_final_1.pdf
[43] https://www.transportenvironment.org/discover/airline-bailouts-set-double-%E2%82%AC26bn-countries-fail-impose-binding-green-conditions/
[44] Microsoft Word - Financial statements and notes AFKLM as of December 31 2021 (annreports.com)
[45] Air France to begin offsetting 100% of CO_2 emissions on its domestic flights on 1st January 2020 | Air France - Corporate
[46] Remove CO_2 from the atmosphere | Air France Act

share of the domestic emissions have so far been offset by REDD+ projects, especially given recent criticism regarding the environmental integrity of the emission reductions from certain reforestation projects that have been funded by Air France.[47] Further research would be required, beyond the scope of this project, to ascertain whether the concerns expressed are valid and to evaluate the specific qualities of such projects.

Figure 3-7: Carbon credits (Gold Standard) retired on behalf of Air France



Source: Gold Standard Impact Registry (2022); Own calculation.

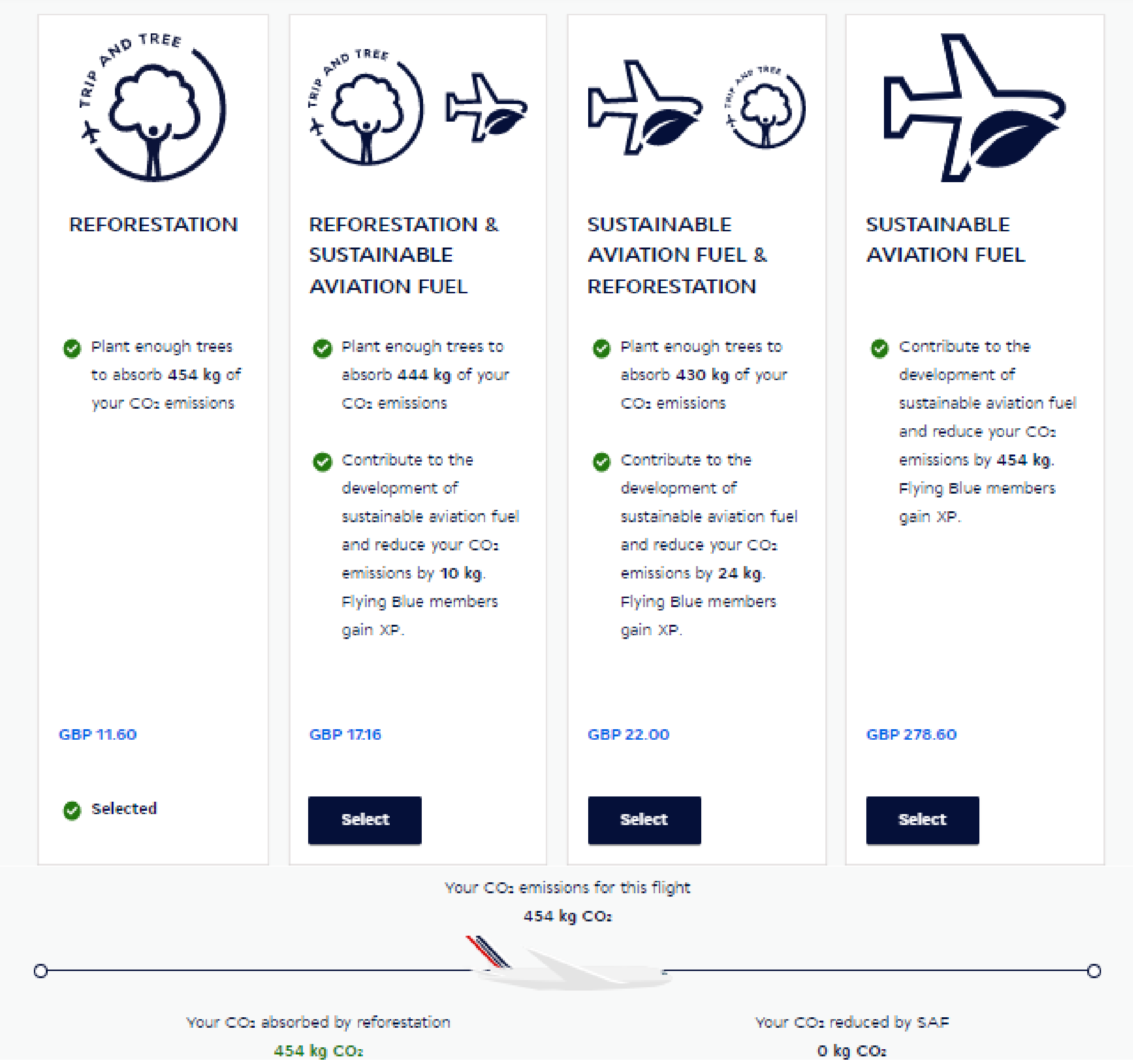
3.2.5.2 Customer offsetting

Air France offers customers the option to offset the emissions from their international flights as part of the online booking process. Figure 3-8 shows that the CO_2 emissions for one person on a return flight from Birmingham to Sofia is estimated to be 454 kg.[48] Based on the information provided it is possible to estimate an approximate cost per tonne of CO_2 to the customer of £26 (converted to €30)[49] by dividing the calculated carbon cost of the return flight (i.e. £11.60) by the CO_2 emissions associated with the return flight. Given that the distance of a flight from Birmingham to Sofia is 2,165 km each way, it is possible to back calculate that the CO_2 intensity value per passenger per km was 105 gCO_2 /km. The carbon intensity value is subject to change and is of course influenced by the factors and assumptions underlying the calculation that vary from one airline operator to another.

[47] Top airlines' promises to offset flights rely on 'phantom credits' - Unearthed (greenpeace.org)
[48] It is not specifically mentioned by Air France that non-CO_2 emissions are converted into CO_2e emissions so we assume that the offset scheme only covers CO_2 emissions.
[49] Based on a conversion rate of £1 = €1.17 as of 12th of June 2022 (taken from www.xe.com)

The customer is offered the option of financing a reforestation project operated by the A Tree for You association in order to offset their flight emissions. Significantly, these reforestation projects do not provide carbon offsetting certification so the quality of the emission reduction from each contribution is very difficult to verify.[50] However, Air France have reported that in 2019, 160,000 trees were planted that is equivalent to a potential emission reduction of 16,000 tCO_2 based on the assumption that one tree captures approximately 100 kg of CO_2.[51] Several more expensive options are also available to the customer with different levels of contribution towards reforestation and the development of sustainable aviation fuels.

Figure 3-8: Current options for offsetting at Air France[52]



Source: Air France (2022).

50 Frequently asked questions – A TREE FOR YOU
51 2019 - 1csr factsheet af en v2 0.pdf (airfrance.com)
52 Booking information was obtained from the British Airways website in June 2022.

3.2.6 KLM

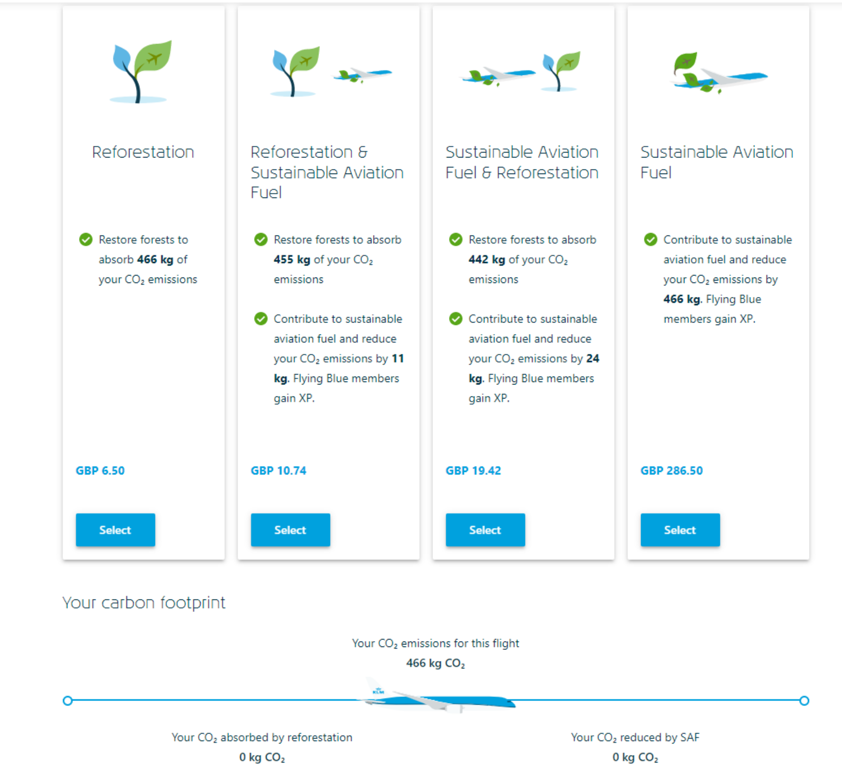
3.2.6.1 Corporate offsetting:

The environmental policy statement from KLM does not include a commitment to offset the corporate emissions of the airline but rather provides a commitment to "adopt the best technologies and to strive to operate environmentally efficient procedures."[53]

3.2.6.2 Customer offsetting

KLM offers customers the option to offset the emissions from their flights as part of the online booking process. Figure 3-9 shows that the CO_2 emissions for one person on a return flight from Birmingham to Sofia is estimated to be 466 kg.[54] Based on the information provided it is possible to estimate an approximate cost per tonne of CO_2 to the customer of £14 (converted to €16)[55] by dividing the calculated carbon cost of the return flight (i.e. £6.50) by the CO_2 emissions associated with the return flight. Given that the distance of a flight from Birmingham to Sofia is 2,165 km each way, it is possible to back calculate that the CO_2 intensity value per passenger per km was 107 gCO_2 /km. The carbon intensity value is subject to change and is of course influenced by the factors and assumptions underlying the calculation that vary from one airline operator to another.

Figure 3-9: Current options for offsetting at KLM

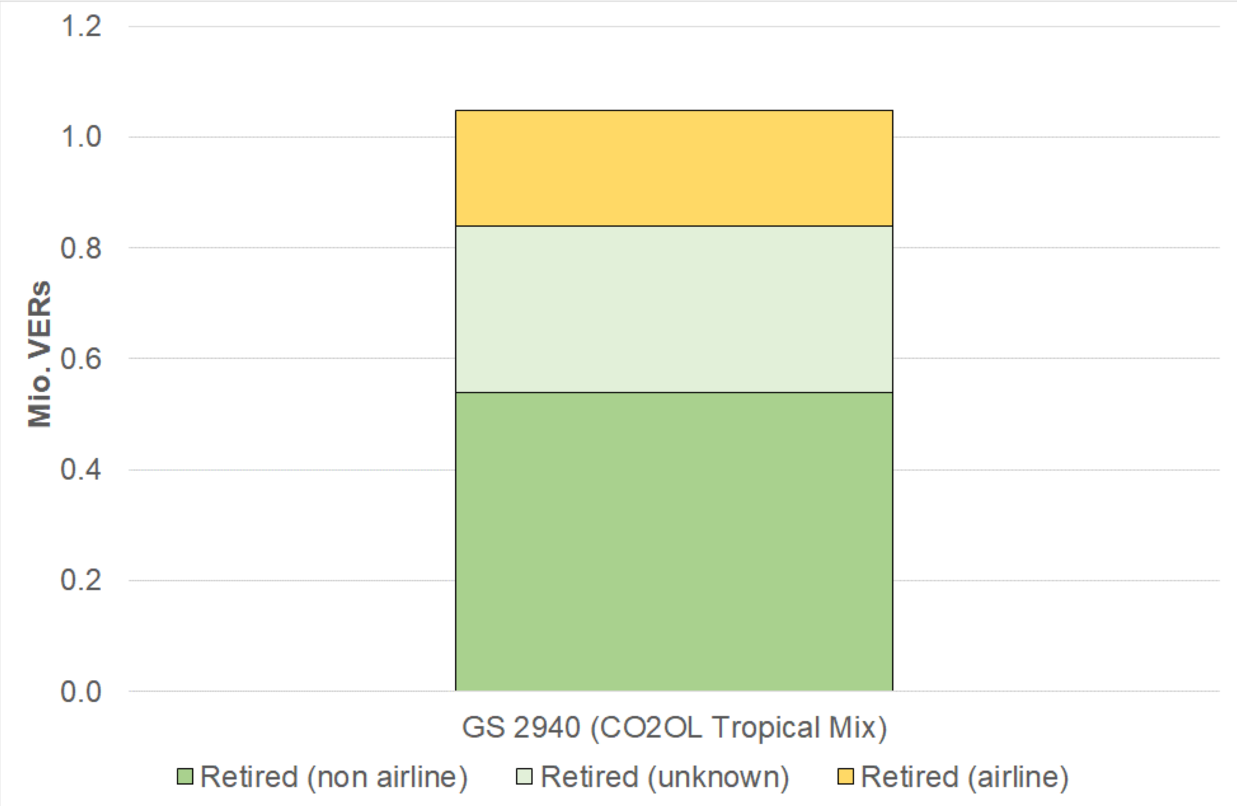


Source: KLM (2022).

[53] https://img.static-kl.com/m/1cf94d2a0be01a46/original/Environmental-Policy-Statement.pdf
[54] It is not specifically mentioned whether non-CO_2 emissions are converted into CO_2e emissions so we assume that the offset scheme only covers CO_2 emissions.
[55] Based on a conversion rate of £1 = €1.17 as of 12th of June 2022 (taken from www.xe.com).

The customer is offered the option of financing a reforestation project in Panama that is certified by the Gold Standard. In general, offsets from reforestation projects have concerns regarding the determination of GHG emissions and their permanence whilst are potentially beneficial with regards to negative emissions and facilitating the transition towards net zero emissions. According to the KLM Annual Reports between 2017 and 2021,[56] so far around 272,500 tonnes of CO_2 have been compensated through their service referred to as CO2ZERO.[57] Although there is a delay between the purchase and retirement of carbon credits, the Gold Standard Impact Registry[58] transparently shows that over 180,000 carbon credits have been retired on behalf of the CO2ZERO service (Figure 3-10). Several more expensive options are also available to the customer with different levels of contribution towards reforestation and the development of sustainable aviation fuels.

Figure 3-10: Carbon credits (Gold Standard) retired on behalf of KLM



Source: Gold Standard Impact Registry (2022); Own calculation.

3.2.7 Wizz Air

3.2.7.1 Corporate offsetting

Wizz air have taken the decision to not include the use of offsets within their carbon intensity reduction targets for 2030 as they state in their Annual Report that the airline is “focused on

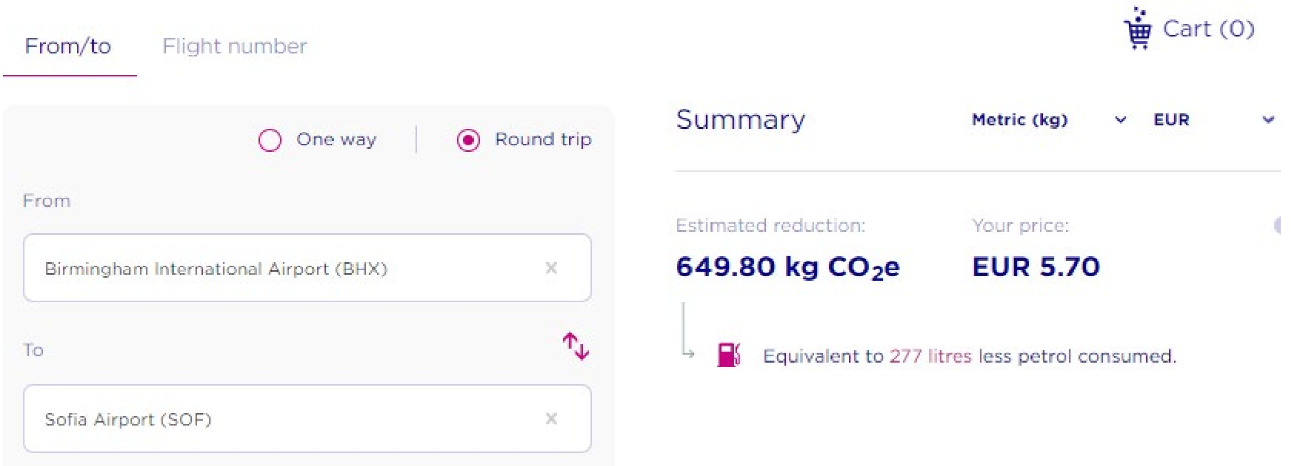
56 https://www.klm.co.uk/information/corporate/publications
57 https://img.static-kl.com/m/7f18a4405ec39c57/original/KLM-2021-Annual-Report.pdf
58 Impact Registry | The Gold Standard

reduction through innovation and technology, and the most efficient operations that we believe will have a greater impact on tackling carbon emissions.”[59]

3.2.7.2 Customer offsetting

In November 2020, Wizz Air started a voluntary offset programme in partnership with CHOOSE. At the time of writing the option to offset the emissions of a flight within the booking flow was not available to customers, which, by the airline operator’s own admission, is impacting upon the rate of uptake.[60] Figure 3-11 shows that the travel footprint calculator[61] estimates CO_2e emissions for one person on a return flight from Birmingham to Sofia is estimated to be 650 kg. This is a relatively high value, however unlike the other airline operators assessed Wizz Air also take into account the additional environmental impact of aviation from the release of non-CO_2 emissions (i.e. such as nitrogen oxides and water vapour) at high altitudes. Based on the information provided it is possible to estimate an approximate cost per tonne of CO_2e to the customer of €9 by dividing the calculated carbon cost of the return flight (i.e. €5.70) by the CO_2e emissions associated with the return flight.

Figure 3-11: Current options for offsetting at Wizz Air



Source: Wizz Air flight offsetting (chooose.today).

Wizz Air is currently supporting two verified carbon-reducing projects:

1) The International Small Group and Tree Planting Program in Uganda (Verified Carbon Standard);

2) The Pichacay Landfill Gas to Renewable Energy (Verified Carbon Standard) Project in Ecuador.

According to the Annual Report of Wizz Air in 2021, their customers offset 105 tonnes of CO_2 emissions for the FY 2021.[62] Wizz Air acknowledge that the number of customers offsetting their emissions is currently limited and are actively trying to increase the rate of uptake. Indeed, the

[59] Wizz Air Holdings Plc Annual report and accounts 2022
[60] https://www.annualreports.com/HostedData/AnnualReports/PDF/LSE_WIZZ_2021.pdf
[61] Wizz Air flight offsetting (chooose.today)
[62] https://www.annualreports.com/HostedData/AnnualReports/PDF/LSE_WIZZ_2021.pdf

volume offset has increased for the FY 2022 to 1,064 tCO_2.[63] The volume of offsets purchased for each project within its portfolio is not currently published by Wizz Air.

A detailed assessment of the quality of the credits purchased by Wizz Air customers is beyond the scope of the study, however, we can make some general observations based upon the output from the recently published CCQI. Table 3-4 shows the quality rating of a generic landfill project based in Ecuador that has a Verified Carbon Standard certification. While the project type scores highly on addressing non-permanence under the CCQI on account that such a project type has no significant non-permanence risks, it is evident that there are challenges with regards to additionality[64] and the likely environmental and social impacts associated with the project type.

Table 3-4: Assessment of the quality of the carbon credits from landfill projects in Ecuador certified by the Verified Carbon Standard

Quality criteria	Rating
Robust determination of the GHG emission impact	1
Avoiding double counting	4
Addressing non-permanence	5
Facilitating transition towards net zero emissions	4
Strong institutional arrangements and processes	4
Environmental and social impacts	1
Host country ambition	N/R

Note: The country input into the CCQI tool for this example is Ecuador, however results do not relate to a specific project and are only illustrative in nature based on project type.
Source: CCQI (2022).

3.2.8 SAS Airlines

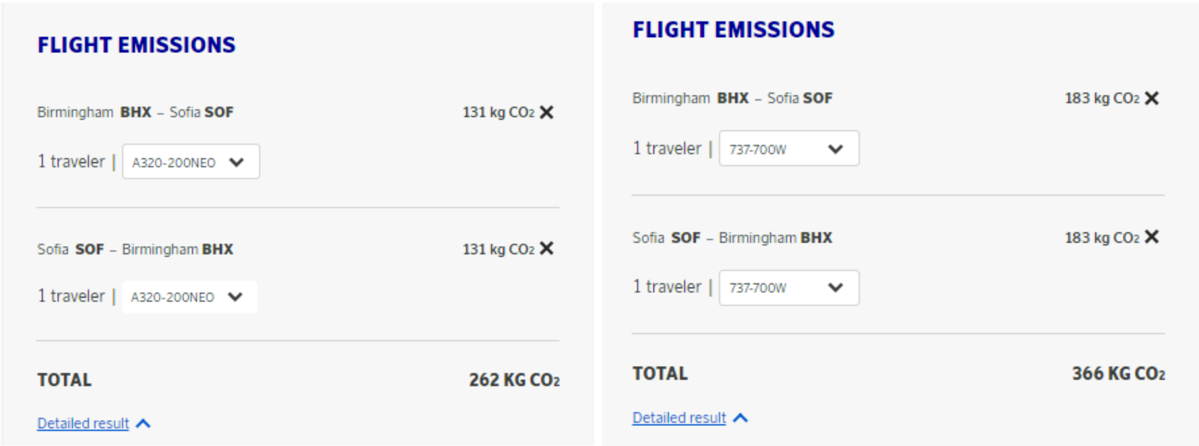
3.2.8.1 Corporate offsetting

SAS offset the carbon emissions of all SAS' tickets for EuroBonus members, Youth travel with SAS and their own staff's tickets. The volume of CO_2 emissions that SAS has offset on behalf of their customers was 1,200,000 tonnes for FY 2019,[65] 700,000 tonnes for FY 2020[66] and 500,000 tonnes for FY 2021.[67] It seems likely that offset volumes for loyalty customers are determined based upon the actual data of the distance flown and the aircraft type and are therefore calculated ex-post. Figure 3-12 shows how the selection of a more CO_2 efficient aircraft can significantly reduce the

63 Wizz Air Holdings Plc Annual report and accounts 2022
64 In the context of carbon crediting, emission reductions or removals from a mitigation activity are additional if the mitigation activity would not have taken place in the absence of the added incentive created by the carbon credits.
65 CO_2 offset (sasgroup.net)
66 SAS ANNUAL AND SUSTAINABILITY REPORT FISCAL YEAR 2020 (sasgroup.net)
67 https://www.sasgroup.net/files/Main/290/3493244/sas-annual-and-sustainability-report-fy2021.pdf

emissions that are required to offset. The SAS calculation provides further information on non-CO_2 emissions but it appears that only CO_2 emissions are considered in the total to be offset.

Figure 3-12: Example of how airplane model can impact carbon emission calculation



Source: SAS (2022).

Limited information is provided with regards to the offset projects other than to say that the actual offsetting is completed by First Climate and the airline's portfolio includes a wind power project in China and a hydro power project to support electricity supply in India. Without further information on these projects it is not possible to assess the quality of the carbon credits. Further transparency is necessary to enhance consumer confidence in the product offering of SAS Airlines with regards to its policy on offsetting.

3.2.8.2 Customer offsetting

There is no option for customer offsetting in the booking process as SAS airlines took the decision since 2019 to offset the carbon emissions from the flights of all loyalty program members for travels in Scandinavia.

4 Conclusion

The beyond value chain mitigation (BCVM) approaches for **eight European airlines**, which were collectively **responsible for over half of the total CO_2e emissions** of the aviation sector in the EU in 2019, were assessed in this study to provide insights with regards to both the extent and quality of efforts, beyond the value chain, to mitigate the negative environmental impacts associated with air travel. Table 4-1 summarises the key insights learnt from the assessment undertaken and it is the aim of this study to inform consumer choice by providing a detailed comparison of the extent and quality of the offset provisions of the leading EU airline operators.

Firstly, the assessment shows that the **average estimated price for the carbon credits purchased is varied but are still all well below the cost of abatement** in the aviation sector. For example, several airlines provide the option to support the development of SAF as an alternative to offsetting (i.e. Lufthansa German Airlines, British Airways, Air France, KLM) but this is at a price that is substantially more expensive. Indeed, the abatement costs associated with some supporting alternative jet fuels are estimated to currently be in the region of €400/tCO_2e to €500/tCO_2e by the ICCT.[68] Although the exact value of the carbon price is, of course, subject to constant change and is not the only consideration for determining the quality of a carbon credit, there is a genuine concern that the promotion of 'carbon neutral' flying via the purchase of carbon credits only encourages further growth in air travel at a time when we should, in the short term, be reducing demand until more sustainable forms of aviation become available.

This leads to the second main conclusion from the assessment that **carbon credits are not a homogenous product**. Airline operators often cite the certification of the projects within their offset portfolio (i.e. Gold Standard, Verified Carbon Standard) as a means of providing a level of reassurance regarding the quality of the carbon credits used to offset their emissions from flights. However, while such certification standards produce much needed oversight, the reliance upon relatively cheap forestry projects in developing countries by nearly all of the airlines assessed in this study (except for SAS) is potentially a concern depending on the type of forestry project. For example, several airlines have invested in REDD + projects that have experienced challenges in determining GHG reductions and are also associated with a high risk of non-permeance. It is beyond the scope of this study to assess the quality of each project within these offset portfolios but this should certainly be the focus of future research.

Thirdly, the assessment was hindered by a **lack of transparency in the reporting** of the BCVM approaches adopted by the airline operators under consideration in this study. Indeed, only easyJet provided complete evidence of the retirement of their purchased carbon credits by publishing information on all of the relevant certificates related to the retirement of carbon credits. Through the Gold Standard Impact Registry it was possible to find retirements of carbon credits that were attributable to both Air France and KLM, however the volume declared appears to be incomplete compared to the level of action that has been pledged. For the remaining airlines assessed certificates specifying which carbon credits were used to meet the pledges were not publicly available. It was thus not possible to identify evidence that the respective amount of carbon credits had actually being retired. Furthermore, the calculation of the carbon offset obligation itself varied amongst the airline operators reflecting the use of different assumptions with regard to fuel burn (related to aircraft type), load factors, cabin class splits and regarding the treatment of non-CO_2 emissions (i.e. only WIZZ Air currently takes into account the impact of non-CO_2 emissions at higher

68 The cost of supporting alternative jet fuels in the European Union (theicct.org)

altitudes). The lack of information here undermines consumer confidence and should be urgently addressed and perhaps even regulated by Member States in order to mandate greater transparency.

Fourthly, the assessment shows that the **volume of carbon credits purchased is strongly influenced by the degree to which the airline's emissions are offset.** Indeed, the most ambitious BCVM approach, with regards only to the volume of carbon credits purchased to offset emissions, is currently provided by easyJet. The airline directly offsets all of the CO_2e emissions associated from passenger flights on behalf of its customers automatically and at no additional cost. SAS also purchase carbon credits on behalf of their loyalty scheme customers to offset the CO_2 emissions associated with their flights and this approach means that the airline operator purchased the second largest volume of carbon credits out of the airlines assessed in this study. For offset provisions that rely completely upon the action of the consumer, the volume of carbon credits purchased are considerably less due to a low rate of uptake. This may be due to either the low cost offering of budget airlines making it less likely that their consumers wish to offset their emissions voluntarily (i.e. Ryanair) or that the process of offsetting is simply not easy enough such as not being integrated into the booking flow process for customers (i.e. Wizz Air).

Next to these findings, it should be noted that voluntary use of carbon credits to offset the emissions of the aviation sector may suggest to customers that it is possible to fly in a 'carbon neutral' manner which could lead to an increase in passenger air traffic at exactly the time when the scientific community is urging us all to fly less. As this is not compatible with the business models of the airline operators, offsetting may be a convenient solution that, however, will not actually contribute to decarbonizing the aviation sector through SAF whilst increasing air passenger traffic. Some airline operators may offer the voluntary option for customers to contribute to the development of SAF but no airline fully discloses how many customers actually take up this offer. The quality of some of the carbon credits used by the airlines assessed in this study has been questioned and this inevitably will lead to further questions regarding whether the BCVM approaches adopted by airlines will only be sustainable in the longer term if carbon credits are secured at low prices. If so, will this BCVM approach actually encourage the change required to travel by air sustainably? Offsetting can undoubtedly empower consumers to make better choices, however voluntary action alone is unlikely to be sufficient to encourage the scale of change required to deliver a low carbon aviation sector.

Table 4-1: Offsetting Initiatives by airline operator

	Airline offsetting				Customer offsetting			Offset calculation						Offset volumes, average cost and transparency							Project type				Project standard			Project location				
	All emissions from flights	All emissions for loyalty group	All emissions from domestic	All employee business flights	Based on tCO_2	*Not based on tCO_2*	*Choice of projects or SAF*	*CO_2 only*	*CO_2 and non-CO_2*	*Based on actual fuel use*	*Based on data assumptions *****	*Radiative forcing index non CO_2*	*Adjustment for ETS / CORSIA*	*2019 in tonnes of offsets*	*2020 in tonnes of offsets*	*2021 in tonnes of offsets*	*Estimated average offset cost per tonne of CO_2 (corporate)*	*Estimated average offset cost per tonne of CO_2 (customer)*	*Estimated average total annual carbon cost in € Mio.*	*Evidence of offsets retired*	*REDD +*	*Cook Stoves*	*Renewables*	*Landfill gas utilization*	*Gold Standard*	*Verified Carbon Standard*	*Other*	*Europe*	*Africa*	*South America*	*Asia*	*Other*
Ryanair					✔	✔		✔			✔			35,285 *	35,285 *	35,285 *		€28	1.0		✔	✔	✔		✔		✔	✔	✔			
EasyJet	✔	✔	✔	✔					✔	✔				3,146,198	2,123,278		€4		10.5	✔	✔		✔		✔	✔		✔	✔	✔	✔	
Lufthansa**				✔	✔		✔	✔			✔			92,310 **	57,750 **		--	€17	1.3 °°°		✔	✔	✔		✔		✔	✔	✔	✔	✔	✔
BA			✔		✔	✔	✔		✔		✔	1	✔		168,000 ***	197,000 ***	--	€12	2.2 °°°		✔	✔			✔	✔			✔			
Air France			✔		✔		✔	✔			✔				250,000 °	250,000 °	€8	€30	2.0 °	✔	✔	✔	✔		✔	✔		✔	✔	✔	✔	
KLM					✔		✔	✔			✔			88,000 °°	44,000 °°	71,000 °°		€16	1.1	✔	✔				✔					✔		
Wizz Air					✔				✔		✔	2				105		€9	0.001		✔			✔		✔			✔	✔		
SAS		✔					✔	✔			✔			1,200,000	700,000	500,000	--		--				✔								✔	

Notes: * Derived by calculating an average carbon price (based on carbon calculator) and we then use this to estimate the number of offsets that could be purchased out of the funding contribution from customers (minus the donation to Renature Monchique). The total volume is then equally distributed between 2019 and 2021. ** Refers to Lufthansa German Airlines with offset volumes reflecting a share of the total for Lufthansa Group based on their verified emissions. *** Assume that the offset volumes reported by IAG are retired by BA to meet its domestic commitment. This is likely to be an over-estimate. **** The main factors considered in this estimation are likely to be arrival and departure point (for distance and fuel consumption), number of passengers, travel class and carbon emission factor. ° Simple assumption based on limited data availability for domestic flight emissions for Air France and is therefore more illustrative of the magnitude of the likely volume of offsets and customer contribution not included. Therefore total cost is calculated based on the estimated CO_2 cost per tonne paid by Air France °° Taken directly from KLM factsheets on sustainability for 2019, 2020 and 2021. °°° Uncertain as the value is calculated based on the estimated offset cost paid by customers and so this may overestimate the total cost if airline purchase carbon credits at a lower price to cover corporate emissions