Factsheet 4: Offsetting

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How compatible is flying with having a good (climate) conscience? More and more airlines and passengers are opting to offset the climate impact of flights. With carbon offsetting, the climate impact of flights is offset by measures to reduce greenhouse gas emissions (e.g. renewable energy projects) implemented by others.

But how does offsetting actually work? (see chapter 1) How useful is it? (see chapter 2) Does it really offset the climate impact of flying? Which credits are good? (see chapter 3) We answer the most important questions about offsetting greenhouse gas emissions and introduce the newer concept of “climate responsibility” (see chapter 4) and give practical advice for offsetting (see chapter 5).

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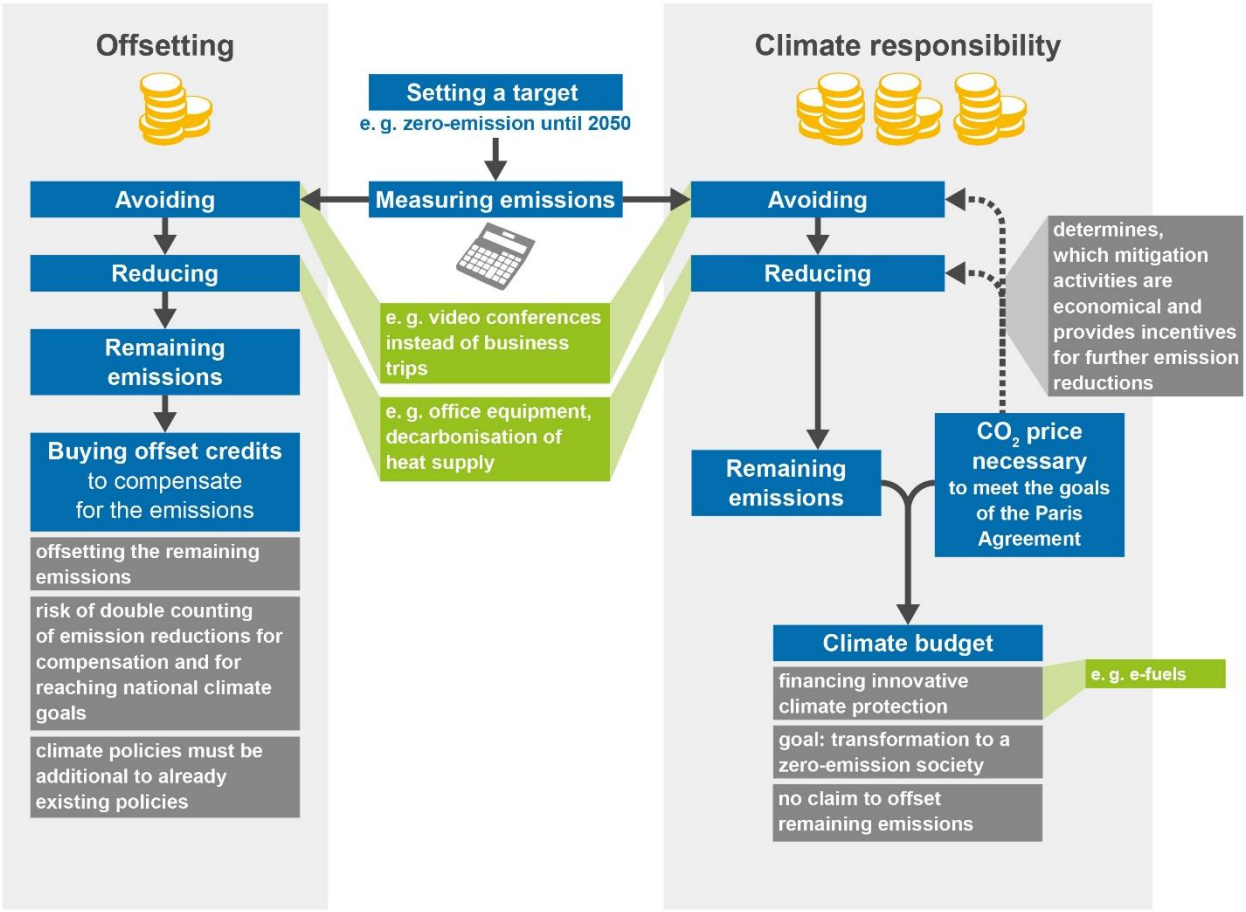
1 How does offsetting work?

Figure 1: Carbon offsetting and climate responsibility



Source: Oeko-Institut 2020

Climate offsetting should always be the last step towards more climate protection in aviation; the priority should always be to avoid flights wherever possible. However, if taking a flight cannot be avoided and the decision has been made to offset the emissions, the climate impact of the flight must first be quantified. Various online calculators are available for this purpose (see chapter 5).

The calculated emissions are then offset with carbon offset credits, which can be purchased from various organizations. Two types of credits come into question:

1. **Carbon offsets from climate protection projects**

The revenue from the sale of carbon offsets is used to finance and implement a specific climate protection project. For this purpose, climate protection projects must first register with offset programs. These specify the requirements for climate protection projects and the issuing of offset credits. Independent experts verify whether a project meets the requirements of the offset program. After successful verification and registration, the emission reductions must be measured and calculated according to the set methods. A credit is then issued for each ton of CO_2 saved. Offset credits can be traded in electronic registries and sold to intermediaries or end customers. When the offset credits are used, they are deleted from the register. There is a large variety of climate protection projects, offset programs and sellers of carbon offset credits. The characteristics of these credits and their actual climate impact can differ considerably (see chapter 3).

Figure 2: Offsetting through certificates from mitigation projects

Source: https://www.olb-eibau.de/proklima.html

2. Allowances from emission trading systems

Under an emissions trading system, a cap is set on the maximum volume of greenhouse gas emissions permitted for a group of emitters. A credit is issued for each ton of CO_2 allowed. The emitters are allocated allowances or must purchase them from the government and provide proof of having a credit for each ton of their greenhouse gas emissions. Emissions trading systems are designed to meet climate targets as cost-effectively as possible. This is because those who can mitigate greenhouse gases at a lower price can bring about a larger emission reduction and sell surplus allowances to others for whom cutting emissions would cost more. Emissions trading systems were not originally designed for voluntary offsetting, but in principle institutions and individuals can purchase and then cancel allowances (for example via The Compensators). This diminishes the supply of allowances and thus reduces overall emissions. This is because the purchase of these credits indirectly increases the climate target of the emissions trading system. In practice, a number of aspects should be borne in mind, however. A positive environmental impact is only achieved if the total emissions permitted by the system are not set too high. Furthermore, some emissions trading systems have instruments to stabilize allowance prices. Under certain circumstances, these can mean that cancelling a credit only decreases the maximum total emissions by less than one ton of CO_2.

2 Is offsetting useful?

Offsetting can make a useful contribution to climate protection, but only under certain conditions. As a general rule, avoiding that the emissions come about in the first place is better than offsetting them. Not getting on a plane is better for the climate than purchasing carbon offsets. There are several reasons for this:

1. **Offsetting is not a long-term solution:** Offsetting is basically only a short- or medium-term measure to make flying less harmful to the climate. It does not change the fact that aircraft continue to emit climate-damaging emissions. To meet the climate goals of the Paris Agreement, global greenhouse gas emissions must be reduced to net zero over the next few decades. This means that every avoidable emission must actually be avoided. Remaining emissions must be offset by absorbing CO_2 from the atmosphere, e.g. through forests. These measures have only

a limited potential, however, which must also be used to offset emissions from sectors like agriculture in which complete avoidance of greenhouse gases is not possible. To get a handle on the climate impact of flying in the long run, the long-term transformation of the aviation sector to carbon-neutral fuels and electromobility is therefore necessary (see factsheet 5). In order to initiate this transformation in time, appropriate (political) measures should be taken today – even if they are more expensive in the short term than offsetting.

2. **Effect of carbon offsets on the climate:** There are considerable uncertainties about the extent to which the purchase of an offset credit actually leads to a reduction of one ton of CO_2 elsewhere (see chapter 3). If people fly less, however, the positive environmental effects are certain.

3. **Rebound effects:** If offsetting emissions through the purchase of carbon credits leads to more flying, it can even be harmful. Scientists refer to this phenomenon as a "rebound effect." Some journeys would perhaps not be made at all or would be made with more environmentally-friendly means of transport if the option to offset emissions were not available. The idea of flying "climate-neutrally" by offsetting emissions is likely to play a role in some flight bookings. If more flights are taken than would otherwise have been the case, offsetting fails to achieve its goal.

Therefore, offsetting should always only be a last resort. However: if a flight is unavoidable, it is definitely better to offset the emissions than not.

3 A question of quality

What is a high-quality carbon offset? There is no simple answer to this question. This is because many factors determine the quality of offsets. Which aspects are important also depends on the priorities of those who purchase the carbon credits. Some buyers, for example, attach great importance to climate protection projects that have a high social benefit, while others are concerned solely with the positive environmental impact.

In cooperation with two non-governmental organizations – the World Wildlife Fund (WWF-US) and the Environmental Defense Fund (EDF) – Oeko-Institut has developed criteria for what constitutes a high-quality carbon offset. According to these criteria, the following aspects are particularly important in determining the quality of credits from climate protection projects:

- **Additionality:** This means that the mitigation activity is only made possible by the revenues of carbon offsets and would not have taken place in their absence. If the project would have been implemented anyway, it does not lead to additional climate protection and thus cannot offset any emissions. Whether a project is really additional is not always easy to check. The decisive factor is whether the project is already economically viable without carbon credits and would therefore be realized in the absence of the financial incentive provided by the credits or whether the project is to be implemented based on existing policy instruments like subsidy programs. Various studies have found that the additionality of many climate protection projects is questionable. There are also mitigation activities, however, where there is a high probability of additionality (Öko-Institut 2016; Schneider 2009; Dechezleprêtre et al. 2014; Grantham Research Institute 2014; Barata

2016; Michaelowa et al. 2019; Gillenwater 2012; Wuppertal Institut 2018; Greiner and Michaelowa 2003; Haya and Parekh 2011).

- **Old projects:** Under the largest offset program – the Clean Development Mechanism (CDM) of the Kyoto Protocol – there is a very large surplus of credits from old projects, for which there is comparatively low demand. The surplus is so large that the credits are sold at very low prices. In most cases, however, the climate protection projects continue regardless of whether they can still sell their credits. This is because the activities often generate other revenue – e.g. from the feed-in of electricity from wind turbines – and continued operation is therefore more profitable than shutting them down. The purchase of credits from such CDM projects does not lead to more climate protection and is therefore not recommended. However, some CDM projects rely on current proceeds from emission reduction credits. This applies, for example, to the avoidance of nitrous oxide gas in nitric acid production or the use of more efficient stoves for cooking with wood. These projects are worth supporting (Warnecke et al. 2019; NewClimate Institute; Öko-Institut 2017; Schneider and Cames 2014).

Clean Development Mechanism (CDM): The Clean Development Mechanism (CDM) is a flexible mechanism for meeting emission reduction targets under the Kyoto Protocol of the UNFCCC. Under the CDM, emission reduction projects are implemented in countries of the Global South without a reduction commitment. The emission mitigations achieved by the project are certified and can subsequently be used as "Certified Emission Reductions" by industrialized countries to achieve their targets. The aim of the CDM is to reduce emissions cost-effectively and to help countries in the Global South bring about sustainable development.

- **Quantifying emission reductions:** To ensure that every offset credit is linked to a ton of avoided CO_2, it is important that the emission reductions are not overestimated. They must be estimated cautiously, because there are considerable uncertainties in quantifying them. One particular challenge is estimating the reference scenario, i.e. how many emissions would have occurred without the project. In the case of forest protection projects, for example, it is very uncertain how the forest would have developed without the project.

- **Avoidance of double counting:** Double counting occurs when a single greenhouse gas emission reduction is counted twice in achieving mitigation targets or offsetting (Schneider et al. 2019; Schneider et al. 2015). Double counting is a significant risk with voluntary offsetting, especially from 2021. This is because the Paris Agreement, under which almost all countries have climate targets, takes effect then. If emission reductions from mitigation projects are sold in a country, there is a risk that not only the person who purchases the offset credit will be credited with the reductions, but also the country in which the project is implemented. This is because the country can prove lower emissions when reporting on the fulfilment of its climate target. This could result in the country having to make fewer climate protection efforts to achieve its targets.

Such double counting can be circumvented by countries subtracting the emission reduction achieved through the project when reporting on the fulfilment of their climate targets under the Paris Agreement. To do this, the government of the country in question must authorize the project for international emissions trading under Article 6 of the Paris Agreement and undertake so-called "corresponding adjustments" when reporting on fulfilment of its climate target. If the credits are to be used to offset emissions and double counting is to be avoided, credits must therefore be recorded via such "corresponding adjustments" in the future (Wuppertal Institut 2020; Gold Standard Foundation 2020; NewClimate Institute; Schneider, L. 2020).

Corresponding adjustments:
Countries wishing to participate in cooperative approaches under Article 6 of the Paris Agreement must make corresponding adjustments to their emissions inventories. These adjustments reflect internationally transferred mitigation outcomes (ITMOs): countries that purchase ITMOs subtract the corresponding amount of greenhouse gas emissions from their inventory, and countries that sell the ITMOs increase their emissions inventories.

- **Permanence of emission reductions:** Forest and moorland projects carry the risk that the stored carbon is later released. For example, if a forest is planted and a fire later destroys it, the CO_2 that was absorbed is released back into the atmosphere. Most offset programs address this risk through insurance: all projects must pay a portion of their credits into a fund. If the carbon stored in a project is released again, the harm to the climate is compensated by cancelling the credits in the fund. How well this approach works depends largely on how well resourced the fund is, how broadly the risks are distributed, and the length of time for which it is checked whether the CO_2 is released back into the atmosphere. Some offset programs also use temporary credits or make a general subtraction when quantifying emission reductions. A few offset programs take no measures at all to ensure the permanence of emission reductions. Only offset programs that have a fund to compensate any damage to the environment and ensure that CO_2 sequestration is checked for at least 100 years should be used

- **Promoting transformation to a zero-emissions society:** The Paris Agreement aims to ensure that people no longer produce any greenhouse gases in the second half of this century. The transformation to a zero-emissions society requires a profound change in our economic activity and huge investments in future technologies. To achieve this, investments in long-lived technologies that continue to produce greenhouse gases must also be avoided. It is therefore important not to promote projects that continue to use fossil fuels such as efficient coal-fired power plants or new gas-fired power plants. Rather, climate protection projects need to be chosen that promote future technologies that avoid greenhouse gas emissions as fully as possible such as innovative renewable energy technologies.

- **Good institutional structures and processes:** Offset programs differ significantly in terms of their structures and processes – for example, in terms of how the public is involved in developing rules and approving projects, or how certifiers are accredited and vetted. Programs with transparent and participatory structures and processes can better ensure that rules are robust and adhered to.

- **Other environmental impacts and social aspects:** In addition to the climate protection effect, it is important that climate protection projects do not have negative social or environmental effects; if possible, they should have positive impacts beyond climate protection. Here, the type of project and how the offset programs check potential negative impacts is very important. For example, projects such as efficient stoves for cooking with wood that improve the living conditions

of rural households in developing countries often have comparatively high social benefits. Some programs, such as the Gold Standard or Verra's Climate, Community & Biodiversity Standards, establish specific requirements with respect to other environmental impacts and social aspects.

4 From offsetting to "climate responsibility"?

Some voices have proposed a new concept as a possible alternative to offsetting and called this concept "climate responsibility". In contrast to carbon offsetting, where the emissions caused are balanced, the concept of climate responsibility proffers a budget to finance climate protection innovations, breakthrough technologies and the transformation to a zero-emission society. Unlike offsetting, this climate responsibility budget is not based on current prices for carbon offsets, but on a significantly higher CO_2 price. The higher CO_2 price also makes one's own mitigation options more attractive, which in turn contributes to emission reductions.

To calculate the climate responsibility budget, a CO_2 price can be used that would actually be required to meet the goals of the Paris Agreement or to bring new technologies to market. The High-Level Commission on Carbon Prices, led by Nobel Laureates Joseph Stiglitz and Nicholas Stern, recommended in 2017, based on a broad literature review, that a CO_2 price of US$40-80 per ton of CO_2 equivalent in 2020, rising to US$50-100 by 2030, is consistent with the Paris Agreement target. Converted into Euro, this price would be approx. €34-68 per ton of CO_2 equivalent in 2020 or €43-85 per ton of CO_2 equivalent in 2030 (HLCCP 2017). In contrast, carbon offset credits currently cost between €0.50 and €23, depending on the provider, offset program and climate protection project.

Climate responsibility: An organization's approach to managing its emissions. Under this concept, a budget is set aside to finance innovative climate protection. Unlike offsetting, the budget is not based on the current prices for offset credits, but on a higher CO_2 price that is multiplied by the organization's emissions.

Carbon offsetting: With offsetting, a public or private actor buys carbon offset credits in the amount of the emissions caused and takes the credits out of circulation. This is intended to offset the negative climate impact of emissions caused by a flight, for example

How can climate responsibility work in practice? Here are approaches of different organizations:

- Carbon Market Watch's Climate and Environmental Policy
- Climate Focus' travel policy
- NewClimate Institut's Climate Responsibility Approach

5 Practical steps and recommendations for offsetting and climate responsibility

We recommend the following steps when offsetting flights:

Step 1: Is the flight really necessary? A quick check.

Check again quickly: Is this flight really necessary? Are there holiday destinations that I can visit without flying? Is there another way of attending a meeting or conference, e.g. via an online meeting? Are there alternative travel options, such as (overnight) trains, that are reasonable in terms of time and cost?

Step 2: Quantify the climate impact

If the flight is necessary, then its climate impact can be quantified using online calculators. However, different calculators use different methods to calculate the climate impact. Make sure that the calculator considers not just CO_2 emissions, but the total climate impact of the flight. It is also important that emissions from the upstream chain of fuel supply are taken into account. The calculators offered by Atmosfair, Klima-Kollekte and PRIMAKLIMA, for example, can be used for this purpose.

However, the calculation of the climate impact of flights differs among providers and organizations, especially in respect of the indirect climate effects (see factsheet 1) beyond CO_2:

- Klima-Kollekte and PRIMAKLIMA use Klimaktiv's CO_2 calculator. This applies a uniform factor of 2.7 for all flights to account for the climate impact of non-CO_2 effects. This value is based on a report by the Intergovernmental Panel on Climate Change from 1999. (IPCC 1999)

- Atmosfair has developed its own detailed methodology for estimating the climate impact. Since this impact strongly depends on the flight altitude, the typical flight altitude is taken into account, which in turn depends on the flight distance. Above an altitude of 9 kilometres, a factor of 3 is applied to account for the non-CO_2 effects. Since some flights do not reach this altitude at all, and some emissions are always emitted by the remaining flights below 9 kilometres (during takeoff and landing), the calculated average factor for all flights worldwide is approx. 2.7. According to this more precise calculation, short- and medium-haul flights have a somewhat lower climate impact than is the case with Klimaktiv's calculator, while long-haul flights have a higher climate impact.

- Some organizations such as the International Civil Aviation Organization (ICAO) or the UNFCCC Secretariat's website Carbon Neutral Now only take into account the CO_2 emissions and not the total climate impact of the flight. The use of these calculators is therefore not recommended.

There are online tools for comparing different modes of transport; http://ecopassenger.org can be used for passenger transport and https://www.ecotransit.org for freight transport.

Step 3: Carbon offsetting or "climate responsibility"?

Choose between carbon offsetting or climate responsibility. With carbon offsetting, you purchase carbon offsets in the next step, which are used to offset the climate impact of your flight. With climate responsibility, you calculate a climate budget that you invest in innovative climate protection projects. For this, you multiply the emission impact of the flight by a higher CO_2 price (see chapter 4).

Step 4: Select providers and climate investment

In the market for voluntary carbon offsets, a wide range of very different projects are offered by a variety of organizations. This does not make the choice easy. We do not recommend individual projects or specific providers here; rather, we want to support you in your choice by providing tips and recommendations.

The following paths are possible:

1. **Purchase from the provider without selecting a project:** You purchase carbon offsets from a provider you trust without selecting a specific project. In effect, you support the provider's project portfolio.
2. **Purchase of carbon offsets from a specific project:** You select a specific climate protection project on the provider's website. Your purchase of carbon offsets then helps to finance this specific project.
3. Following the concept of "**climate responsibility**": Under this concept, you select initiatives with a transformative impact, which you support financially. This support can lead to further decisive breakthroughs in the necessary transformation processes in the medium and long term.

Recommendations for selecting a provider

The German consumer organisation Stiftung Warentest has evaluated different providers of offset credits. In 2018 Atmosfair, Klima-Kollekte and Prima Klima were among the best providers in their evaluation.

Recommendations for selecting offsetting standards

An important factor for determining the quality of offset credits is what offsetting standard is used. The German Federal Environment Agency has published the Guidebook for voluntary CO_2 offsetting via climate protection projects, which compares different programs as well as general information on offsetting.

Due to a large oversupply of credits from the Clean Development Mechanism (CDM), the voluntary offsetting option should only be used if the projects are additionally registered under the Gold Standard or if the income from the offsets is needed for the project to continue. According to a study by NewClimate Institute and Oeko-Institut, this applies to, for example, the avoidance of N_2O from the production of nitric acid and efficient stoves for cooking with wood (NewClimate Institute; Öko-Institut 2017).

Recommendations for selecting projects

The Stockholm Environment Institute and the GHG Management Institute have developed a website and guide for purchasing carbon offsets. This compiles helpful advice on the subject of offsetting, e.g. which projects should be avoided. The website also includes a table of project types which are lower, medium or higher risk in terms of integrity (SEI and GHG Management Institute 2020).

It should be noted that the price of a carbon offset is only a limited indication of its quality, as the costs of avoiding greenhouse gases can differ substantially between projects. However, scepticism is warranted with prices of a few euros, because for most project types, additionality is unlikely at that price level.

The project “Flying high or staying grounded? The relation between aviation and climate protection“ has been financed through donations. All information is available on the website www.fliegen-und-klima.de/en_index.html.

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