Summary

Background of the study and its objectives

Aviation accounts for 2.4% of global CO_2 emissions. In the Netherlands, aviation accounts for as much as 6.2% of emissions. In addition to CO_2 emissions, non-CO_2 effects of aviation, such as NO_x emissions and contrails, also have a significant impact on the climate. In order to comply with the Paris Climate Agreement aviation urgently needs to reduce its emissions. Technological solutions will not be able to achieve this in time, which is why it is essential to reduce the demand for flights. Reducing demand is most effective when policies focus on the flights that are the most polluting.

In that context, Greenpeace asked CE Delft to chart the most polluting KLM flights in absolute and relative terms. This study defines the most polluting flights as those with the greatest impact on the climate, taking into account both CO_2 and non-CO_2 climate effects for the entire route of a flight from the Netherlands to the destination airport.

The contribution of KLM flights to CO_2 emissions of Dutch aviation

The KLM Group, consisting of KLM Royal Dutch Airlines, KLM Cityhopper, Transavia and Martinair, is responsible for 54% of the CO_2 emissions generated by flights departing from the Netherlands. Most of the emissions are generated by intercontinental flights: 82% of the emissions of KLM Royal Dutch Airlines & KLM Cityhopper stem from intercontinental flights.

The most polluting flights

The KLM flights that contribute the most to pollution are those to its long-haul destinations. A flight to Buenos Aires, which is the furthest long-haul destination that can be reached directly, causes the most pollution, both in terms of the flight itself (1,281 tonnes of CO_2 equivalent) and per passenger (3.75 tonnes of CO_2 equivalent per Economy Class passenger). By way of comparison, the climate impact of this flight per passenger is roughly equal to the CO_2 emissions produced in one year by an average Dutch household for food and drink, driving a car or heating their home.

Short-haul flights have a much smaller impact on the climate. The climate impact of a flight from Schiphol to Buenos Aires is 92 times greater than that of a flight to Paris. This can be explained in part by the fact that Buenos Aires is much further away (the flight distance is 29 times greater), but also because the non-CO_2 climate effect increases significantly for longer flights and for flights to high-latitude destinations.

In relative terms, short-haul and long-haul flights have approximately the same climate impact (around 0.25 kg CO_2 equivalent per passenger kilometre). The CO_2 effect per kilometre is greater on short-haul flights because a larger part of the flight consists of landing, taking off, climbing and descending. These phases are relatively energy-intensive and therefore polluting. But the non-CO_2 effect per kilometre is actually higher on long-haul flights. This means that the net effect is more or less the same for short-haul and long-haul flights.

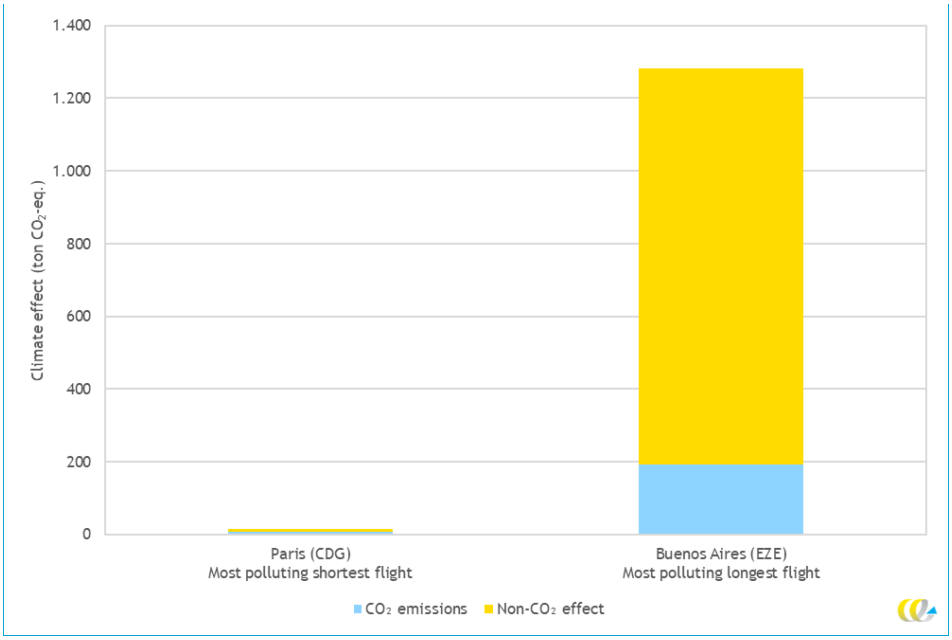
The most polluting flights

As explained in the previous chapter, a number of methods exist for identifying the most polluting flights. The most polluting flight can be determined either in absolute terms, in which case both the climate impact of the flight itself and the climate impact per passenger can be considered, or in relative terms, in which case compensation is provided for the number of kilometres travelled. This chapter presents the conclusions for the most polluting flight for each of these scopes.

Per flight

Figure 1 provides an overview of the most polluting flights in terms of their impact on the climate. On the left is the most polluting flight from the selection of short-haul flights (Paris) and on the right is the most polluting flight from the selection of long-haul flights (Buenos Aires). The most polluting flight in terms of climate impact is clearly Buenos Aires, which is the furthest long-haul destination that KLM flies to directly. Buenos Aires also clearly has a much higher climate impact per flight than Paris. In fact, the climate impact is 92 times greater. This can be explained mainly by the considerably greater distance to Buenos Aires than to Paris. The flight distance to Buenos Aires is 29 times greater, which means that much more fuel is used. A more detailed explanation is that the non-CO_2 climate impact of long-haul flights is much greater than that of short-haul flights (long-haul flights fly longer at cruising altitude where non-CO_2 effects are stronger) and the non-CO_2 climate impact is greater for flights to high-latitude destinations (Buenos Aires is located at a high-latitude in the southern hemisphere).

Figure 1 - The most polluting flights in terms of climate impact per flight of a selection of short-haul (left) and long-haul (right) flights

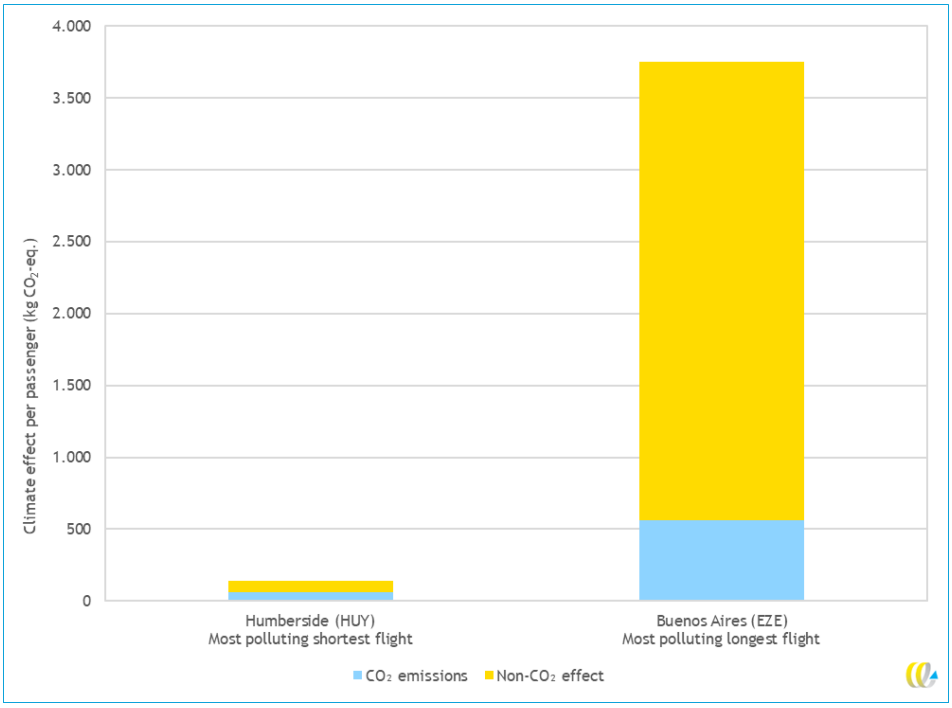


Per passenger

Figure 2 presents the flights with the greatest climate impact per passenger. This is shown for the short-haul flights and long-haul flights selected. The most polluting flight in terms of climate impact per passenger is also to Buenos Aires. In terms of climate impact per flight, the most polluting short-haul flight is to Humberside, rather than Paris. This is because Humberside is a less popular destination and smaller aeroplanes are used for these flights. This causes the climate impact per passenger to be somewhat higher.

The climate impact per passenger is also many times greater (27 times more for Economy Class) on the longest flight, Buenos Aires, compared to the short-haul flight to Humberside. This is also explained by the much greater distance and high latitude of Buenos Aires. The difference is slightly smaller (compared to the 92 times climate impact per flight) because larger aircraft are used on these long-haul flights, which means the climate impact is spread over more passengers.

Figure 2 - The most polluting flights in terms of climate impact per passenger of a selection of short-haul (left) and long-haul (right) flights



Per passenger kilometre

The most polluting flight can also be viewed in relative terms. This study therefore offsets the climate impact per passenger against the number of kilometres travelled, allowing us to look at the climate impact per passenger kilometre. In Figure 3, we provide an overview of the flights with the greatest climate impact per passenger kilometre (in this case, two destinations for the shortest and longest flights because they have a similar climate impact to some extent).

This shows that long-haul and short-haul flights all have approximately the same climate impact per passenger kilometre (0.31 $kgCO_2/km$). This is particularly noteworthy, as we previously observed that the climate impact of the longest flights is many times greater than that of the shortest flights. In relative terms, this is not the case and many short-haul and long-haul flights are equally polluting. If we look specifically at the CO_2 impact, the effect is actually the opposite. In relative terms, short-haul flights have a greater CO_2 impact (approx. 0.15 $kgCO_2/km$) than long-haul flights (approx. 0.05 $kgCO_2/km$). This is explained by the fact that short-haul flights consist largely of take-off, landing, climbing and descending. These phases are relatively energy-intensive and therefore polluting. In relative terms, the total climate impact is still more or less the same for long-haul and short-haul flights because the non-CO_2 effects are relatively greater over long distances.

Figure 3 - The most polluting flights in terms of climate impact per passenger kilometre of a selection of short-haul (left) and long-haul (right) flights