

Monitoring Air Miles at the Faculty of Sciences (MNF) to reduce CO² emissions emitted by academic flights

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Abstract

To counteract the effects of climate change, a radical reduction of greenhouse gas emissions is essential. Reducing emissions is necessary for all areas of society, which includes the scientific community. Sustainable policies are being introduced progressively at universities, and for this paper relevant, the University of Zurich. The University of Zurich has actively chosen a more sustainable path and implemented “Strategy 2030” in 2022, which calls for climate neutrality until 2030. A flight emission reduction of 53% by 2030 is indispensable to achieving this goal. The first steps in the right direction have already been taken by the Faculty of Science (MNF). The MNF collected relevant information about all their paid flights from 2018 to 2020, including flight numbers, IATA codes of the origin and destination airports, booked service class (economy, premium economy, business, and first-class), and emission of greenhouse gas per flight. Analyzing the provided dataset, we were interested in how a chosen service class impacts flight emission. As a result, we conducted an R analysis to quantify the impact of selecting a lower service class has on future flight emissions. The goal is to provide the MNF with concrete approaches, starting with choosing lower service classes and thus implementing the sustainability goals of the University of Zurich.

Keywords: academic flying, carbon emission, sustainability, environmental protection

1. Background

The negative implications of air travel are globally well known. The aviation sector alone is responsible for 3.8% of carbon emissions (Klöwer et al., 2020). Researchers who frequently fly to foreign universities due to conferences, guest lectures, and fieldwork are essential contributors in terms of flight emissions. In recent years, travel by airplanes done by academic staff received growing

attention. Especially as universities worldwide incorporate sustainable development strategies (Borgermann et al., 2022). A significant concern is that flight reduction might harm academic work as flying and face-to-face interactions play an essential role in an academic career (Klöwer et al., 2020; Kreil, 2021). Thus, researching the relationship between academic flying and academic work and finding approaches to reducing emissions via air travel became the subject of multiple studies. The study of Kreil et al. (2021) proved that reducing air travel would not affect scientific work. Possible alternatives to long-duration flights were shown in the survey by Klöwer et al., who demonstrated that virtual conferences have a higher attendance rate and how global conferences could be held physically biennially instead of annually. Contrary to other papers, which thematize the problem on a more global scale, this paper aims to find easy and applicable solutions to reduce air travel emissions at the university level, which are easier and faster to implement.

2. Research goal

This study aims to provide the MNF with an analysis of all flight emissions emitted by flight journeys that the MNF funds. The goal is to present concrete propositions on how the MNF can reduce its flight emissions by 53% by 2030 and the influence of flight classes on this reduction target.

3. Methods and data

The dataset used in this paper was provided by the MNF and included all flight numbers of the MNF-paid flights for the period 2018-2020. The dataset also included a marginal amount of IATA- codes for the corresponding origin and destination airports. Information on flight distances and emissions was not available. To create accurate and meaningful recommendations for reducing flight emissions at the MNF, it is essential to complete the dataset with all IATA codes and corresponding emission values. Two different APIs were used in the data preprocessing, which retrieved the corresponding IATA codes for each flight number using a Python script and calculated the emissions for each flight segment in a second step using the obtained IATA numbers. With the complete dataset, the analysis was conducted to examine the effect of flight classes on emissions. For this purpose, R was used, taking only the emissions and not the flight distances into account. The average of all emissions from 2018 to 2020 was to determine the MNF reduction target. As only one dataset was available for

this paper and a specific analysis of these data was pursued, no alternative approach remained suitable in terms of data selection and preprocessing.

4. Expected or preliminary results

As a result of analyzing the data and the nature of this paper, no hypothesis is made other than that the paper's goal is reducing emissions. This can be achieved in diverse ways, only one of which is specifically analyzed here – the effects of cabin classes. However, as visible in Figure 1, the preliminary results show that the space and CO₂ intensive flight classes cause only a tiny portion of the emissions. Thus, it can be hypothesized that the emission targets of MNF cannot be achieved with a mandatory booking of only economy class tickets. There were 5478 flights, of which 5162 were economy and 262 were business class.

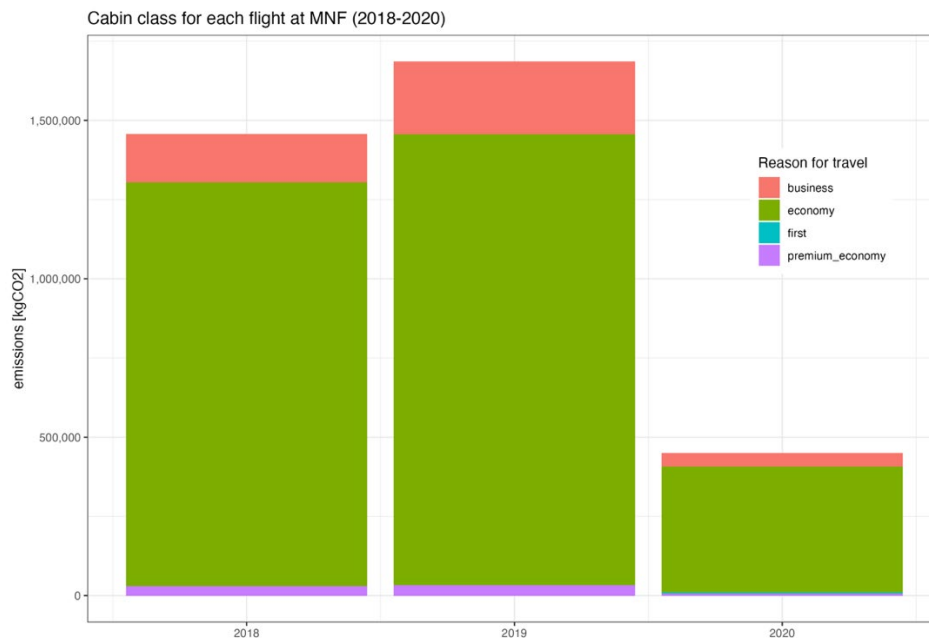


Figure 1: Distribution of emitted kgCO₂ for each cabin class for every flight at the MNF in 2018-2020, distinguished by color.

5. Impact

The findings of this paper will contribute significantly to MNF's ability to meet its goal of reducing aviation emissions by 53% until 2030. Likewise, this paper will demonstrate the varying implications of flight classes on the emissions emitted and illustrate how severe or not a higher flight class is on the emissions generated. Furthermore, the analysis will demonstrate for the first time the spatial distribution and focus on flights across the MNF and what spatial

direction could be further explored with particular attention to groupings for flights. Further, the findings will not only be beneficial for the sustainable goals at the universities level but have also the potential to reduce emissions on a global academic scale, which would positively impact our environment and society.

References

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