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Decreasing environmental impacts of tourism through convenient plane-free travel

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Abstract

Transport represents a significant part of the tourism industry; however, it also contributes considerably to global warming. Aviation not only is one of the modes of transportation that emits the most carbon dioxide, but it also has other detrimental effects on climate, for instance the formation of contrails. Subsequently, this paper aims to explore ways to decrease the environmental impacts induced by tourism through convenient plane-free travel in Europe. After reviewing the literature available on the subject, twelve semi-directed interviews were conducted, either with individuals who take the plane regularly or with people who have made the decision to stop taking the plane for environmental reasons. As a result, advantages and disadvantages of common types of transport used to travel throughout Europe, namely the bus, the car, the plane, and the train, could be identified. Moreover, frequent fliers had the opportunity to indicate why they prefer flying rather than travelling with other types of transport. Individuals who have stopped taking the plane, or at least who are trying to, were also able to highlight barriers they regularly encounter when wanting to travel by train or bus in Europe. Thanks to the insights provided by the interviewees, some recommendations were made regarding improvements that could be done on trains and buses, as well as regulations and nudges which could be implemented by governments.

Keywords: transport, aviation, sustainable tourism, climate change, Europe

Foreword and acknowledgements

Over the last few years, I have developed an increased interest and concern about the topics of sustainability, climate change and global warming. Reflections on how to decrease my carbon footprint have shifted my spending habits, and I am constantly eager to shape my way of living into a more sustainable lifestyle. Accordingly, during the third year of my tourism management studies, I attended various classes related to energy and sustainability.

The field of tourism has a significant role to play in this issue, as travel almost always induces carbon dioxide emissions, largely due to transport. For this reason, my fondness for travelling has collided with my motivation to reduce the emissions I generate. Throughout discussions with friends and family, as well as research in different media, I realised that taking the plane frequently significantly increased my carbon footprint. There are undoubtedly other solutions to decrease our emissions, such as reducing meat consumption or buying second-hand clothes, but in the context of my studies, reducing plane trips is the action which resonated with me the most.

Therefore, I tried to explore other ways to travel within Europe easily, but prices were regularly over my budget and travel time was often too significant, which I found irritating. This was when I began to wonder what could be done to facilitate travel for people who, like myself, did not want to take the plane. This was around the same time my classmates and I were asked to find a topic for our Bachelor thesis, which prompted me to turn to this issue that had been bothering me for a while: finding a way to encourage my peers to decrease their use of air travel.

I have decided to use a qualitative approach in order to exchange with people with a wide range of mindsets, including persons less worried about climate change.

At first, I found myself having trouble finding literature directly related to my thesis, as many articles I read seemed to touch on only one particular aspect of the issue. However, by refining my research and delving deeper into the subject, I was finally able to find helpful literature.

I experienced some difficulty finding individuals who regularly travelled by plane but eventually managed to contact as many persons as needed. I also felt anxious to interview people with such different opinions than mine and felt mindful about confronting them about the emissions induced by their frequent use of the plane. I did not wish to make them feel guilty, although people appeared surprisingly comfortable. My exchanges with them were overall instructive and helped me a great deal throughout my research, by giving me insight on issues I would not have thought about in the first place.

To conclude this foreword, I would like to thank the following persons, whose help and insight have been invaluable throughout this thesis:

- Mr Emmanuel Fragnière, my supervisor, for his availability, his patience, his precious advice and support at all times,
- The twelve persons interviewed, for their time, their insight, and their open-mindedness,
- Ms Clelia Noirot, for her time and her careful proofreading,
- My family, for their immeasurable support, especially at times when I felt discouraged,
- My friends here at the HES-SO, for their advice, their solutions to my frequent questionings, and their caring.

"Humanity is now standing at a crossroads. We must now decide which path we want to take. How do we want the future living conditions for all living species to be like?"

- Greta Thunberg, 2019

Table of contents

List of tables

List of figures

List of abbreviations

CO_2	Carbon Dioxide
COP26	United Nations Climate Change Conference UK 2021
GDP	Gross Domestic Product
IATA	International Air Transport Association
ICAO	International Civil Aviation Organisation
IPCC	International Panel on Climate Change
LCC	Low-Cost Carrier
NO_X	Nitrogen Oxides

Introduction

When one thinks of tourism, a plane is probably one of the first things that comes to their mind. Indeed, flying has become quite frequent, particularly for Europeans and North Americans who go on holiday. This is far from surprising, given that planes are usually the fastest, cheapest, and most convenient mode of transportation. However, its environmental impact is often overlooked.

Nowadays, global warming and climate change are concepts everyone should have heard about, at least once. Through the carbon dioxide (CO_2) emissions they induce, planes are one of the many causes of the rise of temperatures, even if they do not represent the majority of emissions.

Combining tourism and sustainability is not an easy task. One way of drastically reducing a trip's environmental impacts is carefully selecting the mode of transportation used to travel. For instance, trains produce a very minimal amount of CO_2 compared to planes. Accordingly, this paper studies how decreasing the environmental impact of tourism could be possible through convenient plane-free travel in Europe. The associated research question is the following:

Based on semi-directed interviews, how can the Swiss French population be prompted to reduce plane trips, in order to decrease their impact on the environment?

This thesis is divided into six chapters, each with a different purpose. In the first instance, the context of the research will be presented, from the environmental background to the phenomenon of flight shame. The chapter will also analyse the current aviation situation in Switzerland and compare various types of transport, as well as the plane's contribution to gross domestic product. The popularisation of flying and the decline of night trains will also be addressed. At the end of this chapter, the research topic will be established, with its related objectives.

Secondly, the literature available on the subject will be reviewed and divided into three main topics: the impacts of aviation on global warming, related solutions, and socio-economic

factors. Then, the methodology of the paper will be presented, alongside an outline of the approach, the presentation of the interview sample, and the interview guide.

The synthesis of interviews is set out after the methodology and includes a summary of the different points of view expressed by the respondents, which are divided into six themes: climate impacts, comfort and services, destination offers, price, speed, and other advantages and disadvantages. The fifth chapter will describe five statements drawn from the synthesis of the interviews and will either confirm or invalidate the literature review. These statements will be discussed and used as a basis for the recommendations.

Lastly, some managerial recommendations will be outlined, with suggestions for train and bus improvements, regulations, and nudges. Two of the nudges will be further developed, and an example of what further action could be taken will be provided for each of them.

1. Context

This chapter aims to set the context of this paper, in order to see the various elements that have led to the present state of civil aviation, and which will make the research question relevant.

Firstly, the environmental issues will be explored, followed by the current situation in Switzerland and the comparison of the ecological impact of planes compared to other transportation types. Then, the events which have led to the popularisation of flying will be described, as well as their impacts on other means of transport, the voting on the CO_2 Act, and the phenomenon of flight shame. By taking all these previous aspects into account, the research question will finally be established, along with its objectives.

1.1. Environmental context

With the publication of the sixth assessment report of the International Panel on Climate Change [IPCC] in August 2021, it has become more apparent that carbon dioxide emissions need to be urgently decreased to respond efficiently to the climate crisis (IPCC, 2021). Global warming is currently a significant issue and was, for instance, the particular focus of the United Nations Climate Change Conference UK 2021 (COP26), which was held in Glasgow last autumn (United Nations, 2021).

Since the aviation industry is responsible for 2% of the world's human-induced carbon dioxide emissions (Air Transport Action Group, 2020) and is also the cause of 3.5% of global warming if cirrus clouds are taken into account (Lee et al., 2021), it seems evident that reducing air travel would be part of the solution to address climate change.

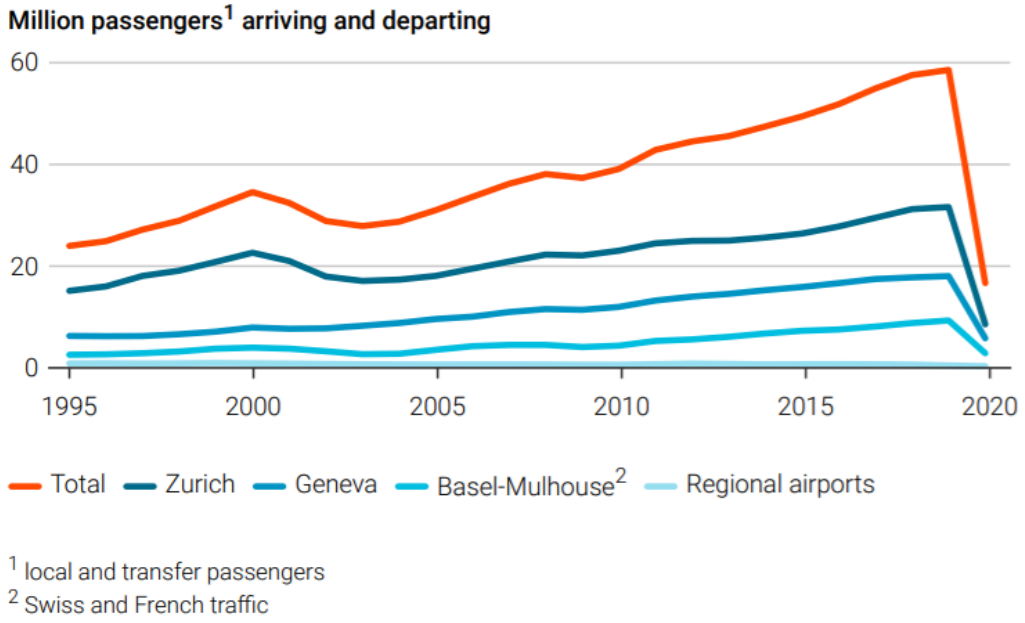
1.2. Current aviation in Switzerland

The Swiss Federal Statistical Office (2021a) keeps track of various information regarding air traffic, which is helpful to grasp the impacts of aviation. In the following paragraphs, only civil aviation will be considered, as it is the primary focus of this paper.

There are three national airports in Switzerland. In 2020, Zurich airport hosted 50% of passengers arriving, departing, or transiting through the country, while Geneva and Basel-Mulhouse respectively welcomed 34% and 16% of them. Fewer passengers go through

regional airports. In 2020, there were almost 16.5 million passengers, compared to about 59 million in 2019. Indeed, the Covid-19 sanitary crisis has had a tremendous impact on this industry, causing a decrease in passengers by 72%, as shown on figure 1. Such a low number had not been recorded since the 1980s (Federal Statistical Office, 2021a).

Figure 1 - Air passengers in Switzerland

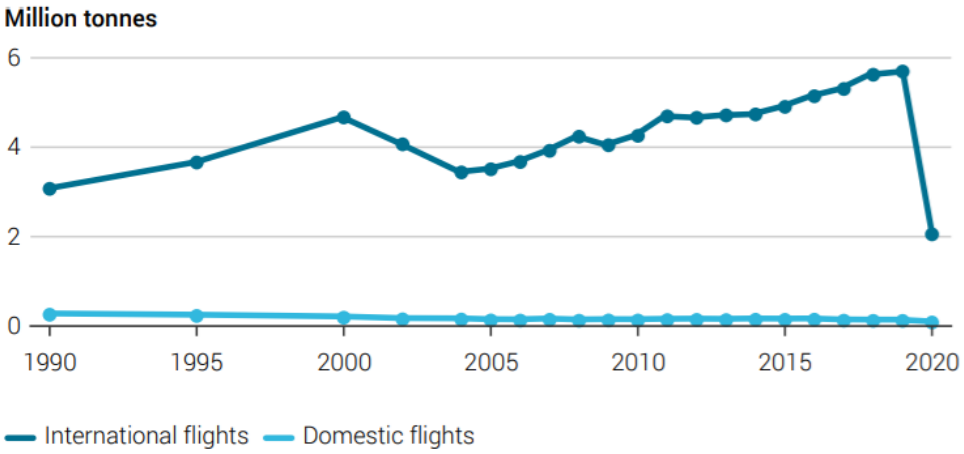


[1] local and transfer passengers
[2] Swiss and French traffic

Source: Federal Statistical Office, 2021c

The pandemic also resulted in a reduction of 64% of charter and scheduled flights movements between 2019 and 2020. There were about 470 thousand of them in 2019, for only 167 thousand in 2020 (Federal Statistical Office, 2021a). These flights produced 2.1 million tons of CO_2 in 2020, against 5.8 million in 2019 (Federal Statistical Office, 2021c), which compares to a car going around the equator circle 585 thousand times (United States Environmental Protection Agency, 2021). The evolution of CO_2 emissions from civil aviation is evidenced in figure 2.

Figure 2 – CO_2 emissions of civil aviation



Source: Federal Statistical Office, 2021c

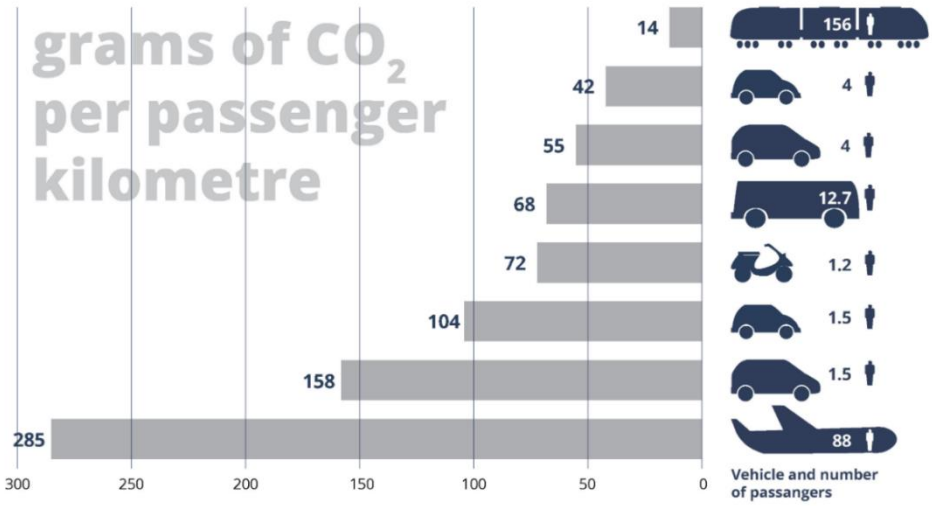
It is important to note that the reduction of emissions is closely linked to national measures regarding the pandemic, such as the shutting of borders. Therefore, it is highly possible that after the pandemic is over, CO_2 emissions from the aviation industry will return to their initial level (Liu et al., 2020).

In November 2021, a member of the National Council asked the Federal Council to consider the real harmfulness of aviation, not just the CO_2 emissions it induces. To this, the Federal Council responded that if all of the effects of air traffic were taken into account, for instance including cirrus trails, 27% of Swiss global emissions would actually come from air travel (National Council, 2021).

1.3. Comparison with other types of transportation

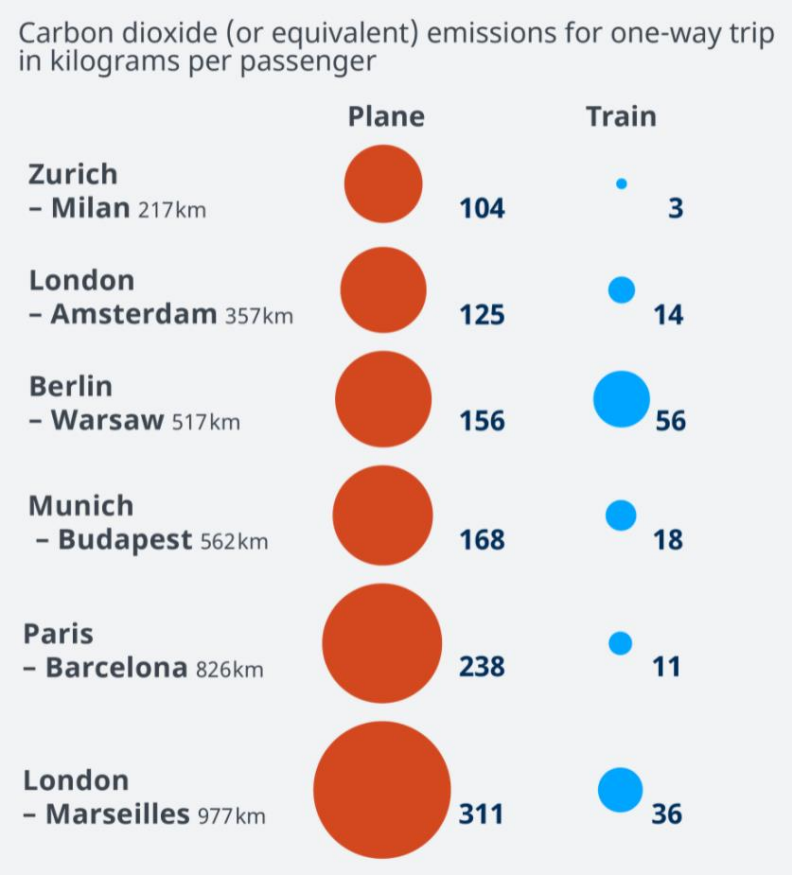
To fully appreciate the extent of the pollution caused by planes and understand why they should not be favoured, it is essential to compare this means of transportation with others, especially regarding CO_2 emissions. In 2014, the European Environment Agency provided an estimation of the quantity of carbon dioxide produced by one passenger for each kilometre they make, for different transport types. Considering their infographic, shown on figure 3, it is clear that planes are the means of transport that emit the most. This is also evidenced by figure 4, which shows a graph from a 2018 study from Deutsche Welle, where researchers compared carbon emissions produced both by a train and a plane, for the same distance. The former emits drastically less carbon than the latter.

Figure 3 – CO_2 emissions from passenger transport



Source: European Environment Agency, 2014

Figure 4 - Comparison of CO2 emissions from train and plane trips



Source: IFEU EcoPassenger, n.d., cited in Deutsche Welle, 2018

1.4. Contribution to Gross Domestic Product

Although the number of flights has dramatically decreased over the last two years as a result of the pandemic, it is clear that the number of passengers was rapidly increasing before then (Federal Statistical Office, 2021b). Indeed, according to AeroSuisse (n.d.), the aviation industry contributed to 2.5% of the Swiss Gross Domestic Product (GDP) in 2018, showing its significant importance in the country's economy.

1.5. Popularisation of flying

In the last decades, flying has become a common means of transport, as it could be seen in previous parts of this chapter. The different factors which have led to this popularisation will be described in the following subsections.

1.5.1. Fuel tax exemption and freedoms of the air

In 1944, the Chicago Convention decided that international air transportation would be exempted from fuel taxation, based on the recognition that these taxes would otherwise represent an obstacle to the industry's development. This measure therefore contributed to the aviation industry's prosperity because it represented one less significant expenditure for airlines, thus inducing a decrease in ticket prices (International Air Transport Association [IATA], n.d.). Furthermore, following the same Chicago Convention, the nine Freedoms of the Air were established, which allowed airlines to have increased flexibility over the circulation and halts of their fleet in other countries' airspace (International Civil Aviation Organisation [ICAO], n.d.).

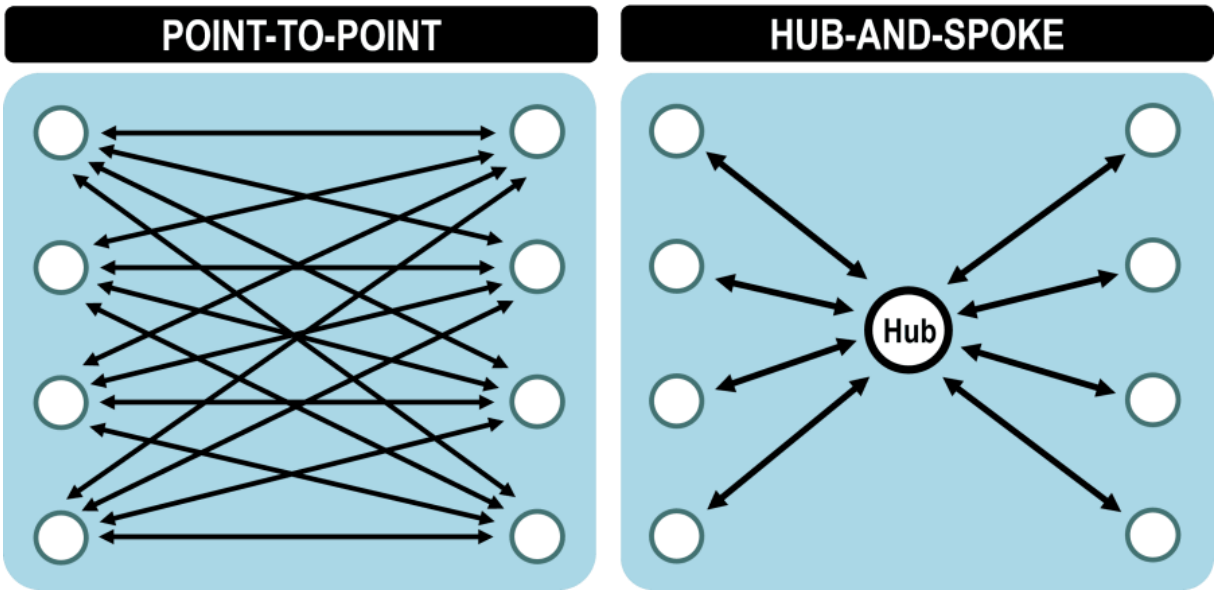
1.5.2. Liberalisation

In Europe, the liberalisation of air transportation took place with the Third Package, which included measures to gradually shift from the nationalisation of airlines to their entrance into the free market. Indeed, before this liberalisation, states had their own rules regarding flying and would usually make bilateral agreements with one another. The Third Package therefore created a more open environment and facilitated aviation throughout Europe (International Civil Aviation Organisation, 2003).

The Airline Deregulation Act, which was passed in 1978 in the United States, represents a significant milestone, as it could be observed that it directly contributed to the decrease in ticket prices (Econlib, 2019).

The establishment of the Freedoms of the Air and the liberalisation made it possible for major airlines to develop hub and spoke systems, which consist of airlines choosing at least one primary airport, the hub, where all passengers transit before being flown to their actual destination, the spoke. As seen on figure 5, this model requires fewer routes than a point-to-point arrangement and allows the airlines to have fuller flights. However, it takes more time for passengers to reach their final destination (International Transport Forum, 2015).

Figure 5 - Airline networks



Source: The Geography of Transport Systems, 2022

1.5.3. Low-cost model

Alongside the liberalisation of air transport came the growth of low-cost carriers (LCC), which reused the point-to-point model. With cheaper flights and shorter travel times, they became highly successful amongst travellers for whom a luxurious experience mattered very little. On these flights, passengers often have less comfort, no free food onboard, and access to fewer cities. LCCs caused air travel to shift from a luxury to a standard service for a wide range of the population. The best-known LCCs in Europe are Ryanair and EasyJet (Picardo, 2020).

1.5.4. Social influence

The rise of social media has created influencers, people who regularly post content promoting various products and services, with a significant number of followers who trust them and adhere to their opinion, similarly to word-of-mouth, only on a larger scale. Influencers regularly collaborate with brands and often focus on a specific topic, such as fashion, sport, or travel (Geyser, 2022). This last element is the most relevant in the context of this paper. Travel influencers will focus on promoting destinations and experiences, while giving their opinion about companies such as airlines or hotels and sharing tips and tricks about travelling (Perese, 2021).

Seeing travel influencers posting about their experience, as well as seeing friends sharing content about their trips, inevitably boosts one's appetite for travel. This increased desire to go on vacation, combined with the cheap flights offered by LCCs, which make travelling easier and more accessible, engenders more travel and produces more carbon dioxide as a result. This phenomenon has created a trend toward regularly flying to popular destinations which are, in fact, not that far away, for instance Barcelona or Ibiza, often for a short period of time, such as a weekend (Asdecker, 2022).

1.6. Decline of night trains

At the beginning of the 1990s, an extensive network of night trains existed throughout Europe. However, with the facilitation and popularisation of air travel, as well as all the elements previously mentioned, particularly the rise of LCCs, this train network rapidly declined, as it was not viable against flights this cheap. Night trains gradually disappeared, mainly until the early 2010s, removing accessible alternatives for people wanting to travel without flying. Figure 6 shows the evolution of the night train network in France from 1981 to 2020. It can be seen that there has been an extreme reduction of available lines, with only two left in 2020. Nonetheless, since 2019, train companies are slowly reopening some of these lines, to align with the European project of becoming carbon neutral (Schmidt & Ferguson, 2021).

Figure 6 - Evolution of the night train network in France

Source: Trains Directs, n.d., cited in France Info, 2020

1.7. CO_2 Act

Moreover, on the topic of politics, the Swiss population voted on the CO_2 Act on 13 June 2021. The law was rejected by 51.6% of voters, with a participation of 59.7% (Federal Council, 2021). This shows that almost half of the voting population was ready to make the suggested concessions in order to preserve the environment. The other half, however, did not agree with the motion. Nevertheless, this does not necessarily mean that they were against the idea of reducing carbon emissions, but only that they disagreed with the measures that were proposed in this instance.

1.8. Flight shame

It is also important to touch on the phenomenon of flight shame, which has developed over the last few years in Sweden and is in stark contrast with travel influencers and the trend of fast travel they created. The term is used to describe concerns about the environmental impacts of taking the plane. It has been demonstrated that this feeling can have consequences on travellers' perception of aviation and decrease their willingness to travel by plane as a result (Gössling et al., 2020).

1.9. Research topic

Considering all of the aspects cited above, it can be seen that civil aviation is now truly popularised, but not necessarily for the better, particularly with regard to climate change. This paper will therefore attempt to answer the following research question:

Based on semi-directed interviews, how can the Swiss French population be prompted to reduce plane trips, in order to decrease their impact on the environment?

The first research objective of this paper will be to review the literature available on the topic. The second objective will be to interview persons part of the Swiss French population, in order to find what prevents them from switching from air travel to trips with other kinds of transportation and recognise difficulties encountered by people who have already stopped taking the plane. Finally, the last objective will be to provide recommendations regarding plane-free travel throughout Europe, in order to encourage the Swiss French population to fly less.

As previously established, reducing carbon emissions is becoming increasingly necessary. The climate emergency is clearly felt within movements such as Fridays for Future (2019) or Extinction Rebellion (n.d.), and one could argue that it should be everyone's top priority, as the future of humanity depends on it. Indeed, each action, including for instance economic transactions, will not matter when the climate crisis reaches a critical stage. Although some will argue that the aviation industry is responsible for 3.5% of global warming (Lee et al., 2021) and therefore not that significant, every single action to mitigate the climate crisis should be taken. This is why finding incentives and alternatives to reduce plane journeys has become crucial.

This thesis will seek to deliver recommendations to transport companies, especially the railway ones, regarding actions they could take to improve their services and become more competitive against airlines. It will also provide some helpful suggestions for governments regarding regulations which could be established to encourage the population towards plane-free travel throughout Europe.

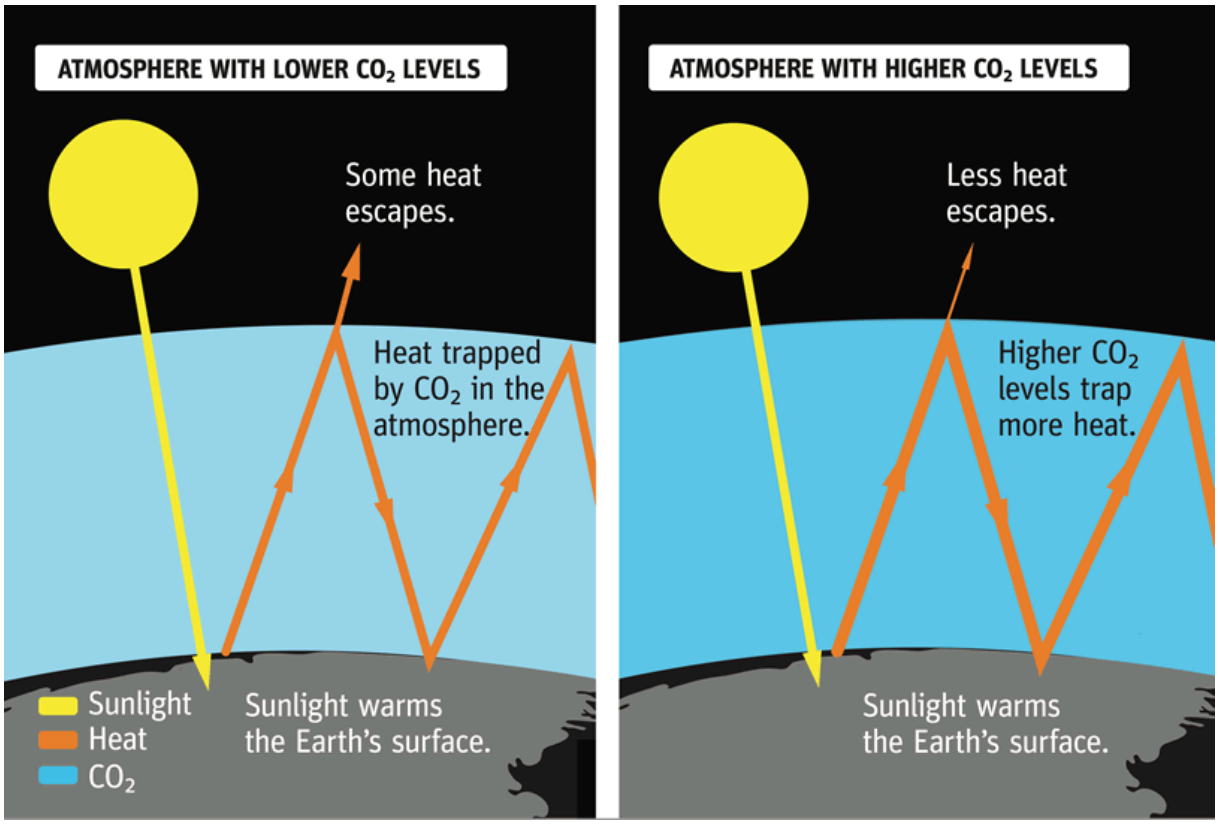
2. Literature review

The purpose of this chapter is to assess the current knowledge around the research question established in the previous chapter. It will first review the scientific studies on the impact of aviation on global warming in further detail than in the previous chapter, before considering various solutions proposed by the literature to counter the issue. Lastly, it will evaluate the socio-economic factors that also influence the reduction of plane trips.

2.1. Impacts of aviation on global warming

Multiple studies have been published on the topic of aviation and global warming. Already in 1999, Prather et al. researched the impacts of planes on climate change, finding three types of emissions produced by planes: substances which are radiatively active such as CO_2, chemicals like Nitrogen Oxides (NO_X), and substances generating aerosol particles such as contrails. At that time, they were not able to measure the exact effect of aircraft on global climate change. However, in 2005, following the Kyoto Protocol, Jardine published a report explaining how to compute the impacts of aviation on the environment. He based the calculation of carbon dioxide emissions on the quantity of fuel used for each flight, with the help of a model for take-offs. He also tried to set a price for the impacts of each ton of CO_2, including its market price, the cost of offsetting it, and externalities regarding the degradation of the environment. For instance, through the construction of airports, aviation also leads to other environmental impacts such as loss of biodiversity, landscape degradation and land deterioration, as explained by Sunlu (2003). Recently, in 2021, Lee et al. considered global warming caused by aviation through not only CO_2 emissions but also other factors, such as contrail cirrus. Based on these new components, they concluded that aviation was responsible for 3.5% of global warming. Figure 7 is a simplified visual representation showing how an increase of CO_2 in the atmosphere leads to a rise in average temperatures.

Figure 7 - Atmosphere with various CO2 levels



Source: Global Climate Change Explorer, 2022

2.2. Solutions

Numerous researchers have studied various solutions to reduce the environmental impacts of air travel. For example, Lee et al. studied technical solutions in 2009, particularly around how to achieve more fuel efficiency on planes since this would reduce emissions of carbon dioxide. In addition, the possibility of using liquid hydrogen or biofuels instead of kerosene was also explored. However, as depicted by Van de Graaf et al. in 2020, several issues still need to be addressed before hydrogen can be used, such as finding clean sources of energy to produce it in the first instance.

Lee et al. (2009) also showed that lowering planes' cruising altitude would reduce emissions, as they need more fuel to go higher in the sky. Furthermore, they considered policies to help reduce CO_2 emissions, such as taxation and better transport planning. Bows-Larkin (2015) also investigated measures for the aviation sector to avoid a two-degree Celsius global temperature rise, before concluding that flying demand should be constrained, despite the population's reluctance. Larsson et al. (2019) reviewed the European Emissions Trading System, a carbon market where stakeholders can trade allowances in order to meet their

emission goals and to which Switzerland has been linked. They also reviewed the Carbon Offsetting and Reduction Scheme for International Aviation created by the ICAO, of which Switzerland is part. With this system, emissions from international flights exceeding those of 2020 are offset. However, both of these models do not appear to be effective enough, according to Larsson et al. (2019).

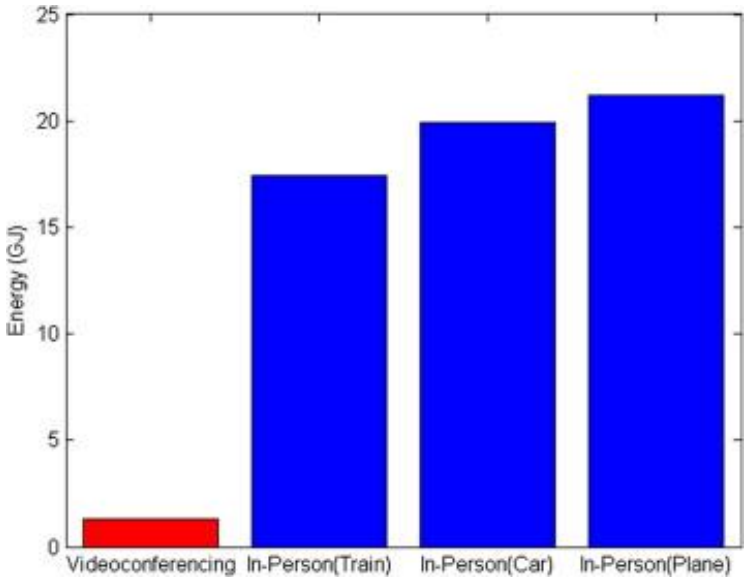
In 2018, Kantenbacher et al. examined the British population's opinion on various policies regarding aviation and climate. They found that the policies that were better received by the public were those that not only were cheapest for individuals, but also had the most direct positive impacts on them. Naturally, these measures placed most of the costs on the government or the aviation industry itself. For instance, the most successful proposition was to develop public transport, and one that received less support was to limit people's number of flights per year.

According to Becken and Mackey, in 2017, one-third of airline companies offered carbon offsetting to their passengers. However, they failed to provide precise and comprehensive information to explain that it is not the flight's emissions themselves that are neutralised, but rather emissions elsewhere. The authors established five principles that airlines should apply in order to have the best strategy regarding carbon offsetting. The first two principles relate to providing a scientifically rigorous and comprehensive explanation to customers. The third suggests carefully selecting the programs used for offsetting, choosing ones that genuinely help refrain climate change and its side effects, and the fourth principle asks to monitor the selected projects cautiously. Lastly, the fifth principle recommends the supervising of carbon credits by a third party. Gössling et al. (2007) also observed that carbon offsetting programs greatly vary, not only in how much they compensate but also in their price, which can cause these programs to lose their credibility.

Furthermore, Becken and Mackey (2017) noted that only a small proportion of travellers chose to offset their flights. In 2016, Anderson and Bernauer discovered that public support for carbon offsetting depends on ethical issues, financial efficiency, and environmental effectiveness. Finally, Araghi et al. (2014) investigated whether carbon offsetting was actually valuable. They found that people prefer using an airline with a certain level of eco-efficiency, but that carbon offsetting barely influences passengers' airline choice.

Furthermore, the pandemic has forced a lot of travel to stop, including business travel. As a result, companies found new ways to meet, such as through videoconferences. On the one hand, people were not travelling anymore for face-to-face reunions, which contributed to decreased emissions from transport. On the other hand, online meetings still require a significant amount of energy to function. It is therefore essential to verify whether videoconferences produce less energy than taking the plane for in-person meetings. In 2021, Evrard et al. compared the environmental impacts of a conference held online or in-person. They concluded that the online conference had significantly less environmental impacts in almost every aspect. In 2014, Ong et al. carried out a similar study, coming to the conclusion that at the time, videoconferences only used 7% of the energy required for in-person reunions, as it can be seen in figure 8, which shows that online meetings are significantly less energy-consuming, and therefore represent a better solution.

Figure 8 - Energy required for meetings



Source: Ong et al., 2014

As shown in the previous chapter, the train is an efficient transportation mean, thanks to its low CO_2 emissions and its large capacity. Nevertheless, as previously mentioned, the number of European night trains has drastically diminished in the last few decades (Schmidt & Ferguson, 2021). While night trains are making a comeback, a much faster and broader development would be needed to offer a real substitute to plane trips. Avogadro et al. studied

this topic in 2021 and found that replacing the short and medium intra-European flights with high-speed trains would be beneficial for the environment and helpful to meet the European emission reduction target. A student from the Delft University of Technology in the Netherlands even created a model for a standardised train network in Europe. Indeed, Laura van Overhagen (2021) detailed her vision in her Master's thesis, imagining a system with regulated prices and automated ticket payment based on the location of the passenger.

2.3. Socio-economic factors

Some alternative solutions can also be found by adopting a social lens on the question. Gössling (2019) investigated the emissions that celebrities produce when travelling, which he found to be considerable. He also highlighted that these personalities tend to set social norms. For instance, if they show themselves taking the plane frequently, they implicitly influence the rest of the population to copy their lifestyles and travel more often and further away.

Gössling et al. (2020) have also researched the phenomenon of flight shame, establishing a correlation between individuals' social setting and their willingness to travel by air. In their study, some people reported flying less because of their children striking for the climate or because the consequences of climate change were regularly brought up in their circles. The research also found that flight shame was truly present in people's everyday discussions and that even though a change in demand had not been noted yet, it could very well come in the future.

The nudge theory, popularised by Nobel prize laureate Richard Thaler and his co-author Cass Sunstein, is another interesting way to consider how human decisions can be influenced. According to the definition they provide in their book, a nudge refers to a component of one's environment that can transform one's behaviour. Their theory states that in order to create effective nudges, one must look at choice architecture. These nudges are meant to help people make intelligent decisions, as human beings are not perfect (Thaler & Sunstein, 2009). Some studies have already been conducted regarding the effect of nudges on passengers' decision to choose carbon offsetting for their flights. In 2018, Tyers came to the conclusion that nudges were not effective in regard to prompting people to offset their flights' carbon emissions. On the contrary, Kim and Hyun (2021) found that nudges directly impacted a large part of their study's respondents. However, nudges are not only appropriate for carbon

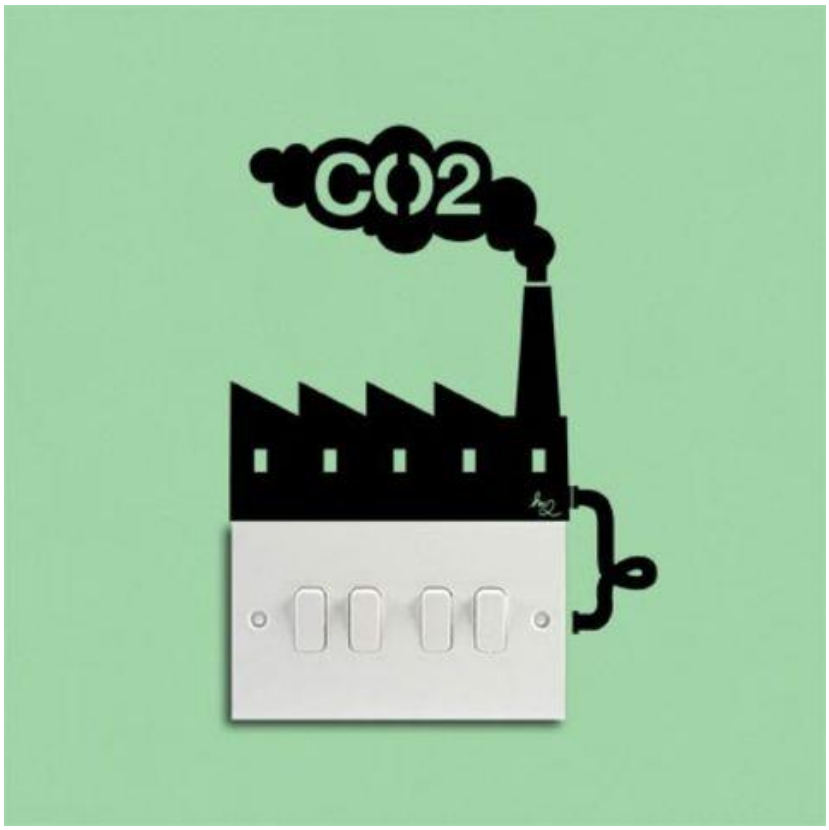
offsetting, but they could also be used to encourage travellers to reduce their plane trips and opt for less polluting types of transport.

As an example, figure 9 shows a nudge used to prompt people to reduce paper towel waste by calling attention to deforestation in the Amazon rainforest. Additionally, figure 10 is an example of a nudge used to encourage individuals to turn their lights off by reminding them that failing to switch them off produces carbon dioxide.

Figure 9 - Nudge for reducing paper towel waste

Source: La Libre, 2014

Figure 10 - Nudge for saving energy



Source: CNN Business, 2012

In 2019, Gössling et al. researched how air travellers rated the necessity of their plane trips. They found that the purpose of travel has a strong influence on its perceived necessity. For instance, plane trips between the place where one's studies and their family home seem to be relatively price inelastic, whereas the choice of transportation for leisure trips depends on price, distance, and the accessibility to other means of transport than the plane. Accordingly, a large proportion of international travel is done by air, as plane tickets have become cheaper over time.

Slow tourism is a good example of a new form of tourism that avoids plane trips for small distances and short stays. Dickinson and Lumsdon (2010) define slow tourism as "people who travel to destinations more slowly overland, stay longer and travel less" (cited in Oh et al., 2016). Indeed, slow tourism encourages the use of transportation means that emit few carbon emissions (Caffyn, 2012).

It goes without saying that reducing flight demand would inevitably compel the airlines to adjust their offers. According to the Federal Statistical Office (2021c), in Switzerland, the field

of aviation employed 12,891 people in 2020. Therefore, a drastic change in demand would inevitably affect people's employment, some of whom would have to be made redundant.

2.4. Overall

The literature presented above highlights the breadth of research that has already been undertaken on the topic of aviation and climate change. Firstly, the consequences of air travel on global warming were explored through the research of various scientists, with the conclusion that the aviation industry seems to represent 3.5% of global warming (Lee et al., 2021). This chapter then presented various solutions, with some focusing on the technical aspect of the issue and others dealing with regulations and policies, with more specific topics such as carbon offsetting, video conferences, and the improvement of European train networks. Lastly, some social and economic factors were reviewed, such as flight shame, the nudge theory, the necessity of plane trips, and the number of employees in the aviation field. The literature reviewed above establishes some knowledge on reasons and ways to encourage the population to reduce their plane trips, which is helpful with regard to the research topic.

3. Methodology

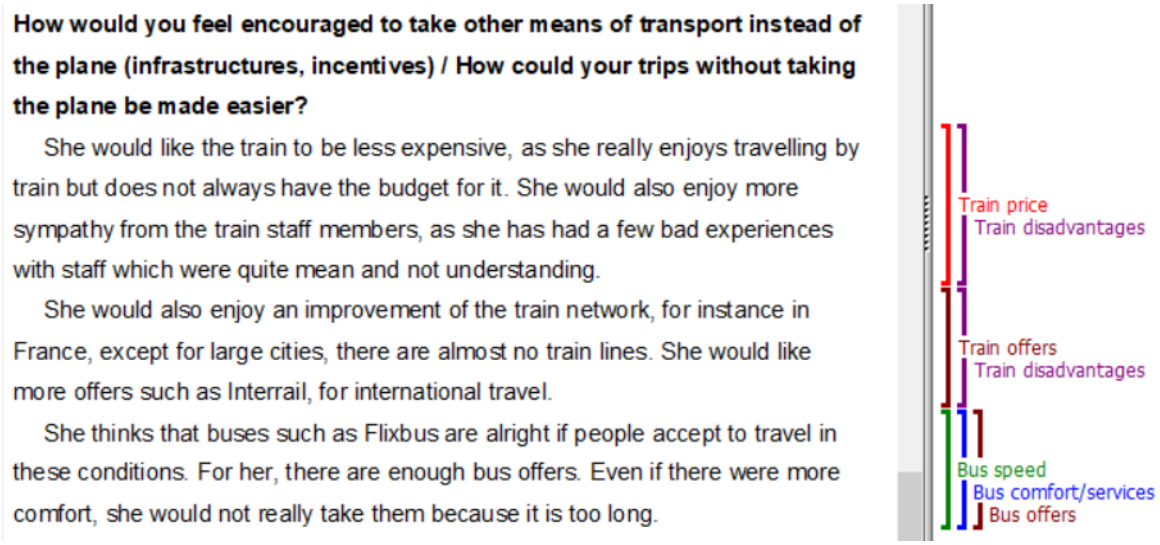
Based on the context and supported by the literature review, the research question has previously been established. This chapter will now look at the methodology needed to find answers to the research question. It will start by defining the chosen approach, then go through the selection of the interview sample, and finally outline the construction of the interview guide. The transcription of each interview can be found in appendices I to XII.

3.1. Explanation of the approach

In order to collect primary data to answer the research question, twelve interviews have been conducted. These interviews were semi-directed, with eight questions prepared in the interview guide. Additional questions might have also been asked, depending on the direction of the discussion. Each interview lasted for about 30 minutes. The researcher took notes during meetings and then transcribed the notes into a description of the discussions. The interviews have therefore not been rewritten verbatim but rather adapted into narrative texts. Each transcription took about one hour.

Once conducted, the transcriptions of the interviews were downloaded on QDA Miner, a software used for analysing qualitative data (Provalis Research, 2022). Thanks to this program, each sentence of the transcription was classified into one or more of seven categories, using the following coding: climate impacts, comfort and services, destination offers, price, speed, and other advantages and disadvantages. Figure 11 shows an example of coding in QDA Miner.

Figure 11 - Example of coding with QDA Miner



Source: Author's data, adapted from Provalis Research, 2022

A table was then created for each of these themes, gathering each point of view expressed during the interviews and categorised by type of transport. The table also stated the number of respondents agreeing with each statement.

With these tables, which can be found in appendices XIII to XIX, the synthesis of the interviews could be established, and a discussion then emerged for each of the themes.

3.2. Interview sample

The interviewees needed for this research have been split into two main categories. The first includes people who rarely or never take the plane, either for environmental reasons or other reasons. The second category, on the contrary, includes people who regularly fly, with at least four trips a year. The latter can be divided into two sub-groups; people who fly for leisure and those who fly for work or their studies. This distinction allows the researcher to get insights from different points of view. The seventh question has been made into two different versions in order to adapt to the different targets.

For ease of reference, the first category, which comprises the persons who rarely or never fly, will hereafter be called group A. As for the second category, the first subgroup, people who frequently fly for leisure, will be referred to as group B. Lastly, the second subgroup, people who frequently fly for business, will be named group C.

In group A, six persons were interviewed. Their decision to stop flying ranges from 2014 to 2021. One of them has not entirely stopped but rarely allows themself to take the plane and only does so for long distances that can hardly be done by car or train.

Three persons who mainly fly for leisure were interviewed in group B. For group C, there are two respondents. One of them frequently flies because they study abroad, and all of their plane trips are from their place of study to their family's home. The other interviewee mostly flies for work meetings.

The remaining respondent, however, does not fit into any of the groups. They are a tour operator and travel a lot as a result. They have nonetheless limited their plane trips to twice a year for environmental reasons, either to accompany their groups or for familiarisation trips.

Thus, they do not belong to any of the groups identified above, yet their insights as a tour operator were considered interesting and relevant enough to be interviewed.

The participants were either identified amongst the researcher's personal contacts or responded to a post on the researcher's social media.

Table 1 gives an overview of the demographic profile of the interviewees. The first column shows the interview number, which can then be found in the appendices. The second and third columns respectively indicate the interviewees' age and occupation. The fourth column displays the average number of trips per year the respondent recorded taking, all transportation means considered. The fifth column also shows the average number of trips per year the respondent took, but only those taken by plane. Finally, comments with specific details regarding the respondent are included in the last column.

Table 1 - Demographic profile of respondents

Interview number	Age group	Occupation	Total trips	Plane trips	Comment
First interview	18 – 24	Student in tourism	4	0	Stopped taking the plane in 2020.
Second interview	30 – 34	UX Designer	5	0-1	Tries to take the plane as rarely as possible, and only for long distances which cannot be done by train or car.
Third interview	18 – 24	Sales & Marketing	20-25	18-19	Travels mostly for leisure and occasionally for work.
Fourth interview	30 – 34	Student in pedagogy	5	0-2	Would take the plane approximately twice a year before the pandemic, however, she has decided to stop flying in 2021.
Fifth interview	25 – 29	Social educator	2-3	0	Stopped taking the plane in 2018.
Sixth interview	18 – 24	Student in ergotherapy	5	5	Currently lives in Belgium for her studies since the training is limited in Switzerland. Her trips are solely between her place of study and her family's home.

Seventh interview	18 – 24	Student in literature	6	0	Stopped taking the plane in 2014.
Eighth interview	18 – 24	Student in socio-education	8	4	Travels only for leisure.
Ninth interview	50 – 54	Commercial director	30	25	Travels mostly for work.
Tenth interview	50 – 54	Tour operator	10-11	2	Travels for work and has limited himself to taking the plane twice a year for ethical reasons.
Eleventh interview	18 – 24	Ticket vendor in a cinema	1-2	0	Stopped taking the plane in 2019.
Twelfth interview	55 – 59	Deacon	4	3	Travels solely for leisure, mainly to her secondary residence in Greece.

People who rarely / never fly People who frequently fly for leisure People who frequently fly for business

Source: Data collected by the author – interviews 2022

3.3. Interview guide

The interview guide was initially written in English and then translated into French since all the respondents were French native speakers. The interviews were conducted in French, and the transcriptions were then written in English based on the notes the interviewer collected.

Before the discussion questions, the interviewees were asked a few details regarding their demographic profile, such as their age and occupation. They were also asked about their average number of trips per year and for how many of them they took the plane. Interviewees who had chosen not to fly anymore were asked when they made this decision.

The eight questions of the interview guide and the reason they were chosen are as follows:

1. Please tell me about your last experience booking a trip and choosing a type of transport.

This question is used as an icebreaker and a conversation starter. It is helpful to provide an indicator of the interviewees' usual behaviour when booking a trip.

2. Why did you choose this type of transport?

This question complements the previous one, as the interviewees are here asked to detail their reasoning when choosing a specific transportation means. What is valuable to them becomes more evident.

3. How would you define the role transportation has in your trips?

This question is asked to establish how the respondents perceive transportation and whether it is only a way of getting around as opposed to a part of the vacation.

4. Which advantages do you see in this type of transport and in other types?

This question further helps highlight what is valuable to the interviewees and how they perceive each transportation means.

5. Which disadvantages do you see in this type of transport and in other types?

This question highlights what respondents find annoying about each transportation mean. Furthermore, when the plane is addressed, it is also helpful to understand the participants' attitudes and awareness towards its environmental damage.

6. In your opinion, to what extent does taking the plane impact the environment, and how does it damage it?

This question provides an overview of the degree of knowledge of the respondents in relation to ecological issues and whether they know precisely how planes damage the environment.

When asked to people who fly regularly, this question is preceded by a disclaimer, which signifies to the participants that the question's purpose is not to criticise their habits but rather to establish their degree of knowledge on the topic.

7. How would you feel encouraged to take other means of transport instead of the plane? / How could your trips without taking the plane be made easier?

This question is the closest to the research question and the most important as a result. It allows the interviewer to collect specific details about what would motivate people to reduce their plane trips, such as infrastructures or incentives.

The first version of this question is directed at people who regularly fly to establish what they think is missing in other types of transport compared to the plane.

The second version is aimed at people who have already stopped taking the plane to know what could facilitate the organisation of their trips.

8. Thank you for your answers, is there anything else you would like to talk about?

The purpose of the last question is to thank the interviewees for their time and to ensure whether there is anything else they would like to discuss in relation to the subject.

4. Synthesis of the interviews

Based on the guide described in the previous chapter, twelve interviews were conducted with the persons portrayed in the interview sample. This chapter will set out the synthesis of the interviews, organised by themes.

The complete transcription of interviews can be found in appendices I to XII. All of the inputs used in this chapter come from data collected by the author from interviews conducted in 2022.

To get a sense of the main topics discussed during the interviews, figure 12 shows a word cloud of the most mentioned words in the transcriptions.

Figure 12 - Interviews word cloud

Source: data collected by the author, adapted with Word Art, 2022

Several themes emerged from the interviews, each with different points of view depending on the type of transport related to it. The themes identified were the following: climate impacts, comfort and services, destination offers, price, speed, and other advantages and disadvantages. Some shared points of view on these topics will be described below, as well as some contrasting opinions.

Appendices XIII to XIX feature some common attitudes that emerged during interviews regarding various themes specified in the title of the appendix. The tables show the type of transport involved, the attitude associated with it, and the number of interviewees who expressed it. Light green shaded rows indicate that multiple respondents shared the opinion, as opposed to light red shadings, which indicate that only one or two participants shared it.

4.1. Climate impacts

Regarding the impact on climate change, three interviewees thought that it was difficult to establish which type of transport was better to use for a given trip, emissions wise. Two respondents stated that transportation, in general, emits a significant amount of carbon dioxide.

Four participants stated that buses emit CO_2, although less than the car.

Six interviewees believed that the car is quite polluting, especially if only one or two persons are in it.

All twelve respondents thought that the plane was very polluting, as it emits a significant amount of carbon dioxide, as well as other greenhouse gases.

Three participants considered the train to be the least polluting type of transportation.

A synthesis of the interviewees' opinions on climate impacts can be found in appendix XIII.

4.2. Comfort and services

With regard to comfort and services, five respondents found buses uncomfortable due to the lack of space. In addition, four of them thought that travelling by bus was inconvenient

because of luggage. However, one interviewee underlined that not having to take care of luggage once on the bus was enjoyable.

Three participants stressed that if the level of comfort were comparable to that of the plane, with services such as food and drinks, they would feel more inclined to travel by buses and trains.

Eight respondents found cars convenient, particularly regarding luggage, though one of them considered that loading all of the suitcases in the boot was not enjoyable. Furthermore, three interviewees believed that having to concentrate while driving could be annoying and tiring.

While three participants felt that planes were uncomfortable, mostly due to the lack of space and other considerations such as air conditioning, two of them thought that the limitation of luggage could be quite constraining. On the contrary, three respondents felt that planes and airports generally offer an elevated level of comfort and services.

Five interviewees considered travelling by train to be comfortable due to the reasonable amount of space for both people and luggage. In addition, three participants believed that trains were convenient as they did not require driving, and they allowed individuals to do other activities such as listening to music or reading. Finally, seven respondents underlined that having to carry and watch their luggage when taking the train could be irritating, similarly to catching connections.

A synthesis of the interviewees' opinions on comfort and services can be found in appendix XIV.

4.3. Destination offers

With regard to destination offers, three respondents expressed that the bus network to travel within Europe was broad enough and included a wide range of destinations. Nevertheless, two participants thought that bus destinations' offers should be increased.

One interviewee felt that a better network of carpooling would be convenient.

Two participants felt that airlines offered a wide range of destinations. Nevertheless, one respondent believed that airlines should be prohibited from offering flights for short distances within a country where trains are available for the desired journey.

Six participants found that the train offer remained low and highlighted their favourable attitude towards an increase in night trains, high-speed trains and passes such as Interrail. Alternatively, one interviewee viewed the current train offers as satisfactory. Furthermore, three respondents considered that booking train tickets could be quite complicated.

A synthesis of the interviewees' opinions on destination offers can be found in appendix XV.

4.4. Price

As far as price was concerned, two participants stated that it is a decisive factor regarding the type of transport they choose. On the other hand, one interviewee explained that price did not influence their choice of transport.

Seven respondents found that bus journeys such as those offered by the company Flixbus are cheap.

Six participants expressed that travelling by car was expensive due to costs involved, such as tolls, gas, parking, and maintenance. On the contrary, one respondent found car trips to be fairly inexpensive.

On the one hand, seven interviewees said that travelling by plane was cheap, or at least less costly than other types of transport. On the other hand, five respondents found that flying could sometimes be expensive. Indeed, two participants considered that going to the airport may induce other transportation costs, such as for taking public transportation or parking fees. In addition, two interviewees believed that plane tickets should be more expensive in order to discourage people from flying.

One respondent stated that offers such as Interrail are not necessarily a good deal due to booking costs. Seven participants found travelling by train to be really expensive, and six of them expressed that cheaper train tickets would be beneficial, as well as a good incentive to reduce plane trips. One interviewee noted that trains are sometimes cheaper than other types

of transport. Finally, one respondent declared that more offers such as Interrail, or student prices, would be welcome.

A synthesis of the interviewees' opinions on price can be found in appendix XVI.

4.5. Speed

Regarding the speed of buses, six respondents said that taking the bus for long distances was too time-consuming. One interviewee believed that the bus could, on the contrary, be faster than other vehicles in urban areas, as they sometimes have their own line.

Three respondents declared that travelling by car took time due to regular breaks. One interviewee nonetheless felt that time goes by faster in a car since they have to focus on the road.

All twelve participants found the plane convenient because it is fast, although four of them consider that waiting times at the airport decrease the time efficiency of the plane. Moreover, one respondent declared that the plane does not give them enough time to make them realise that their vacation is over.

Contrasting opinions have been expressed in regard to train speed, with four participants finding it quite fast whereas five thinking it requires a lot of time. Furthermore, four respondents believed trains to be often late, if not cancelled, especially outside of Switzerland, and three of them found train schedules inconvenient. One respondent mentioned that travel time was not the main reason why they preferred taking the plane, whereas another said they would take the train more frequently if it were faster.

A synthesis of the interviewees' opinions on speed can be found in appendix XVII.

4.6. Advantages and disadvantages

Other advantages and disadvantages, described below, have been identified by the interviewees. Elements related to climate, comfort, services, destination offers, price, and speed are not taken into consideration in this section, as they have already been discussed in the five previous sections.

One interviewee thought that not having to drive and focus when on a bus was enjoyable, while another enjoyed travelling by bus as they could have time to admire landscapes. Three participants found buses convenient for large groups of travellers and a way to meet new people as a result. On the contrary, one respondent thought that buses tend to be loud, which they find annoying. Another person disliked the fact that buses are dependent on traffic and can get stuck in traffic jams, which may impact the duration of the trip.

Nine respondents appreciated the flexibility of travelling by car, as they can make stops when and where they like, as well as choose their itinerary. Moreover, two interviewees found cars useful to visit and move around the destination itself, whereas one participant liked the fact that the car creates privacy as opposed to public transport. In contrast, two participants stated that driving could sometimes be difficult, for instance in the mountains or in countries where they drive on the other side of the road. One person disliked having to find a parking space, which can sometimes be challenging. One respondent found traffic jams to be frequent, which can delay the estimated arrival time.

Four interviewees considered the plane to be the only time-efficient means to travel overseas, while three thought that travelling by plane created an increased feeling of being on vacation. However, one respondent stated that taking the plane with large groups can prove to be complicated, and two other persons explained that the process of carbon offsetting for flights remains unclear. One participant also highlighted the poor quality of food on planes, which not only is not pleasant but can also lead to waste.

One respondent enjoyed being able to stand up and walk while on the train, and two participants considered trains a good way of meeting new people. Alternatively, one interviewee found that train platforms being displayed very shortly before departure in some countries can cause a considerable amount of stress, and another person stated that the staff on trains are not always very helpful nor understanding.

A synthesis of the interviewees' opinions on these advantages can be found in appendix XVIII and the one on these disadvantages in appendix XIX.

5. Discussion

This chapter will provide an analysis of the interviews. Several hypotheses of cause-and-effect relationships will be discussed, using the interviews, the literature, and personal reflections as a basis.

5.1. Climate impacts awareness

Awareness regarding the environmental issues induced by planes can be seen amongst the interviewees. Consequently, some of them have decided to stop flying, while others try to change their habits and take it less often but encounter obstacles due to current infrastructures.

As explained in the context and the literature review chapters, planes have a harmful effect on the environment, as they produce carbon dioxide and other greenhouse gases which induce global warming. The twelve persons interviewed, when asked about this impact, showed signs of knowledge and awareness on the topic, each to varying degrees.

This awareness, which leads to a desire to reduce plane trips, is confirmed in the literature by Gössling et al. (2020). By studying the phenomenon of flight shame, they showed that increased awareness of the plane's climate impacts could lead to a decrease in individuals' willingness to fly.

As it can be seen in the interviews, people who are highly aware of the earth's environmental and climatic state often decide to stop flying, either entirely or only for short to medium distances. It is, however, difficult to find alternatives and booking train tickets can for example prove complicated and time-consuming.

Moreover, some frequently travelling but less aware tourists might try to take trains and buses when convenient for them. However, when they travel dozens of times a year, even if they only take the plane for half of these trips, their carbon impact is still highly significant. For the sake of the planet, it is therefore imperative to give them the opportunity to avoid taking the plane for the majority of these trips.

Seeing that there is a desire for alternatives to plane trips, and despite many obstacles to do so, it is crucial to facilitate trips with other transports such as trains and buses. Nudges

(Thaler & Sunstein, 2009) can also be implemented to motivate the decrease in plane trips to an even greater degree. The following sub-sections will discuss specific topics where there is a need for improvement, in order to help the population to fly less.

5.2. Discrepancies in levels of comfort and services

The level of comfort and services delivered in planes cannot be found in other types of transport, as passengers are less taken care of in trains and buses. This does not provide any incentive for frequent fliers to change their habits.

Some frequent fliers seem to appreciate taking planes particularly due to their level of comfort and to the services provided on board. As a result, they may be more reluctant to take the train or the bus. Throughout the interviews, some participants mentioned that they would appreciate some catering facilities on trains, at least by providing snacks and drinks. This is already the case in some trains, for instance restaurant cars on some Swiss and French lines, so this service could be expanded to more trains.

Space appears to be an issue, not only in buses but also in planes. Passengers might not be comfortable, either because of the little physical distance between them and strangers or because of seat rows being often very close. On the contrary, the interviewees considered trains to be spacious enough.

Luggage is another related issue. Some people appear to be less inclined to take the bus or the train as they find carrying their luggage everywhere inconvenient. Finding room for them can also be a bother. There is no such issue in planes, as one can leave them at the airport and get them back, without having to take care of them. To counter that, the Swiss railway company has already set up a luggage service, with a shuttle taking suitcases from the point of departure to the point of arrival. Expanding this service and its advertising might prove beneficial, as it may encourage a more significant number of travellers to choose the train instead of the plane.

This issue of various levels of comfort and services for transportation means has not been discussed clearly in the literature yet. This is quite surprising, as the question seems to considerably matter for travellers, at least enough to be a decisive factor in their choice of transport.

These various topics, space, luggage, and services, are potential improvement points which could be further developed to create greater incentives for travellers to favour other transports over the plane.

5.3. Lack of train destination offers

As the train offer is too narrow, people often prefer the plane given its more considerable choice of destinations. The international railway network, for instance high-speed and night trains, has been underdeveloped since flying became increasingly popular.

As explained in the section discussing the decline of night trains, the rise of LCCs, along with the popularisation of flying, caused the shrinkage of the night train network, which used to be well-developed in the early 1990s. Nowadays, the railway structure is far less expanded than it used to be.

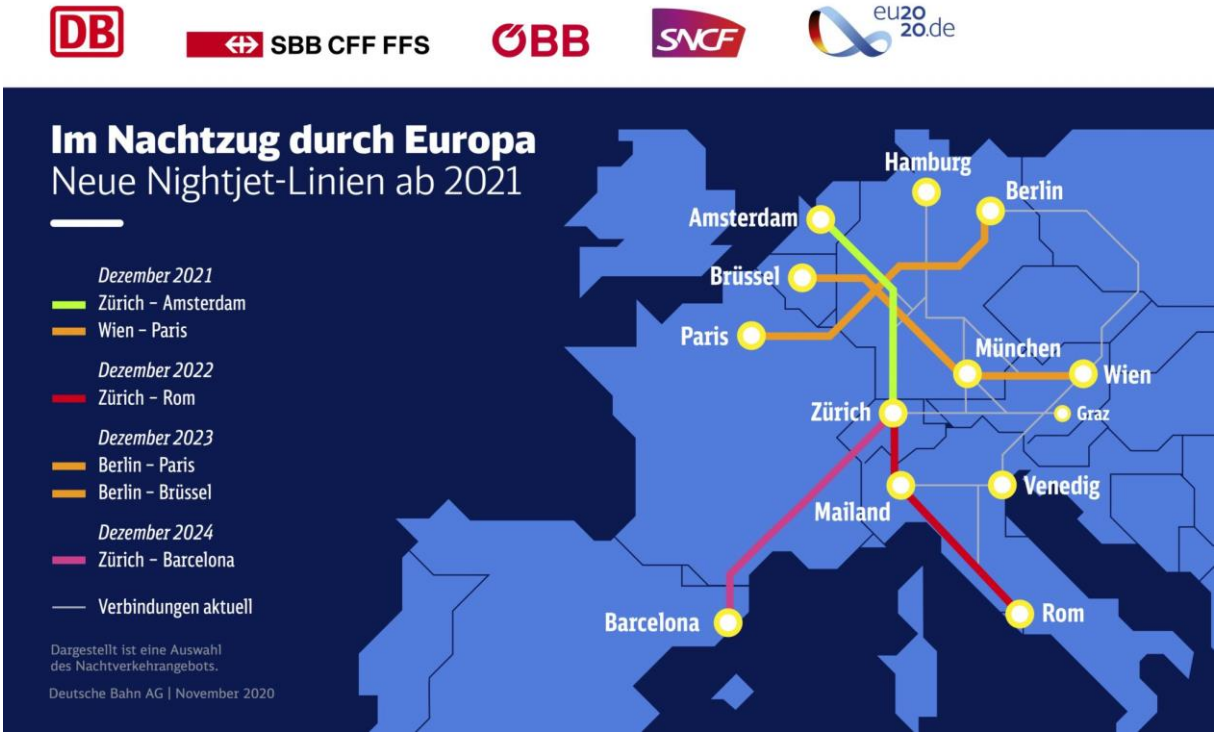
This underdevelopment can be seen clearly in the interviews, as it is the statement shared by the most people on the topic of destination offers. Indeed, a strong desire for more night trains and high-speed trains can distinctly be noticed amongst respondents.

On the contrary, buses seem to have a broad enough offer within Europe, reaching destinations that trains usually do not. Likewise, destinations offered by airlines are sufficient, as no need for more connections was expressed in interviews, at least considering European lines.

Another issue which arose from the qualitative research is that the booking process for train tickets is rather unclear and somewhat complicated. Globalisation of booking systems for trains in Europe would be necessary to facilitate trips without planes.

As expressed by Schmidt and Ferguson (2021), some railway lines that were previously closed due to the decrease in train trip demand are now slowly being reopened by train companies. Figure 13 shows a map of the night train network in Europe. The thin lines represent the previously established night train network, while the bold lines represent the new network which has started and will continue to expand until 2024. On the left side, the legend shows what destinations will be covered by the lines and when these will be accessible.

Figure 13 - New European night train lines from 2021 - 2024



Source: Deutsche Bahn, 2020

Despite this improvement, an acceleration of the redevelopment of night trains and an increase in the high-speed train offer is highly needed. This is also the case for international passes such as Interrail, which represent a good incentive for tourists to visit Europe by train.

5.4. Flying: the cheapest transportation mode

Plane trips are generally less costly than other types of transport, which is partly why it is so popular. Price is therefore a significant factor when it comes to finding alternatives to flying.

The section discussing the popularisation of flying described how planes came to be so popular, partly due to becoming cheaper. As explained by Econlib (2019), the Airline Deregulation Act induced a decrease in plane tickets. The rise of low-cost carriers resulted in even more affordable flights, which seems to make planes the cheapest transportation mode nowadays.

Due to dynamic pricing, ticket fares strongly vary, making the passengers' perception of cheapness change depending on the situation. Indeed, some interviewees stated that flying was expensive, whereas others thought that travelling by plane was cheap. On the contrary,

the majority of the respondents agreed on the fact that train tickets are too expensive and that lowering their prices would provide an excellent incentive to take the train more often.

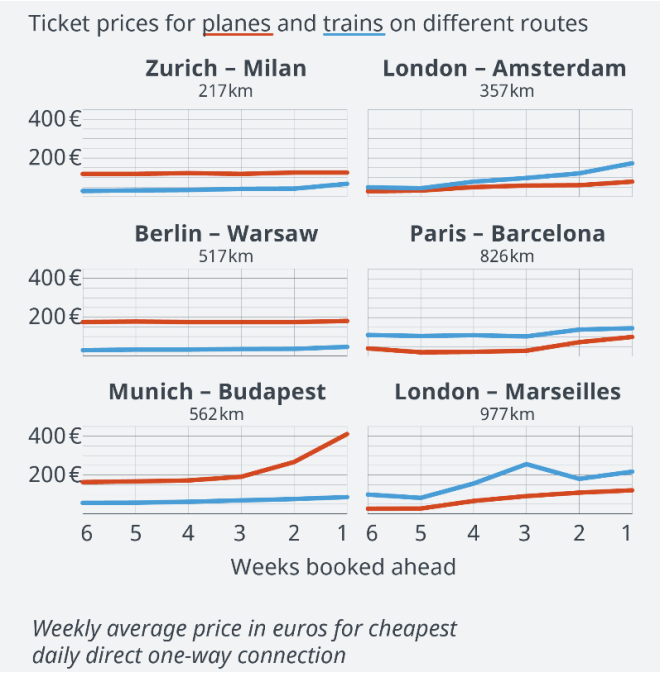
It is not surprising that people regularly turn to planes when they want to travel, as they often provide reasonable ticket prices, especially with LCCs. Wanting to save money on transport in order to have more budget for activities or meals during a vacation is completely understandable.

Taking this into consideration, reducing other transport ticket prices is decisive in the process of facilitating trips without planes. Still in relation to trains, expanding dynamic pricing, similarly to the aviation industry's model, could be an acceptable middle ground. Indeed, railway companies' benefits would not shrink as much as if they were simply decreasing prices, but it would still allow customers to have access to cheaper train tickets.

Another approach to tackle this issue would be to create a standardised train network throughout Europe, with homogenised ticket prices, as suggested by Laura van Overhagen's model (2021), which is described in the literature review.

While it is true that train tickets are often more expensive than plane tickets, this is not always the case, as shown in figure 14.

Figure 14 - Comparison of train and plane ticket prices

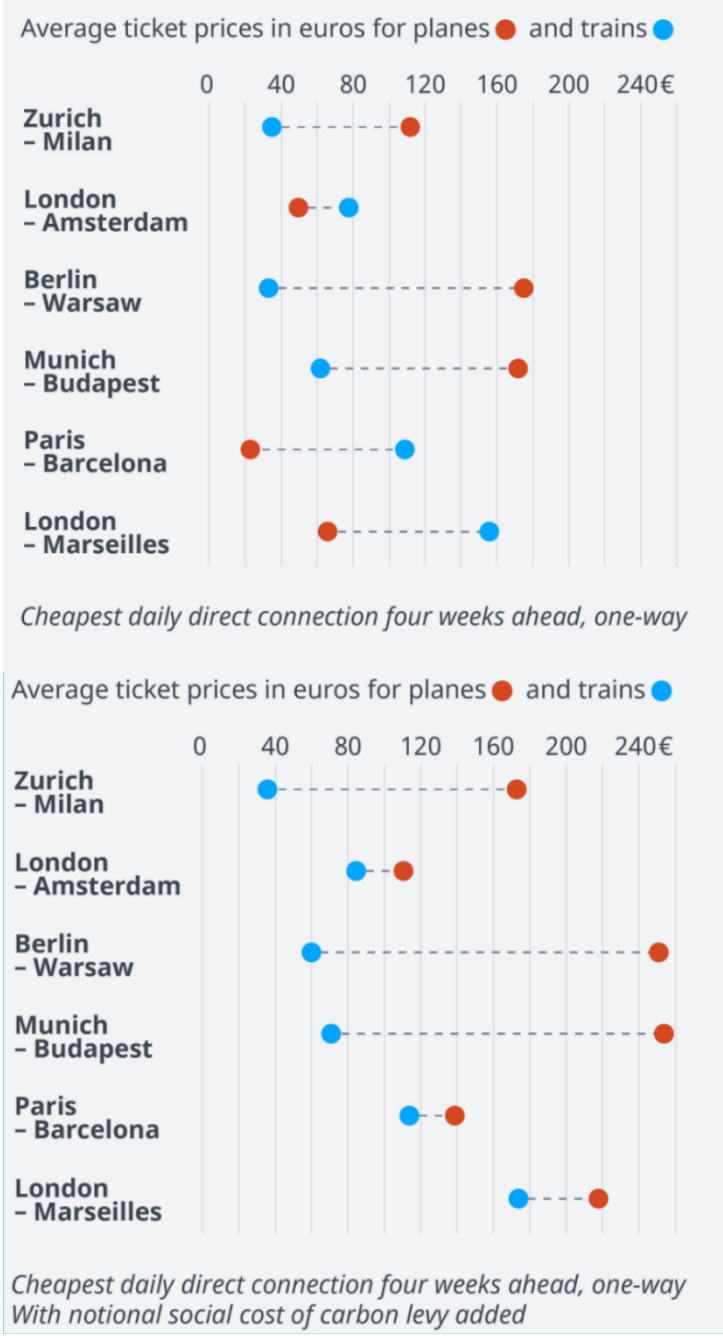


Source: Google Flights, n.d.; Trainline, n.d., cited in Deutsche Welle, 2018

This shows that the population's perception of prices might not always be accurate.

Moreover, figure 15 evidences the average ticket prices in 2018 and compares them with what should be paid with a carbon tax that takes direct and indirect costs of emissions into consideration, which might be an appropriate way to help the population realise the actual impacts of their flights.

Figure 15 - Price adaptation with carbon tax



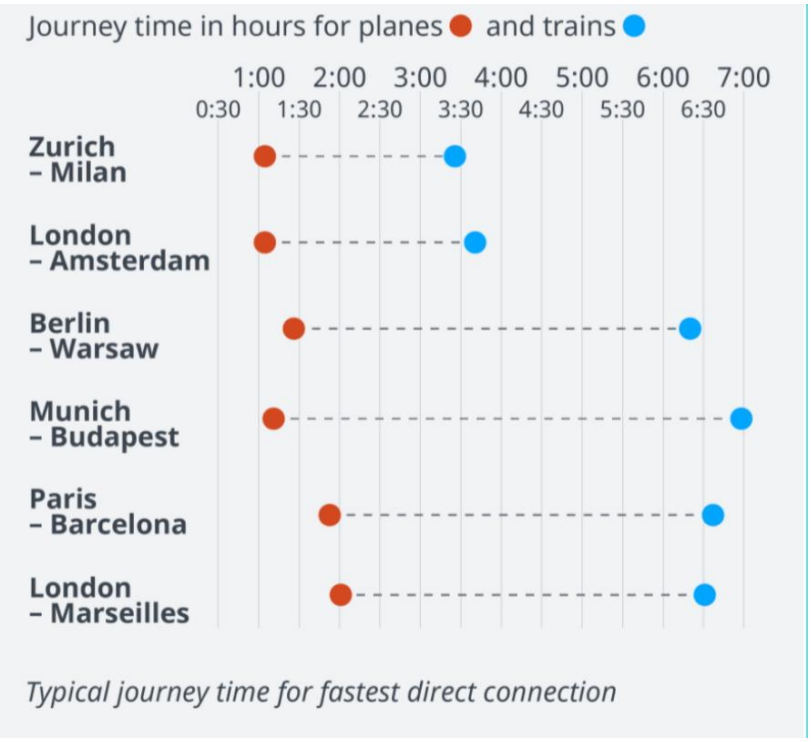
Source: IFEU, n.d.; Ceronsky et al., n.d., cited in Deutsche Welle, 2018

5.5. The value of speed

Opinions differ regarding the speed of various means of transport, as for instance trains are regularly late or cancelled, and planes require additional time at the airport. Speed could thus have an influence on passengers' choice of transport.

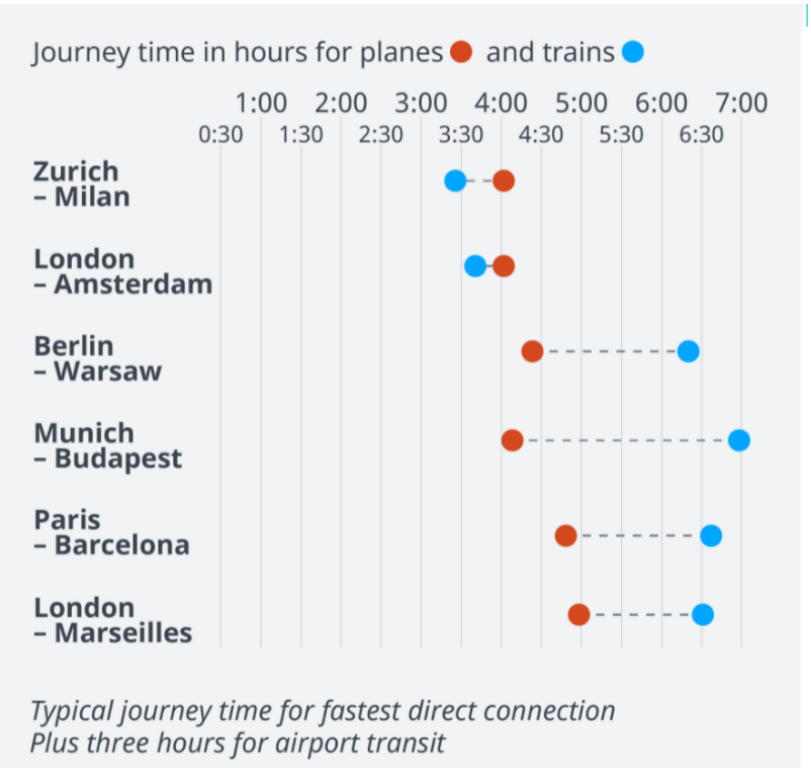
According to Gössling et al. (2019), price represents a more decisive factor than travel time for tourists when it comes to leisure trips. However, the twelve interviewees of this thesis deemed it rather decisive, as they all agreed that the plane is convenient because it is fast, though some disliked the fact that waiting times at the airport impact its time efficiency. Figures 16 and 17 show that when time spent at the airport is actually added to travel time, the gap between planes' and trains' journey time drastically diminishes and may, in some cases, even be reversed.

Figure 16 - Journey time without time spent at the airport



Source: Google Flights, n.d.; Trainline, n.d., cited in Deutsche Welle, 2018

Figure 17 - Journey time with time spent at the airport



Source: Google Flights, n.d.; Trainline, n.d., cited in Deutsche Welle, 2018

Opinions differ when it comes to trains: some people find them quite fast, whereas others think that they require a tremendous amount of time and regret their frequent delays and cancellations. However, there seems to be a consensus around buses, which people find too time-consuming for long distances.

In 2020, Omio, a website comparing travel times and prices, researched which trips were faster by train or bus than by plane, including time spent at the airport and time needed to travel from the train station or the airport to the city centre. They found that 27 trips were faster by train, and one was faster by bus. A sample of their results, with the seven most time-saving routes, can be found in table 2.

Table 2 - Time saved by travelling by train instead of flying

Route	London – Brussels	Frankfurt – Cologne	Sheffield – London	London – Paris	Paris – Rennes	London – Darlington	Rome – Napoli
Time saved in minutes	136	124	120	108	97	96	87

Source: Adapted from Omio, 2020

This question of speed is a wonderful opportunity for trains to increase their number of customers. For instance, with better development of the high-speed train network, central Europe could become more easily accessible, with time gains, since there would be no need to go to the airport two or three hours before departure.

The organisation Climate Perks (n.d.) looked at this issue from another perspective. Instead of trying to decrease the time needed to travel somewhere by train, they realised that what was really a problem for a large part of travellers was to waste some of their vacation days on travel when they could be spending that time on their holiday destination. Climate Perks suggested that employers could offer paid “journey days”, which would not be deducted from their annual leave. This way, individuals would not feel like they were wasting any of their vacation time by travelling with a more sustainable form of transport than the plane. This would ultimately be up to employers who would need to agree to the scheme. Nonetheless, in companies where this model was implemented, both the employees and the employers seemed satisfied by the benefits provided by this solution.

Similarly, if the night train offer were expanded, it is likely that more people would use them, as travelling by night is not so much perceived as a waste of time, compared to travelling by day.

6. Recommendations

Some managerial recommendations have been drawn from the discussion. This last chapter will therefore present a list of propositions classified by the following field of applications: regulations, train improvements, bus improvements, and nudges. Two of the nudges will then be further developed, and an example of what actions could be taken will be provided for both of them.

6.1. Regulations

Setting some regulations in place could encourage the population to reduce their plane trips. The third part of the IPCC sixth assessment report, published on 4 April 2022, clearly states that government action, in the form of policies and infrastructures, must be implemented in order to help citizens reduce their greenhouse gas emissions (IPCC, 2022). It is therefore important to arrange directives, preferably standardised throughout Europe, to discourage the population from travelling by plane while facilitating trips by bus or train.

One interviewee, for instance, suggested forbidding domestic flights in cases where fast train connections were possible. Another example, as presented by Bows-Larkin (2015), would be to introduce a carbon quota, thus creating a limit of kilometres flown per year for each traveller. Though it would not necessarily be well received by the population, this radical measure would significantly decrease emissions stemming from the aviation industry. Finally, introducing a global tax on plane trips could be effective.

6.2. Train improvements

As seen in the section comparing the plane with other transports, the train is the means of transport with the lowest rate of CO_2 emission per passenger, as it can carry a high number of travellers onboard. Consequently, it is the transportation type which was emphasised the most during the interviews and the discussion, and the topic on which most of the recommendations have been made. Table 3 shows suggestions of improvement for trains, following the themes created during the synthesis of the interviews.

Table 3 - Recommendations for train improvements

Theme	Recommendation	Comment
Comfort and services	Offer snacks and refreshments on trains, especially for long distances.	This is already done on some Swiss and French train lines.
	Develop the offer for a service transporting travellers' luggage separately, from departure to arrival. Intensify advertising for this service to increase awareness.	The national Swiss train company already offers a similar service.
Destination offers	Expand the network of night trains throughout Europe.	The redevelopment of some lines is already in progress.
	Expand the network and frequency of high-speed trains throughout Europe.	-
	Improve and standardise the booking system.	For trains travelling from Switzerland abroad, online booking is not always available.
Price	Introduce dynamic pricing on all international lines.	Dynamic pricing already exists on some lines.
	Standardise ticket prices.	This suggestion and the previous one do not have to be implemented together.
	Inform travellers that train tickets are sometimes cheaper than plane tickets.	There seems to be a public misconception on the topic.
Speed	Inform travellers that train trips are sometimes faster than plane trips.	There seems to be a public misconception on the topic.

Data collected by the author – Interviews 2022

6.3. Bus improvements

Less efficient than trains regarding CO_2 emissions by passenger, buses are still a better alternative than planes when it comes to travel. For this reason, a few recommendations are also issued for this type of transport. In the same way as table 3, table 4 sets out proposals to improve buses, but only on the theme of comfort and services, as it appears to be the area where buses still lag.

Table 4 - Recommendations for bus improvements

Theme	Recommendation	Comment
Comfort and services	Improve the seats in terms of space and cosiness.	With more space by seat, fewer people will be able to fit on the bus, so profitability will decrease while emissions by passenger will increase.
	Create an arrangement for luggage so that travellers do not have to bring it with them all the time but still feel that it is kept somewhere safe.	While being able to leave luggage in the baggage hold is convenient for most travellers, some are afraid of having it stolen.
	Launch some high standard buses with an elevated level of comfort and services.	This type of buses already exists in the United States.
	Establish some “quiet lines” so that passengers who desire a calm environment can still travel by bus.	This suggestion could be merged with the idea of high standard buses.
	Offer a food and drink service, especially for long trips.	Attention should be paid to the fact that buses are less steady than trains.

Data collected by the author – Interviews 2022

6.4. Nudges

Another way to help the population shift their habits from travelling by plane to trains or buses would be to use nudges. Thaler and Sunstein popularised this theory in 2009, studying how human decisions could be influenced. In this situation, nudges would be used to raise awareness of the aviation industry's impact on the environment and create new habits for European travellers. Table 5 shows several ideas of nudges to prompt people to reduce their plane trips; the desired effect is shown in the first column, followed by the nudge which could be set to achieve the goal.

Table 5 - Examples of nudges

Desired effect	**Nudge**
Raise awareness on opportunities to travel with another means of transport than the plane.	Setting the default proposition to trains instead of planes on booking platforms that offer both options.
Encourage people to switch from plane trips to train travel.	On airline websites, display the number of people who switched to a train trip, and provide additional information on length and prices of a train alternative.
Remove the barrier of employees fearing to lose vacation days.	Introduce paid journey days for travelling by train or bus.
Create an incentive for travellers to book tickets regularly, thus making them return customers for railway companies.	Similarly to frequent flier airline programs, develop frequent rider offers for travellers who take the train regularly, with discounts or free complimentary services.
Make the impacts of aviation visible to increase the public's awareness.	Inform passengers about how much CO_2 their flight will induce, comparing it to examples they can relate to.

Data collected by the author – Interviews 2022

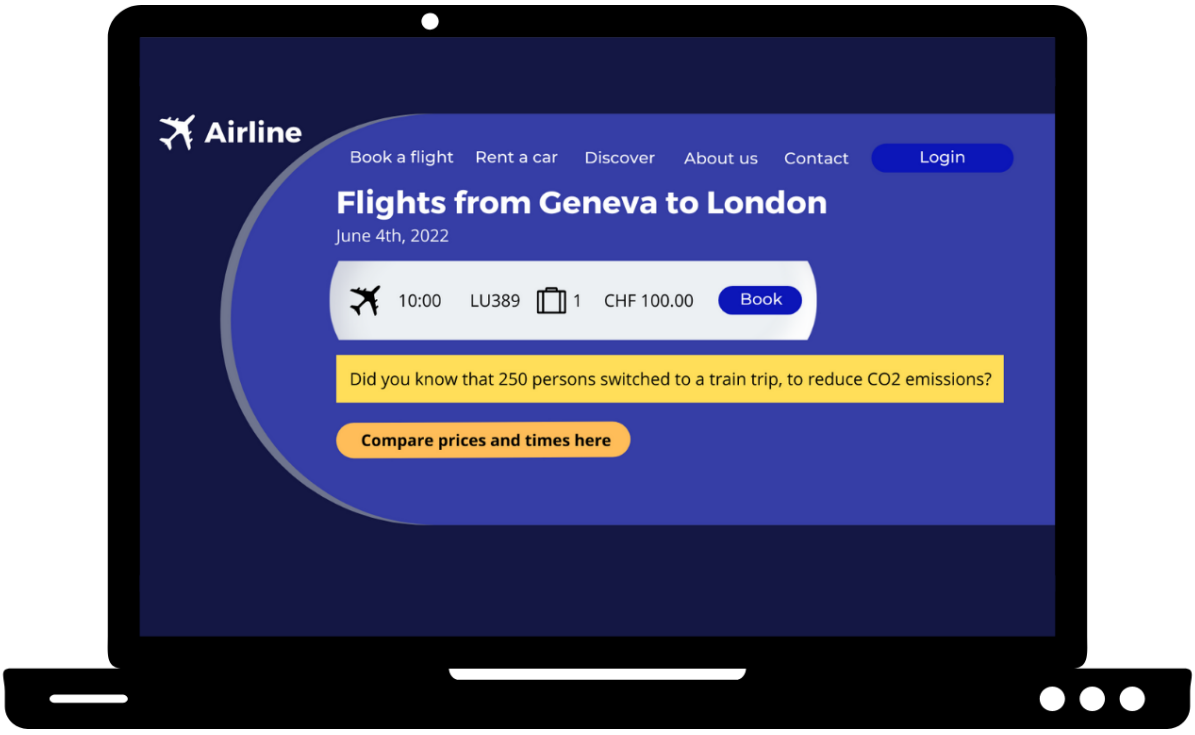
6.4.1. Displaying the number of travellers who renounced a plane trip

As described in table 5, an example of nudge could be to display the number of people who switched from a plane trip to one by train on airlines' websites. This could encourage passengers to swap their plane trips in favour of train travel. Indeed, knowing that a large part of the population does something tends to influence individuals to act the same. Providing information regarding ticket prices and trip length would also be helpful, as interested travellers would be able to access the information they need easily, without having to spend time searching for it.

Nevertheless, airlines would probably be reluctant to display this information, as it could turn away potential customers from their service and promote their competitors, the railway companies. For this reason, this nudge would have to be regulated by the government and legally enforced if it were to be efficiently implemented.

Figure 18 shows an example of how this could be displayed on airline companies' websites, using fictive numbers.

Figure 18 – Nudge example: travellers switching transportation mode



Author's data, 2022

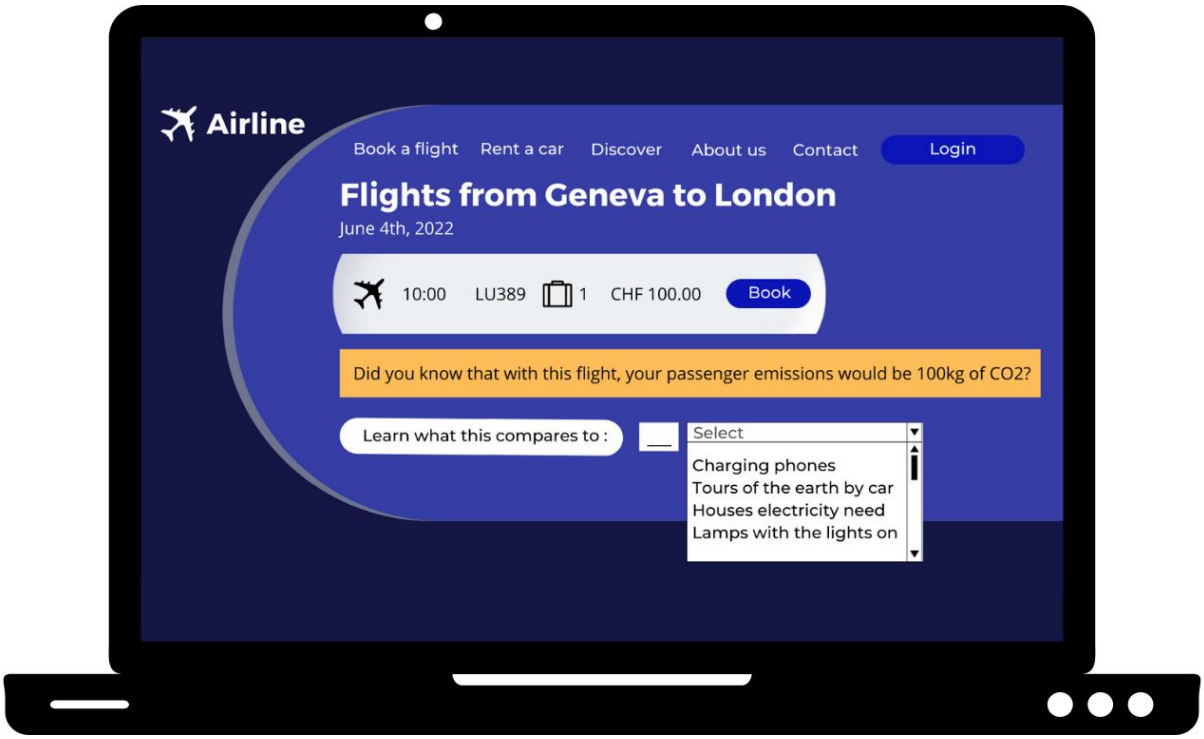
6.4.2. Informing passengers on CO_2 induced from their flight

Similar to the previous section, another nudge could be implemented on airline companies' websites, aiming to make the impacts of aviation visible and ultimately increase the public's awareness. This could, for instance, take the form of an information box, displaying how much CO_2 their flight would induce, and allowing them to compare the amount of CO_2 from the flight to other activities, for instance how many charging phones this corresponds to; how many tours of the earth by car; how many lamps with the lights on; or finally how many houses electricity needs it covers.

As for the previous nudge example, airlines may refuse to display this type of information on their website, as it could affect their brand's reputation. Thus, this would also have to be regulated by the government and legally enforced if it were to be efficiently implemented.

Figure 19 shows an example of how this could be displayed on airline companies' websites, using fictive numbers.

Figure 19 - Nudge example: Information on CO2 emitted



Author's data, 2022

6.5. Overall recommendation

This chapter has considered potential recommendations on regulations, improvements of train and bus services, as well as nudges. It has moreover provided examples of how two of the nudges could be implemented. The last two subsections emphasised that the nudges would have to be regulated by the government, which highlights the way in which recommendations would have to be linked to one another. Evaluating which solution could be implemented in parallel to another is crucial in order to develop an optimised action plan. Finally, collaboration between European countries, including Switzerland, is imperative for effective international travel.

Conclusion

This thesis has looked at ways to decrease the environmental impacts of travel through convenient plane-free trips throughout Europe. Based on the literature review and the field research, which took the form of semi-directed interviews, several topics were explored and discussed.

As a result, some managerial recommendations emerged and were classified into four distinct themes. The first one focused on regulations which could be introduced. The second presented improvements for trains, with regard to comfort and services, destination offers, price, and speed. Suggestions regarding bus improvements were also provided, solely focusing on comfort and services. Then, examples of nudges which could be used to raise awareness on the environmental impact of the plane. Two of the nudges were then further developed, and an example of possible action was provided for each of them.

As for the limits of this paper, it is important to consider that the research question is based on the fact that flying is highly polluting, as eco-friendly planes are not on the market yet. However, if a solution for a low-emitting plane were to emerge and be commercialised, the order of transportation modes from least to most polluting would be disrupted, and recommendations previously made would have to be reconsidered. Nonetheless, based on what was seen in the solutions section of the literature review, this does not seem likely to happen in the near future, and given that CO_2 emissions need to be reduced quickly, this research was established without taking this eventuality into account. Furthermore, projects such as the Hyperloop were not explored either, since they have not been commercialised in Europe yet, and infrastructure needed to create an international network could take years before it is even established.

The last significant limit of this paper is that of the car. While this type of transport was discussed during the interviews and was also mentioned in the synthesis, it is not the focus of the discussion or the recommendations. As a matter of fact, cars are also quite polluting, especially if there are only one or two passengers in the vehicle. For this reason, the idea of replacing plane travel with car trips has not been further developed throughout the research.

Additionally, cars are frequently used for going to work or to leisure activities, rather than for tourism, which means that to reduce their use, a different approach should be considered. This could be the focus of further research, with additional measures explored, such as policies and regulations. However, some recommendations on improvements for buses and trains issued in this paper could also be applied to cars.

In terms of further research, another possibility would be to conduct a quantitative survey on the same subject as that of this paper, but with a larger sample size. This could complement the research carried out in this thesis, and it would help getting a better sense of the population's habits in terms of preferred types of transport, as well as of barriers to stop the use of the plane and the disadvantages found in other transportation modes.

Finally, since only two of the recommendations made in the previous chapter were developed and exemplified, further research could be conducted on ways to implement the suggestions that could not be explored in this paper. The best solution would be to identify a way for all the proposed solutions to coexist throughout Europe, as this would encourage a vast part of the population to reduce their plane trips or even to stop flying completely.

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Author's declaration

I hereby declare that I have carried out this final research project on my own without any help other than the references listed in the list of references and that I have only used the sources mentioned. I will not provide a copy of this paper to a third party without the permission of the department head and of my advisor, including the partner company with which I collaborated on this project, with the exception of those who provided me with information needed to write this and whose names follow:

- The persons who did the interviews number seven, nine, ten, and twelve, and who are anonymous.

Sierre, the 25th of April 2022.

Sarah Sandoz