Understanding attitudes and barriers towards voluntary carbon emission offsetting among Finnish airline passengers

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Abstract

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Carbon emissions offsetting plays a key role among strategies to reduce global carbon emissions. Offsetting has been identified as one of the leading measures to help achieve net-zero targets, along with the use of SAF, advancements in technology (such as electric aircrafts) and improvements in infrastructure across the aviation industry. According to studies, voluntary carbon emission offsetting uptake remains low, despite wide offerings by multiple airlines.

This research focuses on uncovering the factors that contribute to the low uptake of offsets among Finnish airline passengers. Based on the research results, recommendations are made towards improving offsetting initiatives and uptake, with the broader goal of contributing towards CO2 neutrality within aviation industry. The scope of the study is set to Finnish airline passengers and voluntary offsetting solely as a carbon emissions reduction method, because this theme is uniquely seen as controversial and debated over.

The theoretical concepts that are included in the study are climate change and the greenhouse effect, carbon dioxide emissions reduction and carbon emissions offsetting. Alongside with concepts of consumer behaviour and decision-making, where barriers to action and attitude-behaviour gap are introduced. Previous studies of voluntary offsetting in aviation are presented and the history of debate and greenwashing allegations in Finland are included.

The research method used to gather data is a quantitative online survey, which aims to unfold the underlying attitudes and barriers Finnish airline passengers have towards voluntary offsetting, as well as examine their awareness of the purpose and functioning of offsetting. Additionally, the study seeks to uncover demographical differences throughout the survey. The survey was published in several social media channels and the data was collected in April 2024.

The result of the study suggests that the core factors and barriers preventing higher engagement and affecting Finnish airline passengers' perceptions and attitudes towards voluntary carbon emission offsetting are individual doubts, scepticism towards the effectiveness of offsets, and practical concerns such as cost. To overcome these barriers, the study suggest that careful consideration is to be placed in clear communication and building trust, where media and environmental originations plays a key role.

This study contributes to a deeper understanding of the obstacles preventing voluntary carbon emission offsetting in aviation sector in Finland. By addressing these challenges, various stakeholders can foster more effective and sustainable practices within the aviation industry. Suggestions for future research include the exploration of cultural differences in pro-environmental behavior, to test incentive structures and the role of trust in offset programs to endorse them.

Keywords
Carbon emissions, offsetting, airlines, sustainability, consumer behaviour, attitude-behaviour

Contents

1 Introduction

Following the establishment of Paris Agreement in 2015, which set an ambitious goal of limiting the global warming well below 2 degrees Celsius, civil aviation sector committed to achieving net-zero carbon emissions by the year 2050. Among the strategies to reduce emissions, voluntary carbon emission offsetting programs plays a key role. Offsetting is one of the leading measures identified helping to achieve net-zero targets, alongside with the adaptation of sustainable aviation fuel (SAF), advancements in aircraft technology (such as electric and hydrogen-powered aircrafts), and improvements in infrastructure across the industry, including airports (ABBB 2021).

The United Nations Framework Convention on climate change (UNFCCC, 2024) describes carbon offsetting as an action, that allows individuals and organizations to compensate for unavoidable emissions by supporting sustainability projects that reduce emissions elsewhere. According to the Air Transport Action Group (2020), 44 airlines, including Finnair, currently offers voluntary carbon offsetting programs and 30% of global passengers fly with these airlines. However, only 1-3% of passengers typically choose to purchase these offsets, underlining apparent barriers and attitudes that discourage participation. This thesis aims to explore these barriers among Finnish airline passengers, in a country where sustainability issues generally hold significant importance.

By collecting and analyzing quantitative survey data, the study aims to discover Finnish airline passengers' barriers and attitudes towards voluntary carbon emission offsetting, providing insights for both academia and industry stakeholders. Based on the research results, the study will offer recommendations for improving offsetting practices, with the broader goal of contributing towards CO2 neutrality within the aviation sector. The study aspires to be a valuable addition for airlines and the aviation industry, helping to align offsetting initiatives with passenger expectations and global sustainability goals.

Chat GPT was utilized in the thesis report as a supportive tool for ideation, and refining text throughout the writing process. It was especially helpful in generating ideas for the survey questions (in relation to original research questions), and for structuring and presenting insights. However, careful consideration was given when incorporating Chat GPT suggestions into the thesis, particularly in the analysis of the survey results. While Chat GPT offered useful perspectives, some of its suggestions contained inaccuracies. Therefore, all content used from Chat GPT, particularly related to the survey data, was thoroughly reviewed and double-checked to ensure accuracy and reliability before being incorporated to the thesis report.

1.1 Research objective

The main objective of the research is to investigate the factors that influence the decision-making process of airline passengers in Finland, regarding voluntary purchase of carbon dioxide emissions offsets. By gaining insight to the underlying reasons why Finnish passengers choose not to engage in offsetting practices, the study seeks to recommend effective strategies to overcome these barriers. Ultimately, the goal is to contribute to the uptake of emissions offsets among passengers, or to recommend alternative practices, and thereby contribute towards achieving the global net-zero emission targets.

1.2 Research structure

The report proceeds in the following structure: introduction, theoretical framework, methodology, research results and analysis, discussion, and conclusions. Lastly, references and appendices are included, to ensure transparency of the research process. To provide further structure to the study, specific research questions have been formulated. These questions serve as a frame throughout the research. By answering the research questions in the final discussion chapter, the aim of the thesis will be reached. The research questions are set to following:

Q1. What are the primary factors influencing Finnish passengers' decisions regarding the purchase of carbon emission offsets offered by airlines?

Q2. How aware are Finnish passengers of the existence and purpose of carbon emission offset programs and what are the key factors influencing their awareness?

Q3. What are the perceived barriers to voluntary purchase offsets among Finnish airline passengers and does these barriers vary across demographic groups?

1.3 Demarcation

The demarcation of the thesis is drawn to the specific theme of offsetting as a carbon emission reduction method, because there lies apparent controversy and debate over offsetting programs specifically (hence the low amount of participation). The same effect and discussion are not seen around SAF or electric/hydrogen flying. People seem uncertain when it comes to offsetting, and numbers (ATAG 2020) show that they remain low in popularity for passengers to voluntarily purchase them. The scope to study Finnish passengers specifically, was done to better manage the target population. Finnair is used as an example airline (and its offsetting partner programs)

because it is the major flag carrier airline in Finland, which offers the option to voluntary purchase offsets.

The theoretical framework is divided in two main themes, which are environmental sustainability and consumer behavior and decision-making. The first part, environmental sustainability covers theory of climate change and the greenhouse effect, description of the main greenhouse gases, and the main causes and consequences of climate change. This is an essential theme for the thesis as it explains the severity of climate change in theory. Moreover, the environmental sustainability part examines carbon emissions role in climate change, the methods of emissions reduction, and which agreements are in place for emissions reduction globally, and more precisely, how offsets help in neutralizing carbon footprint in aviation. Additionally, the current state of offsetting in Finland is examined.

The second part of the theoretical framework contains theory of consumer behavior and decision-making. These themes are essential for the thesis as they provide understanding of the psychological and social factors that influence consumer decisions regarding voluntary carbon offsets. Given the recognized environmental awareness among Finnish citizens, but low uptake of voluntary offset purchasing, examining consumer behavior theories and the attitude-behavior gap is necessary. Ajzen's (2005) theory of planned behavior offers a relevant model, highlighting how personal attitudes, social pressures, and perceived control impacts intentions and actions. Additionally, attitude-behavior gap, as evident in environmental decisions, discovers the discrepancies between pro-environmental attitudes and actual behavior. Moreover, previous studies of airline passengers' carbon emission offsetting behaviors are incorporated.

1.4 Key definitions

To ensure a clear understanding of the concepts discussed in the theoretical framework, this subchapter provides explanation of the essential key definitions related to the themes of the thesis. The following key terms are crucial to comprehend the theory and context surrounding carbon emission offsetting in air travel:

Carbon footprint

Carbon footprint refers to the total amount of greenhouse gases generated from our actions. There are multiple ways to reduce carbon footprint as individuals, by making more sustainable lifestyle choices. These actions include the use of public transportation instead of personal vehicle, limiting food waste, eating less meat, using recycled materials, reusing/recycling clothing, and monitoring home's power usage. (The Nature Conservatory 2024.) Airlines refer to carbon footprint as the

amount of CO2 emissions emitted from your flight. This amount varies, depending on the aircraft used, the distance flown, and the weight of the airplane (Finnair 2024). Some airlines offer a carbon footprint emissions calculator on their website, to see the exact amount of your carbon footprint from your flight (in order to offset the amount).

Net-zero emissions

Net-zero emissions refer to the balance between (*overall*) greenhouse gases released, and greenhouse gases removed from the atmosphere. It is the balance point where humans stop *adding* climate-heating gases in the atmosphere. (Bernoville 2023.)

Net-zero carbon

Net-zero carbon refers to no carbon being emitted from the beginning = no carbon needs to be captured or offset. For example, a company that is running solely on solar energy, and using zero fossil fuels, are net-zero carbon. (Bernoville 2023.)

Carbon-neutral

Similar to net-zero emissions, carbon neutrality refers to the balance of carbon dioxide emissions emitted and removed from the atmosphere (whereas net-zero refers to bigger scale including all greenhouse gases). For a company to become carbon-neutral, there are two options. Either to reduce carbon emissions to net-zero or to balance their emissions through offsetting and purchase of carbon credits. (Bernoville 2023.)

Carbon sinks

Carbon sinks are anything that absorbs more carbon from the atmosphere than they emit (such as forests, soils, and oceans). As of today, no artificial carbon sink has demonstrated the capacity to sufficiently reduce atmospheric carbon dioxide levels to combat global warming. (Bernoville 2023.) There is ongoing research to further develop these technologies aiming to combat the climate change challenges.

Greenhouse gases (GHG)

GHGs are heat trapping gases that stay in earth's atmosphere. GHG's keep the earth temperature from dropping too low, sustaining life on planet earth. Human activities have dramatically increased the release of greenhouse gases, which are causing the temperature to rise excessively. The main greenhouse gases include carbon dioxide, methane, nitrous oxide, and water vapor. (Nationalgrid 2023.)

Carbon dioxide (CO2)

Carbon dioxide is a naturally occurring gas, released in several natural processes. Including animals' and humans' respiration, and volcanic eruptions. However, human activities have increased the amount of carbon dioxide in the Earth's atmosphere by 50%, in less than 200 years. This additional CO2 comes primarily from burning fossil fuels, such as coal, oil, and natural gas. (NASA 2024.)

Offsetting

Offsetting is a method to 'neutralize' carbon footprint. It is also described as investing into carbon sinks health (Nationalgrid 2022). Offsetting projects include reforestation and resource recovery, such as capturing methane from landfills. Offsetting through carbon credits can help to achieve carbon neutrality by balancing emissions with equivalent reductions or removals elsewhere. Notably, offsetting programs (in aviation) are at risk of being seen as ''greenwashing'', as there are debate over them appearing to give purchaser meaningful steps to reduce emissions, but do not provide an aviation-specific solution (McKinsey 2020, 14). Multiple airlines offer the option for passengers to purchase offsets when flying, to compensate for their carbon footprint. The amount varies depending on the flight route and the type of aircraft. Usually, passengers can choose the amount to offset regardless of the number of emissions emitted.

Carbon credits

The purchase of carbon credits is a method to offset your carbon footprint. Carbon credits represent a unit of measurement equivalent to the amount of carbon dioxide emitted. Each carbon credit typically equals to a reduction or removal of one ton of CO2 or its equivalent. (United Nations Climate Change s.a.)

Sustainable aviation fuel (SAF)

Sustainable aviation fuels are carbon-neutral fuels, created from renewable sources, such as cooking oils, agricultural waste, algae or municipal waste. They can replace fossil based kerosine in aircrafts, reducing *additional* CO2 emissions, by using material that would otherwise release emissions upon decomposition. SAF can reduce aviation emissions up to 80%, although older aircrafts require a 50% blend with conventional jet fuel. Notably, SAF resources are currently limited, and high in cost. Hence the small amount currently used. The use of SAF is considered as the most effective way to reduce carbon footprint of existing aircrafts. (McKinsey 2020, 15.)

2 Climate change and the greenhouse effect

Climate change, also referred as the climate crisis or climate emergency, is a phenomenon that is occurring on planet Earth, primarily caused by the greenhouse effect. Greenhouse effect implies to the accumulation of heat-trapping gases, in the Earth's atmosphere. The gases act as a 'blanket', blocking the release of heat into outer space. As this 'blanket' thickens, it intensifies the warming of the globe. While the greenhouse effect is a natural occurrence crucial for sustaining life on planet Earth, human activities, especially the combustion of fossil fuels, such as coal, oil and gas have significantly intensified this process, resulting in global warming. (IPCC 2022.) Consequently, climate change manifests in rising temperatures, leading to phenomenon such as the sea level rise, and escalation in other climate-related disasters that are further explored in this chapter.

2.1 Causes of climate change

As mentioned, the greenhouse effect results from the presence of greenhouse gases in the Earth's atmosphere. The gases are water vapor, methane, ozone, sulfur hexafluoride, nitrous oxide and carbon dioxide, the most well-known among them. While water vapor constitutes a significant portion of greenhouse gases and persist in the atmosphere for several days before dissipating, methane, remains there for approximately 12 years. However, it is the longevity of carbon dioxide, enduring centuries in the atmosphere, that causes the highest concern among researchers. (Wong 2015, 39-41.)

The synthesis report released by the International Panel on Climate Change (2023) explicitly confirms that human activities represent the primary driver of climate change. Since the industrial revolution, carbon dioxide levels have skyrocketed, experiencing 39% increase in the atmospheric concentration. While a portion of the excess carbon dioxide is absorbed by natural carbon sinks, such as oceans, soils, and vegetation, a large fraction remains in the atmosphere for ages. The escalating levels of carbon dioxide stems mainly from burning fossil fuels, essential for modern human lifestyles. Activities such as transportation, including cars and air travel, as well as energy generation from coal and gas power plants, collectively contribute to this surge in carbon dioxide emissions. (NOAA s.a.)

Out of all human-caused CO2 emissions, 90% comes from burning fossil fuels. The remaining 10% comes from land-use changes, especially from deforestation. Trees and plants remove CO2 out of the air and emits oxygen, acting as 'lungs' of the Earth. Vegetation thereby acts as a carbon sink causing a net-reduction in atmospheric CO2. Deforestation reduces carbon sinks, and in most cases, is accompanied with burning the dead trees and plants, releasing the carbon stored in them into the atmosphere. (Romm 2018, 21.)

2.2 Consequences of climate change

The growing amount of greenhouse gases affects to the global climate change by creating extreme weather conditions. This is the earliest manifestation of the climate change that most people will be exposed to. Extreme weather conditions encompass a range of disturbances, including sea level rises, floods, tornadoes, heavy rainfalls, heatwaves, wildfires, hurricanes, and snowstorms. (Romm 2018, 31-39.)

Probably the most alarming concern is the rate at which sea levels have surged over the past decade, doubling the pace observed in the preceding century. (Wong 2015, 42-42.) This trend holds a significant implication for the globe, considering that 71% of the Earth's surface is covered by oceans. Sea level rise stems from multiple factors, including melting of icebergs and glaciers, which contribute additional water to seas. Also, the expansion of water due to rising temperatures is a contributor to the rise. Potential consequences of rising sea levels are disastrous, particularly for vulnerable regions and smaller island nations of the globe. Greenland and Antarctic ice sheets, if fully melted, could result in a dramatic 77 meters of sea level rise (NOAA s.a.), endangering coastal communities, and making many regions uninhabitable (IPCC 2022).

Furthermore, the warming of ocean waters has led to increased evaporation, saturating the atmosphere with more humidity, leading to heavier rainfalls and floods. As temperature continues to rise, scientists anticipate a surge in heatwaves across various regions. Additionally, studies have found that the warming of oceans also contribute to making hurricanes more intense, as they draw their energy from the ocean warmth. Meaning, as hurricanes form, climate warming provides them with more fuel. (Romm 2018, 3, 32-34.)

In addition to sea level rise, climate change poses a significant threat to human health, through air pollution, wildfires, and other extreme weather events. It engenders forced displacement, food insecurity and immense pressure on humans' mental well-being. Research has shown that 3.6 billion people live in areas that are highly vulnerable to the effects of climate change. Areas with weaker infrastructure, mostly developing countries, will be the most vulnerable. (WHO 2023.) Despite of minimally contributing to global emissions, these nations are the most vulnerable to the effects of climate change. Which stresses the urgent need for intensive global action to mitigate the consequences of climate change.

3 Carbon dioxide emissions reduction

Carbon dioxide is the primary contributor to the greenhouse effect, and possesses a remarkable longevity in the Earth's atmosphere, intensifying global warming as its concentration increases. Addressing this issue requires a termination of all carbon dioxide emissions from human activities, or achieving a state where emissions are offset by activities that effectively remove and seize carbon dioxide for extended periods. This critical stability, known as net-zero carbon emissions, holds the promise of stabilizing global temperatures and mitigating the impacts of climate change. (IPCC 2022.)

The pursuit of net-zero carbon emissions presents a multifaced challenge that requires intensive efforts across various sectors of the society. Ways to mitigate emissions include adopting sustainable practices in transportation, for example by utilizing public transit instead of owning a car and transitioning to electric vehicles. Similarly, individuals can make environmentally conscious choices in their food and energy consumption patterns, opting for plant-based diets, reducing food waste, and using renewable energy sources to minimize their carbon footprint.

With the ambition of emissions reduction, governments and scientific associations have set targets and guidelines for nations, and the aviation sector to reduce their carbon emissions. These include the Kyoto protocol, the Paris Agreement, net-zero by 2050 (IEA) and the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) a target from the International Civil Aviation Organization (ICAO). In the following subchapters the history of global agreements, and targets that are currently in place are explained further.

3.1 Kyoto protocol

An international treaty aimed at addressing the climate change by settings binding targets for reduction of greenhouse gas emissions, was adopted in 1997 in Kyoto, Japan. The protocol entered into force in 2005 and was initially signed by 192 countries. a Key feature of the Kyoto protocol was its establishment of legally binding emissions reduction targets for developed countries. These targets varied among signatory nations and were set based on their historical levels of GHG emissions. The protocol required these countries to collectively reduce their emissions by an average of 5.2% below 1990 levels during years 2008 to 2012. (United Nations Climate Change s.a.)

To achieve the targets, Kyoto protocol introduced emissions trading, a flexible mechanism allowing countries to buy and sell emission allowances, enabling countries that exceeds their targets to purchase surplus allowances from those that emit less than their allocated limit. Another method

introduced was the Clean Development mechanism (CDM). The CDM enables developed countries to invest in emissions reduction projects in developing countries as a way to offset their own emissions. These projects typically focus on renewable energy, energy efficiency and sustainable development initiatives. Another mechanism introduced by the Kyoto protocol is called Joint Implementation (JI). Similar to CDM, allowing developed countries to invest in emissions reductions projects, with the aim of achieving cost-effective emissions reductions. (United Nations Climate Change s.a.)

Kyoto protocol faced criticism for lacking binding emissions targets for developing countries, limited participation from major emitters, such as the United Stated, and the failure to sufficiently address emerging environmental challenges. However, there has been positive aspects to the protocol as well, as it did lay the groundwork for subsequent international climate agreements, including the Paris Agreement, which seeks to enhance the efforts initiated under the Kyoto Protocol.

3.2 Paris Agreement

The Paris agreement is an international treaty, adopted by 196 member states of the United Nations, with the aim to limit global warming below 2 degrees Celsius above pre-industrial levels. To reach the goal temperature, participants that are committed, need to reduce their emissions 45% by 2030 and reach net-zero by 2050. Negotiated and agreed in Paris, December 12, 2015. The agreement represents a pivotal moment in global climate action. All member nations were required to communicate their emissions reduction actions they had taken by 2020. Followed by a report in 2024 detailing the actions taken, which serve as recommendations for other nations. The Paris agreement is monumental, for being the first-time agreement bringing nations together to fight for the climate change crisis. While the actions need to be massively increased to reach the goal, since the agreement was made, there has been a great spark in low-carbon solutions and new markets. (United Nations Climate Change s.a.)

3.3 Net-zero by 2050

The International Energy Agency (IEA) released a roadmap in 2021 outlining how the global energy sector can achieve net-zero emissions by 2050. The roadmap is essential to addressing the climate change, aligning with the goals set in the Paris Agreement (to limit global warming below 2 degrees Celsius pre-industrial levels). It emphasizes the energy sector’s central role as a major contributor to GHG emissions. Key measures include expanding renewable energy sources, phasing out coal-fired power plants and deploying clean energy technologies like carbon capture and storage. Additionally, enhancing energy efficiency across different sectors, transitioning to electric vehicles, and expanding public transportation networks are highlighted. As for aviation

sector, by investing in projects such as renewable energy, carbon sequestration and other emission reduction initiatives, the industry can contribute to the strategies outlined in the IEA roadmap.

3.4 Carbon reduction schemes in aviation

Aviation sector plays a crucial role in achieving global net-zero carbon emissions, as it represents a significant contributor to global GHG emissions. As the demand for air travel grows, addressing carbon footprint of aviation becomes increasingly crucial in the aim for net-zero emissions. To mitigate aviation's environmental impact, the industry is actively pursuing various strategies and initiatives aimed at reducing emissions. These strategies include technological advancements, such as the development of more fuel-efficient aircrafts, the use of SAF, and operational improvements to optimize flight routes and reduce fuel consumption.

Despite the efforts, achieving net-zero emissions within aviation sector remains a challenge, particularly concerning long-haul flights and air freight. In response to the concerns of the environmental impact of air transportation, the International Civil Aviation Organization (ICAO in Rotaris, Giasoldati & Scorrano 2020) introduced measures to control emissions growth, with a resolution for 'carbon-neutral growth from 2020' aiming to limit the global net CO2 emissions, from international air travel to 2019-2020 levels. While SAF, new aircraft technologies, and operational improvements are among strategies in action, these strategies are not sufficient. At least in the short run, additional measures are needed to meet emissions reduction targets.

Complementing technological and operational advancements, ICAO introduced The Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA), an obligatory market-based offsetting mechanism aimed at further mitigating aviation emissions. CORSIA mandates airlines to offset a portion of their emissions by investing in carbon reduction projects, such as reforestation efforts and renewable energy projects. Offsetting is a practical approach for airlines to mitigate their carbon footprint as they strive to achieve net-zero emissions in line with global climate targets. (ICAO 2018.) The following chapter will explore carbon emission offsetting in more detail.

4 Carbon emission offsetting

The UNFCCC (2024) describes offsetting as a form of a ‘climate action’ that allows individuals and organizations to compensate for unavoidable emissions by supporting climate projects, that reduce emissions elsewhere. Offsetting is crucial in achieving Paris agreement targets, as it helps bridge the gap between current emission levels to those required to meet the global climate goals. Both businesses and individuals can purchase carbon offsets to mitigate their carbon footprint. These offsets typically fall into the following four main categories: biological sequestration, renewable energy projects, energy efficiency, and CO2 emissions reduction (Mulligan 2010). This chapter will explore the current adoption of voluntary carbon offsetting by airlines, the debate and controversy surrounding the practice, including the issue of greenwashing. Additionally, the offsetting platform of Finland’s largest airline is introduced.

4.1 Airlines voluntary carbon offsetting

Airlines have introduced voluntary carbon offsetting (VCO), an option for passengers to voluntarily pay for their emitted emissions. This can be seen as a way to remove the responsibility from the airline to the passenger, and to give the passengers responsibility for their own part of the greenhouse gases. Nevertheless, research have shown low VCO participation, most likely due to perceived credibility (Zhang, Ritchie, Mair & Driml 2019). According to Aviation Benefits Beyond Border’s (2020) study, 44 airlines offer voluntary carbon offsetting programmes to passengers (Finnair is one of the airlines) and 30% of all passengers fly with these airlines. However, generally only 1-3% of passengers choose to pay for the offerings of voluntary offsetting (Figure 1). Therefore, this thesis is aiming to study these reasons from the Finnish passengers themselves.

Notably, there are some airlines that show a higher uptake to VCO’s than 1-3% (which airlines there are, was not specified in the study), and these airlines are typically linked to improved offset visibility, ease of use, perceived project quality, and cultural environmental consciousness. Notably, there are number of passengers and corporate travellers who offset through a ‘third party’ providers. These companies offer individuals and businesses to offset more than their flights, for their everyday carbon footprint of their daily activities. Similarly, for companies, many choose to offset their total emissions of their operations (including business travel). Therefore, the total offset amount from aviation is harder to estimate. (ATAG 2020.)

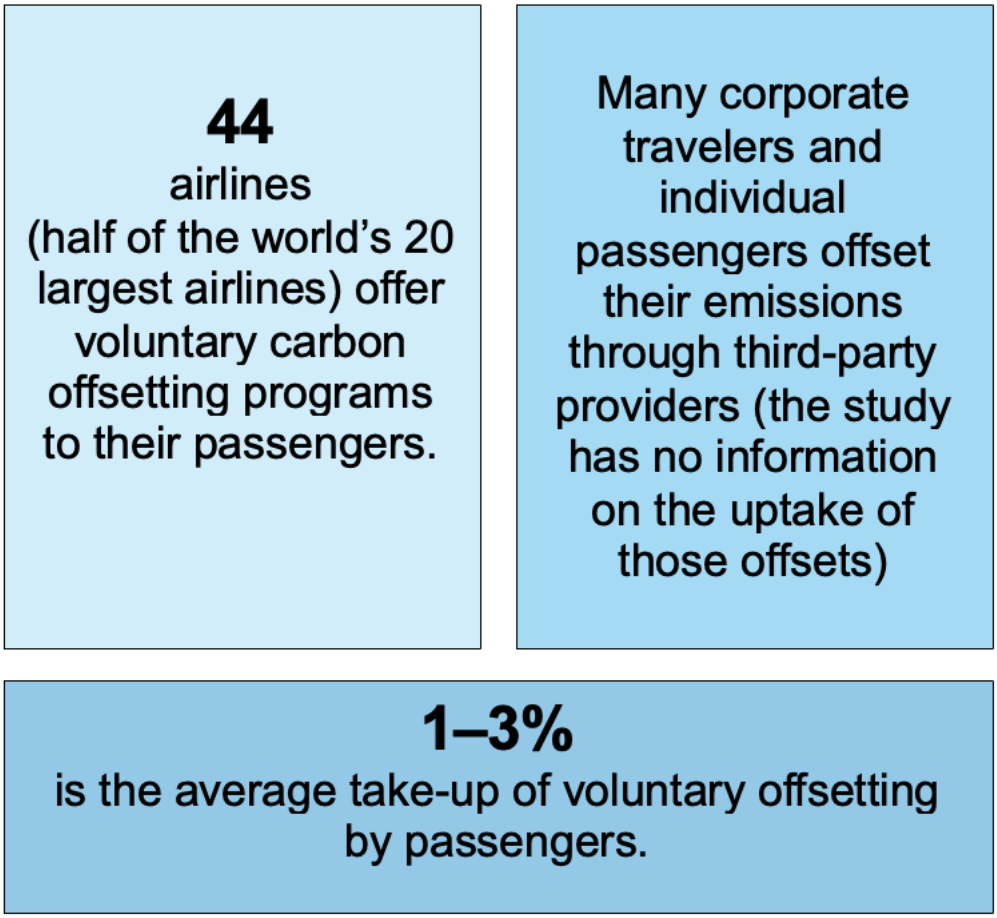

Figure 1. 2020 up-take on voluntary offsetting by airline passengers (adapted from ATAG 2020)

According to a study conducted in Italy by Rotaris et al. (2020) the willingness to pay for voluntary offsets is significantly lower if the target project is not mentioned. It was stated that forest protection, afforestation or reforestation are among preferred projects towards voluntary offsetting, as well as technological improvements in aircrafts and increasing the usage of SAF. Studies consider several reasons for the lack of voluntary participation. These are lack of knowledge and awareness of carbon offset schemes, as well as offset programs being confusing, lacking transparency and credibility. (Zhang et al 2019.) It has been demonstrated that people are more likely to purchase airlines VCO's after the concept of voluntary carbon offsetting was explained. Therefore, a study by Gössling et al. (2009), suggests that a careful consideration must be placed on the messaging about aviation VCO's, as these most likely affect consumers attitudes and purchase intentions. These reasons are examined and surveyed from Finnish airline passengers in the methodology part of the report.

4.2 Debate and controversy

Controversy surrounding emissions offsetting persists. Passengers continue to hesitate with the concept of emissions offsetting and ongoing debate whether offsetting is ‘greenwashing’ remains. Lack of trust regarding the benefits of carbon emission offsetting supports uncertainty among passengers. Consequently, people are seemingly hesitant to pay additional costs for a concept perceived as unsubstantiated. Despite the wide availability of emissions offsetting options by many airlines, as mentioned, empirical data (McKinsey 2020; ATAG 2019) indicates that only a fraction of passengers choose to engage with voluntary offsetting initiatives.

Perceived lack of credibility affects negatively consumer attitudes and purchase intentions. Therefore, communication messages are crucial in offsetting context (Zhang et al. 2019). Related to this, Finnair had difficulties in offsetting marketing in 2019. There was a campaign was called ’push for change’ and it presented misleading formulation of the emissions reductions amount. The campaign stated that the airline aims to reduce overall emissions by 2020, by cutting CO2 emissions 17% from the 2013 baseline. However, the capacity on the airline was growing and therefore the overall emissions of the airline grew. Later on, the misleading messaging was corrected and apologized for. (Richardson 2021.) Nowadays the offsetting partner of Finnair has changed to company called CHOOOSE. The new partner platform is explored more in chapter 4.4.

More recently, YLE (2024a) published news article about EU-commission investigating Finnair, and 19 other airlines about greenwashing suspicions. Airlines are under investigation regarding emission credit claims. The EU-commission is demanding the airlines to clarify their environmental claims with science. Finnair’s communications director responded that the greenwashing claim was mostly about the communication of the use of renewable jet fuel. As the airline stated to be using renewable fuel, but only amounted 0.2% of its consumption (YLE 2024b). The response for EU-commission is yet to be seen. There is no question that news of this nature can significantly influence Finnish passenger’s perception about offsetting programs credibility and functioning.

The history with a misleading offsetting campaign, and more recent news about greenwashing is expected to affect Finnish passengers’ perception on offsets, by losing trust in efficacy and transparency of the airline-led offsetting initiatives. The lack of confidence can dissuade individuals from participating in such programs, particularly if they perceive lack in credibility or alignment with genuine environmental goals. Secondly, Finnair’s growth strategy, leading to an overall increase in emissions, may have led individuals to reconsider the effectiveness of their carbon offsetting as means of mitigating their carbon footprint, if overall the airline keeps on growing. If passengers perceive that their efforts to offset are being undermined by the airline’s expansion plans, they may question the value and impact of their contributions to offsetting.

4.3 Greenwashing

A term that has frequently appeared jointly in news about offsetting, and also mentioned several times by this research's online survey respondents is so called 'greenwashing'. According to Cambridge dictionary (2024), greenwashing refers to '*behavior or activities that make people believe that a company is doing more to protect the environment than it really is*.' By survey respondents, this term was used several times as a reference to their perceptions towards voluntary carbon emissions offsetting.

In Finnish media, the major airline in Finland has not been in a positive light when it comes to offsetting programs. News media channel YLE made a document on how Finnair's offsetting money is used. MOT's video in YLE Areena (2022) shows example on how offset money is used for biogas project in India. In the documentary, Indian family shows how the biogas they use is created, and the issues the usage has. Another notable point was that biogas is and has been created in the villages already *before* the offset projects. Therefore, it is not actually creating anything new. Also, the people in the village measure the usage of biogas by themselves, which is to their benefit due to being paid as much as the usage is. Another way these project's money is used in India, is by adding solar panels, which according to the document by YLE, are a challenge to dispose, as India does not have functioning recycle system. It was mentioned in the document by an Indian environmentalist, that the suggested way to use the offsetting money is to focus on structural changes, developing the way the globe is working to minimize the effects of climate change.

It has been argued that offsetting in this type of projects is a way to move the responsibility, or clear ones self-conscious from the guilt of carbon emissions emitted from flying, with the sake of calling it 'offsetting'. However, it is worth to mention that the biogas projects in India are only one of the projects that the offsetting platform Finnair uses, supports. In the following chapter, the offsetting partner platform is introduced more thoroughly, and it is explained that the offsetting projects offered to companies and airlines 'climate portfolio' varies. There are options to choose from carbon removals, carbon reduction projects and SAF.

4.4 Offsetting platform of largest airline in Finland

Finland's largest airline, and the fourth-largest producer of greenhouse gases in the country (Richardson 2021), provides passengers the opportunity to offset their emissions through a platform called CHOOOSE. This platform is utilized by several prominent airlines globally, including British Airways, Alaska Airlines, Southwest, Japan Airlines, and Air New Zealand. Established in Norway in 2017, the platform aims to bridge the gap between climate intentions and climate

actions by facilitating the adoption of various climate solutions, such as carbon removals, sustainable aviation fuel (SAF), and nature-based offsets. (CHOOOSE 2024a.)

The platform allows companies to tailor their climate solution portfolios. Companies can choose which climate solutions to offer, between SAF, carbon removals, community projects or nature-based solutions. Nature-based solutions include activities like carbon removal and storage through restoration, conservation, and management of natural resources. For instance, one initiative supported by CHOOOSE focuses on conserving mangrove ecosystems in Colombia, highlighting the potential of nature-based solutions. (CHOOOSE 2024b.) Finnair has tailored their offering for passengers to choose to allocate their payments between offsetting projects or investing in sustainable aviation fuel.

Companies using such offsetting platforms trust in the international environmental certificates, as the ones CHOOOSE has. These certifications include Sustainable aviation fuel platform (assurance audit) Verifavia, Information security management ISO 27001 and GHG emissions calculations methodology (assurance audit). (CHOOOSE 2024c.) When partner companies of these offsetting platforms are asked about the proof of the functionality of these programs, (as seen in MOL, YLE Areena documentary) they tend to rely on the ’certifications that they must trust in’.

The history of carbon offsetting marketing in Finland has likely led individuals to critically assess the credibility, effectiveness, and alignment of airline offsetting initiatives with their personal environmental values. This critical evaluation significantly influences their decision on whether to participate in airline-sponsored offset programs or to seek alternative ways to reduce their carbon footprint. Additionally, the media coverage surrounding offsetting in Finland may have shaped passengers' perceptions, leading them to associate offsetting primarily with specific projects, such as those in India, rather than recognizing other available options, like contributing to sustainable aviation fuel or new technologies.

5 Consumer behavior and decision-making

In order to understand the decisions that consumers take when choosing whether to purchase voluntary offsets, it is valuable to take a look on the concepts of consumer behavior and decision making. It is recognized that Finnish citizens hold high value and awareness towards environmental matters. Therefore, it could be assumed that voluntary offsetting and other environmental initiatives would be popular as well. However, as explained earlier, this is not the case with offsets, and it is likely that attitude-behavior gap is present. Thereby this chapter will also cover the concept of attitude-behavior gap.

5.1 Planned behavior

According to theory on planned behavior (Ajzen 2005, 117-118), intentions are usually a predictor of different behavior. And to understand behavior, behavior intentions are identified in a function of three basic factors: personal, social influence, and sense of control. Personal factors refer to individuals' attitude toward the behavior, as in individual's negative or positive evaluation of performing the specific behavior of interest. The second factor of intention is about perceived social pressure to perform or not to perform the behavior under consideration, this deals with normative prescriptions. The third factor of intention is the factor of self-efficacy, or ability, to perform the behavior or interest. Overall, people intend to perform a behavior when they evaluate it positively, experience social pressure, or when they believe they have the means, ability, and opportunities to do so.

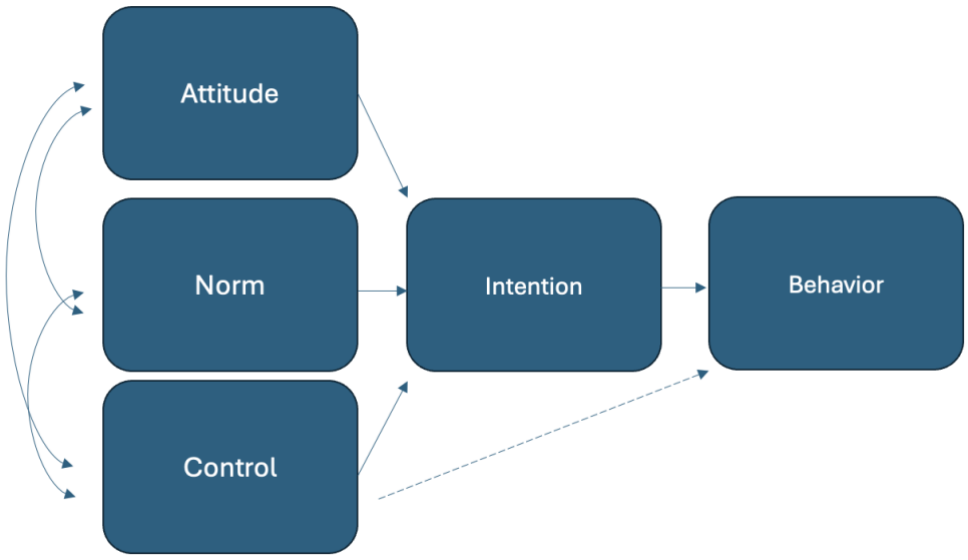

Figure 2. Illustration on theory of planned behavior (adapted from Ajzen 2005, 118)

In some cases, only one or two of the listed factors are needed to explain an intention, while sometimes all three factors are determinants. Notably, the weight of factors varies between individuals/populations. As illustrated in figure 2, there is a direct link from perceived behavioral control to behavior. Ajzen's (2005, 119) theory believes that there can be an exception where people feel very confident about their ability to perform a behavior and act on it, bypassing the need for intention first. For example, if someone is confident of their ability in recycling, they might do it automatically, without consciously planning to do it. Similarly, direct arrow from perceived behavioral control to intention, presents the favorable attitudes people have towards the behavior. For example, if someone has positive attitude towards recycling, but lack the necessary resources to do so, there might be intention to recycle, without the behavior.

Ajzen's theory on planned behavior framework helps to understand the psychological and social factors influencing individuals' attitudes and decisions towards voluntary offsetting. The model helps to identify the determinants of intention and actual behavior. There may be attitude factors, personal perceptions of positive or negative evaluation of voluntary offsetting. Which can be formed with environmental awareness and perceived benefits of offsetting. The social pressure to purchase (or not to purchase) voluntary offsetting can be a factor. These social influences can be within a family, friends or broader societal expectations that affects individuals' decisions to participate in voluntary offsetting. Finally, there is the perceived behavioral control, the perception of how much value does individuals own offsetting amount actually give to the cause. There can be direct link to intentions that person believe they have the resources (financial, knowledge) and opportunities (available programs) to participate in offsetting. And in some cases, strong perceptions of control can directly influence behavior without the intention, if individual feel extremely capable. The factors that affect Finnish airline passengers' environmental behavior in the context of offsetting, are measured and discussed in the methodology part of the thesis.

5.2 Attitude-behavior gap in environmental aspects

Studies has shown that an attitude-behavior gap exists in environmental topics, as environmentally conscious people who normally acts pro-environmentally, does not do so in the matter of air travel (Barr, Gilg & Shaw 2011). Researchers have tried to explain this gap. Four causes were defined by Rajecki (1982 in Kollmuss & Agyeman 2002, 242):

- *Direct versus indirect experience:* Refers to direct experiences having a strong influence on people's mind, when experiencing them personally. For example, seeing a dead fish versus studying about it in school. And thereby acting environmentally conscious.

- *Normative influences:* Such as social norms, cultural traditions, and family customs shapes people's attitudes. For example, if the societal norm is unsustainable lifestyle, pro-environmental behavior is less likely to happen, widening the gap between attitude and behavior.
- *Temporal discrepancy:* Refers to the fact that people's attitudes change over time, and inconsistencies in results of data collection may arise when attitudes and actions are measured at different times.
- *Attitude-behavior measurement*: Refers to measured attitudes being often broader than the measured actions. For example, measuring of caring about the environment versus asking about recycling. This can lead to large discrepancies in results. (Newhouse 1991, in Kollmuss & Agyeman 2002, 242.)

Notably, it is emphasized that attitudes do not determine behavior directly, as illustrated in Figure 2, they rather influence behavioral intentions, which shape our actions. Intentions are not only influenced by attitudes but also by social pressures. Therefore, '*the ultimate determinants of any behavior are the behavioral beliefs concerning its consequences and normative beliefs concerning the prescriptions of others'* (Ajzen & Fishbein 1980, in Kollmuss & Agyeman 2002, 242).

Furthermore, pro-environmental behavior has been studied (Hines et al 1986, in Kollmus & Agyeman 2002, 243) and association with the following variables, between people who act pro-environmentally have been found:

- *Knowledge of the issues*: People who are familiar with environmental problems and the causes, tends to act pro-environmentally.
- *Knowledge of the ways how to act*: People who have the knowledge of the ways to act.
- *Locus of control*: Individuals who perceive that their behavior can bring change with their actions.
- *Attitudes*: People with strong pro-environmental attitudes are more likely to engage in pro-environmental behavior.
- *Verbal commitment*: People who communicates willingness to act.
- *Sense of responsibility:* People with greater sense of responsibility tend to act pro-environmentally.

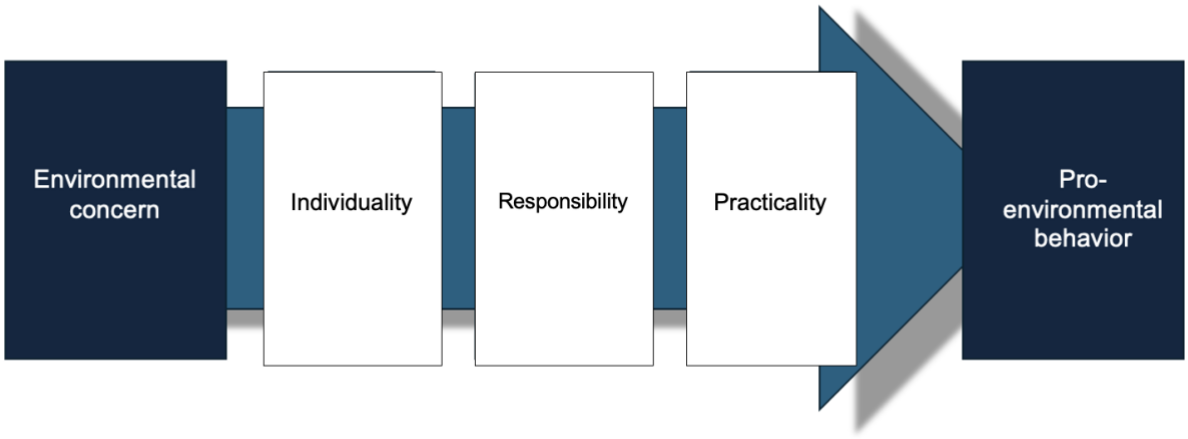

Figure 3. Barriers between environmental concern and action (adapted from Blake 1999, in Kollmus & Agyeman 2002, 247)

There are multiple different models to illustrate the attitude-behavior gap in environmental aspects. One of them is from Blake (1999, in Kollmus & Agyeman 2002, 247). Blake illustrated three barriers between environmental concern and action (Figure 3). These are individuality, responsibility, and practicality. Individual barriers encompass attitude and temperament. These barriers are especially present in people without strong environmental concern. Second barrier, responsibility, is linked to people feeling as they cannot influence the environmental issues and therefore don't act. This also includes the lack of trust in institutions, e.g. local or national government, and the suspicions are barriers to act pro-environmentally. Third barrier, practicality, refers to institutional and social limitations that limit people from acting pro-environmentally, regardless of their attitudes or intentions. These limitations can be time, money, or lack of information. Notably, in Blake's illustration, the cultural factors and other social norms are missing.

Other interesting factors found to influence the attitude-behavior gap in environmental aspects are demographic factors. These are gender and education related. Studies (Fliegenschee & Schelakovsky 1998; Lehmann 1999, in Kollmus & Agyeman 2002, 248) show that women are more emotionally engaged to environmental problems and more willing for change. Additionally, the longer the education, the more extensive is the knowledge about environmental issues (although not necessarily increased pro-environmental behavior). Another factor influencing to the attitude-behavior gap are institutional factors. Pro-environmental behavior is likely to take place when the necessary infrastructure is provided.

Other factors include economic factors, social/cultural factors, motivation, knowledge/awareness, values, and attitudes. Interestingly, when studied about the factors of which affects to environmentalists' sensitivity to the issue, a combination of factors was found. These included childhood experiences in nature, pro-environmental values in the family, role models, and education. Which proofs the fact that emotional connection to natural environment seems to be in a role in fostering environmental awareness. (Kollmuss & Agyeman 2002, 247-249.)

5.3 Airline passengers carbon offsetting behavior

A study conducted by Glössling et al. (2009) found, that out of 300 passengers sampled at the Gothenburg airport, only 2% were paying for offsets, even when 71% of respondents were worried about the climate change. There was as high as 76% passengers who were not aware of the concept of carbon emission offsets and after a short introduction to the topic, 70% of the interviewees showed interest in paying for offsets. However, it should be taken in consideration that the study was conducted in 2007, therefore, awareness of offsets might have smaller of a topic and has increased during the past 17 years. Similar study conducted by Hooper et al. (2008) found that less than 50% of 487 responders at the Manchester airport were aware of carbon emission offsetting. Less than 10% showed interest to offset their flight.

Another similar study in Finland, conducted by The Finnish society for tourism research (Ruuska & Hakkarainen 2015) found via online questionnaire that Finnish leisure travelers were generally aware of voluntary carbon emission offsetting programs and had more positive than negative attitudes towards offsetting. However, still only a few reported to voluntary pay for offsetting. The study found that the more environmentally conscious the respondent were, the more likely they had positive attitudes towards VCO. Additionally, it was mentioned that environmentally positive attitudes do not, however, guarantee environmentally conscious behavior, and attitude-behavior gap can be seen in green consumer's actions. There was not a more up-to-date study found of Finnish airline passengers' attitudes towards voluntary carbon emission offsetting. Notably, the number of companies and airlines offering the option to voluntary offset their emissions has been growing, and it is worth to do more updated research to see how the attitudes and behaviors have changed among Finnish airline passengers.

6 Research methodology

In this chapter, the selected research approach, the creation of online survey, sampling, and data collection methods are explained. Additionally, research validity and reliability are discussed, and an overlay matrix is used as a tool to verify the connection of survey questions to the theoretical framework, the original research questions and the results. Finally, the challenges of the whole research process are discussed, and how the potential biases were managed and minimized. As a support, the book of Methods for Development work: new kinds of competencies in business operations (2022) by Moilanen, Ojasalo and Ritalahti, was used throughout the methodology part. Together with Scribbr.com, a knowledge base website. Additionally, a sample size calculator by Qualtrics.com was used to determine the accurate sample size of survey respondents needed for generalization.

6.1 Research approach

The characteristic of a research-based development is usually to solve problems; generating new ideas and renew practices, products, or services (Moilanen et al. 2022). When choosing the appropriate research approach, both case study and constructive research were considered. Case study was considered because of its aspects of producing suggestions for development and ideas. Which has similar elements of what this thesis aims for. Generally, the target of a case study can be a company or its department, product, or service. However, a case study is always about restricted target, and its characteristics does not include generalizations to a larger population. This thesis is not commissioned by any specific company or an airline (instead it can be adapted to multiple organizations/airlines) and therefore it is generalizable to a bigger scale in the industry. Thereby, it was preferred that constructive research approach is more suitable for this thesis.

Moilanen et al. (2022) describes constructive research method as *''developing a theoretically well-founded solution to a problem in practice, thereby producing new knowledge for doing business and contributing to the scientific community''.* In constructive researched, it is essential that the solution is functional also in other organizations besides the target organization. The best approach of this thesis is constructive research, as the aim is to improve an existing practice. This existing practice is voluntary offsetting, by understanding attitudes and barriers that passengers have towards voluntary offsetting, and ultimately to improve voluntary offsetting practice and contribute towards reaching carbon emission reduction goals in aviation.

Once the appropriate research approach was selected, it was time to choose the data collection method. To study the attitudes and barriers of Finnish airline passengers towards voluntary offsetting, it was important to gather insights and thoughts from Finnish passengers themselves.

To do this in a larger scale, the preferred method was to use quantitative method, an online survey. This method was selected, because the data would be collected from a large group of respondents. The methods used in constructive research are adaptable, as the approach does not require the use of a one specific method, however, surveys are among the most typical methods used for constructive research approach (Moilanen et al. 2022). Another method option that was considered, was qualitative methods, using in depth interviews. The decision to use online survey was made in order to generalize the results to a larger group of Finnish airline passengers, using a sample from the target population.

6.2 Questionnaire design

The creation of survey questions was started with identifying hypothesis (statements and assumptions) that occurred from theory, and previous studies. Alongside with the original research questions. The original research questions were used to form sub questions from each question category. The categories are:

1. Factors influencing purchase decision
2. Awareness of carbon emissions offsetting
3. Perceived barriers to voluntary offsetting

Chat GPT was used as a supportive tool for ideation, to help form and structure the survey questions. Original research questions were presented in Chat GPT, and suggested survey questions asked. Also, Chat GPT was asked for which demographic information of the respondents could be useful in this kind of study. Few of the suggestions from Chat GPT were selected to the survey. Additionally, an overlay matrix (Table 2) was created to ensure that each survey question is in relation to a research question and the theoretical framework. The structure of the questionnaire (visible in Appendix 1) includes cover letter with linked consent form, background/demographic variables, followed by the actual survey variables.

The survey starts with a cover letter, with a brief introduction to the study. No explanation of the functioning or purpose of offsets was included intentionally, for the survey results to be as authentic as possible, with the experience that the respondents have at the moment of taking the survey. It was stated in the cover letter that the responses are handled confidentially, and anonymity is kept, as the nature of the answers might be sensitive. The tone in the cover letter and throughout the survey was intentionally kept as neutral as possible, and critical tone was minimized to give each respondent the opportunity to approach the questionary with their own existing idea of

carbon offsetting. Whether they would be skeptical of the functioning of offsetting, or truly trust in them. The intention of the survey was not to lead the respondent in any direction of the matter.

The survey consists of a total of 21 questions, with yes/no, multiple choice, Likert scale (Table 1), and open-ended questions. The aim was to form the survey in a way that it is fast to answer, and the questions are easy to understand. The survey starts with demographic questions, to gain insights of the backgrounds of the respondents. The intention was to find variables between different demographic groups. These questions were of country of residence, gender, and age. Followed by questions of frequency of flying and the level of environmental consciousness of the respondent.

The actual survey variables were divided in three categories, linked to the original research questions. The first theme was about the *factors influencing purchase decision of carbon emission offsets*. These questions were focusing on the importance placed on environmental impact of air travel, and factors encouraging and discouraging the decision to purchase carbon emission offsets. A question if the respondents had ever purchased offsets before was included, and if they had not, what were the main reasons for not purchasing.

The second theme was about the respondent's *awareness in carbon emission offset programs*. These questions focused on gaining insights of the previous knowledge in offsetting, and the respondent's level of understanding the purpose and functioning of carbon emission offset programs. Additionally, the sources that respondents primarily rely for their information regarding environmental initiatives in air travel, and the motivation drivers to possibly learn more about carbon emission offset programs was asked.

The third theme was about the *respondents' perceived barriers to voluntary purchase offsets.* This theme included questions if respondents had ever considered purchasing offsets, and how important are the factors of cost, and concerns about legitimacy and effectiveness for willingness to purchase. Also, a question on the amount of extra money that the respondents would be willing to pay for completely emission free/compensated flight, and the perceived importance of offsetting in combating climate change was included. The survey finished with an open-ended question, offering the option for respondent to write their thoughts with their own words, to which strategies could boost the visibility, accessibility and perceived value of emission offset programs among Finnish passengers.

Because measuring attitudes and perceptions were in a central part of the survey, Likert scales were used in multiple questions response option. Likert scale (Table 1) is a five-point scale ranging

from negative, neutral to positive. Likert scale format measures the respondents amount of agreement or disagreement. (Bhandari & Nikolopoulou 2020.)

Table 1. Likert scale (Bhandari & Nikolopoulou 2020)

1= Strongly agree/ Extremely important/ Very familiar
2= Agree/ Important/ Familiar
3= Neutral
4= Somewhat disagree/ Not important/ Not familiar
5= Strongly disagree/ Not important at all/ Not Familiar at all

6.3 Research sampling

According to Moilanen et al. (2022), it is utmost important to define the population that will be surveyed, to support the inferences that will be drawn, and to determine the generalizability of the results. The target population, also called as observation unit, for this research are Finnish airline passengers. This is the group which the research aims to draw conclusions and generalizations about. However, since it is unrealistic to gather responses from all Finnish airline passengers, a random sample is the most ideal sampling method to use. By analyzing a random sample, it is possible to make inferences about the entire population.

Sample group refers to a smaller subset of the target population. To draw conclusions about the attitudes that Finnish airline passengers have towards voluntary offsetting, probability sampling is the most effective method. This method allows to make strong statistical inferences of the whole group, and it is mainly used in quantitative research. Probability sample enables confident generalizations about the whole population. Probability, or random sampling ensures that the research results are unbiased. Simple random sampling means that every member of the population has the chance of being selected to participate. (Bhandari 2023a).

However, sometimes a random sample is not possible, when the researcher does not have a sampling frame (Moilanen et al. 2022). Therefore, the sampling style that was used for this study, can be considered as more of a voluntary response sampling. This is because the individuals chose by themself to respond the survey. No participants were contacted personally, but they were reached via different online groups, where they voluntarily chose to take the survey. The target of the sample was to gather responses from as random sample as possible, but the most convenient way to gather responses ended up being a non-probability sampling method, convenience sample. This is due to reaching more responses from the researchers own social media channels, from

researcher's own contacts, where the responders were reached at *convenienc*e. The risk of biases in voluntary response sampling and convenience sampling are discussed in chapter 6.6.

Sample size

To determine the ideal amount of survey respondents needed for generalization, a sample size was calculated. To have an idea of the needed sample size, an online sample size calculator from Qualtrics.com (2023) was used. To make unbiased estimates, the sample should be representative of the entire population, or randomly selected (Middleton 2019). Thus, a large number of respondents improves the generalizability of the results. Qualtrics sample size calculator (figure 4) determines the ideal sample based on the population size, confidence level, and margin of error.

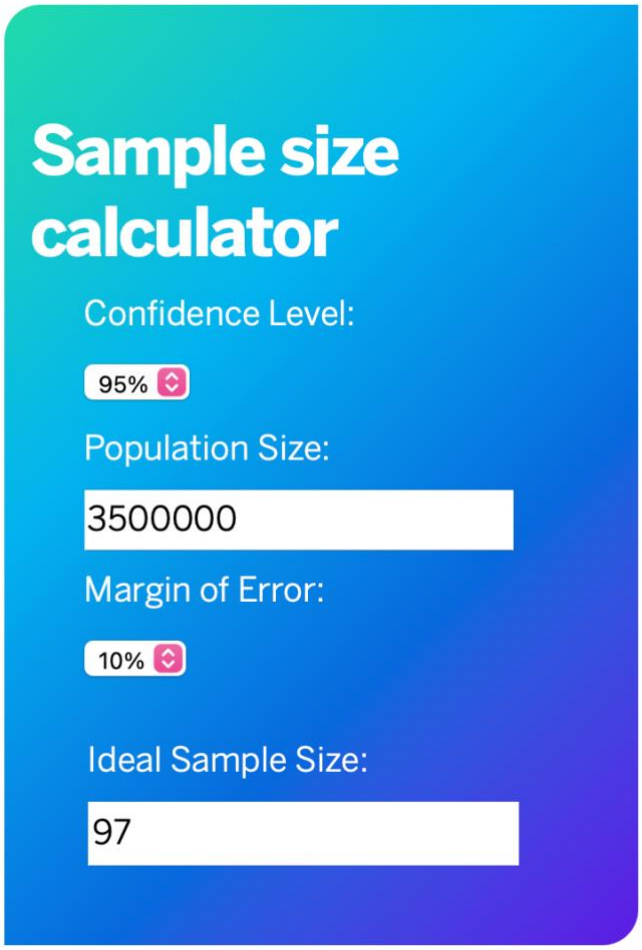

Figure 4. Screenshot of a sample size calculator in Qualtrics.com (2023)

Estimating the population size

Due to lack of precise data of the number of Finnish airline passengers, an estimate was necessary for this research. The total population of Finland, which is 5.6 million people

(Tilastokeskus 2023) was used as a starting point. Next, the children under 18 years old, who are less likely to purchase their own airline tickets were deducted. This amount is approximately 1.5 million people according to Tilastokeskus (2020). This left the subtracted 4.1 million potential passengers. Further deductions were made to account for those who do not travel by air due to financial constraints, medical reasons, or personal choice. Thereby, the population size for the study was set to an estimate of 3.5 million, which is approximately 62,5% of the total population of Finland. Notably, the population size is not such an important factor in the study, as when tested with the sample size calculator, the ideal sample size stayed the same no matter if the population was 4 or 5 million. It is the changes in confidence level, and margin of error that changes the amount of ideal sample size.

Confidence level and margin of error

Confidence level was set to 95%, which is the most commonly used level according to Qualtrics (2023). This indicates the degree of confidence that the actual mean falls within the margin of error. The margin of error was set at 10%, which measures the accuracy of the results (Qualtrics 2024). Given the scope of the study and the resources available in this case, the margin of error was set fairly high. Additionally, the diverse opinions surrounding the research topic, along with increased uncertainty contributed to the decision of higher margin of error. According to the sample size calculator on the Qualtrics website (figure 4), the ideal sample size was set to 97 responses.

6.4 Data collection

In expectation to reach the full 97 responses, the data collection was started. The survey was distributed online, on multiple different channels. The channels that were utilized were Facebook's Finnish travel groups, and Jodel-chat applications different groups including Finnish and English language travel groups. Researcher's own Instagram channel and personal Facebook groups was also used to gather more responses. The survey was open to be responded for 4 weeks. The following is a detailed list of the distribution streams and channels that were used:

- Facebook groups:
    - Soolomatkailijat, 5,6k members
    - Matkailu/Loma, 3,5k members
    - Vinkkejä matkailuun, 4,8k members
    - Researcher's personal Facebook groups, 34 members
- Jodel channels:
    - Haaga-Helia
    - Finnair
    - Traveler

    - Matkailu
- Researcher’s personal Instagram
- Researcher’s university’s Teams group

When choosing the channels to distribute the survey, the selection process was started with an online search of different travel groups. In a previous, similar study conducted by The Finnish Society for Tourism Research (2015), the responses were collected in Pallontallaajat, travel website. This site does not exist anymore. However, inspired by that stream of data collection, I started to search for similar groups in Facebook and in Jodel. The thought process was to find groups with participants who are interested in travel (and thereby most likely does travel by air). Additionally, in those groups, the admins would more probably allow me post something related to the topic of air travel. The groups chosen needed to be from Finland, to reach Finnish passengers, with as wide demographics, and as ‘regular’ passengers as possible. Therefore, no environmental nor sustainability groups were selected, even if the topic of the research is of this kind, in order to get a respondent sample from ordinary Finnish passengers. Figure 5 is an example of a Jodel and a Facebook invitation post that were published to collect responses.

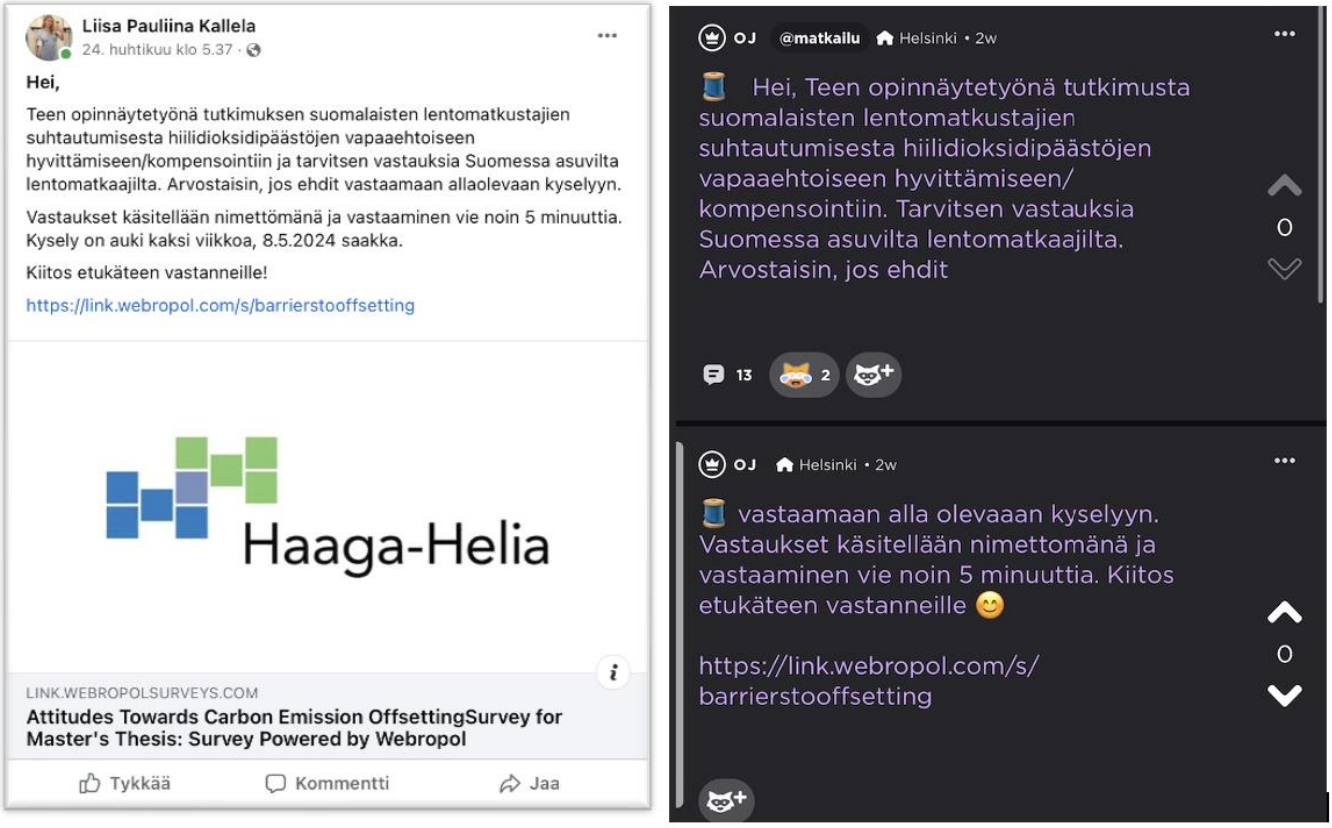

Figure 5. Screenshots of Facebook and Jodel (2024) invitations to participate in the survey

Jodel is an anonymous, location based mobile application that allows people to have chat conversations in different channels. The platform is particularly popular among young adults (Jodel 2024). This platform was chosen because similar posts from other students asking for survey responses for their thesis were seen as inspiration. Also, quantitative research lecturer Ms. Pirjo Saaranen mentioned Jodel as a stream that other students had used before to collect survey responses. In figure 5, an example of the post is showed that I posted in Jodel to reach responses to the survey. Channels where to post the survey were selected with similar criteria to those in Facebook.

Storage of Data

All the collected data during the research process were stored in Webropol website and personal laptop. All thesis related material that was stored on personal laptop were also saved in personal student OneDrive portal and personal iCloud. All platforms where data was stored is password protected. Notably, all survey data will be deleted after the thesis is finished and published in Theseus platform.

6.5 Research validity and reliability

Reliability and validity are important factors when doing research, especially to evaluate the research's quality. Reliability refers to the research consistency, and validity refers to the accuracy of a research. Both of these concepts are especially important in quantitative research. Notably, if research is valid, it usually is also reliable. One way to assess validity, is to compare the results to the data and/or the theory. (Middleton 2019). And an effective way to do this, is to use an overlay matrix tool.

According to Choguill (2005, 616), an overlay matrix tool is a tool consisting of rows and columns, that 'force' the researcher to think of the logic of the study. The main point is to ensure that the different components of the study are linked together logically, and no important parts of the study are absent. The tool therefore works for planning of the research and provide clear understanding what the study is about and the results that can be expected. Furthermore, overlay matrix tool ensures that hypotheses are in relation to the objectives and the overall goal of the study, and forces the researcher to determine the techniques/ research methods that will be used, at the very beginning of the study.

To verify for validity of this research, is to verify that the survey questions match the original research questions. To illustrate this, an overlay matrix tool was created (table 2). The tool is presenting the relation of the theoretical bases to the research questions, the survey questions, and finally, to the results. For example, the research question 2: *How aware are Finnish*

passengers of the existence and purpose of carbon emission offset programs and what are the key factors influencing their awareness? The theoretical connection is to the chapters: 2 Climate change and the greenhouse effect and 3 Carbon dioxide emissions reduction, as these chapters explains the existence of climate change and the purpose of carbon emissions reduction in theory. While chapters 4 Carbon emission offsetting, 4.1 Airlines voluntary carbon offsetting and 4.4 Offsetting platform of largest airline in Finland encompass the theory of offsetting and voluntary uptake by passengers globally, and the current platform of the largest airline in Finland.

In order to understand the awareness Finnish passengers holds towards offset programs, survey questions number 11-14 (visible in Appendix 1) were incorporated to the survey. These questions are in direct link to the research question and the theoretical framework. For instance, survey question 12: *How familiar are you of the purpose and functioning of carbon emission offset programs?* and number 13: *What sources do you primarily rely on for information regarding environmental initiatives in air travel?* Finally, the results of these questions are presented in chapter 7.4 Awareness of carbon emission offset programs.

Table 2. Overlay matrix

Research question	Theoretical connection	Connection with the survey	Results
1. What are the primary **factors influencing** Finnish passengers' decisions regarding the **purchase** of carbon emission offsets offered by airlines?	**Chapters:** 5 Consumer behavior and decision-making	**Questions:** **6,7,8,9,10**	**Chapters:** 7.3 Factors influencing purchase decision of carbon emission offsets
2. How **aware** are Finnish passengers of the **existence and purpose** of carbon emission offset programs and what are the key factors influencing their awareness?	**Chapters:** 2 Climate change and greenhouse effect 3 Carbon Dioxide emissions reduction 4 Carbon emission offsetting 4.1 Airlines voluntary carbon offsets 4.4 Offsetting platform of largest airline in Finland	**Questions:** **11,12,13,14**	**Chapters:** 7.4 Awareness of carbon emission offset programs
3. What are the perceived **barriers** to voluntary purchase offsets among Finnish airline passengers and does these barriers **vary across demographic groups**?	**Chapters:** 4.2 Debate and controversy 4.3 Greenwashing 5 Consumer behavior and decision-making	**Questions:** **1,2,3,4,5 15,16,17,18,19,20**	**Chapters:** 7.2 Respondents background 7.5 Perceived barriers to voluntary purchase offsets

Reliability of the survey was tested before publishing the weblink. Survey was reviewed and pre-tested by two people. By the thesis supervisor Ms. Heini Noronen-Juhola and quantitative research lecturer Ms. Pirjo Saaranen. A zoom meeting was held with Ms. Saaranen to assist in adding of research and consent announcement form link to the cover letter, and to go through the survey one last time before publishing. This was valuable, in order to make final corrections on the parts that had been misspelled or otherwise done incorrect while doing the survey.

6.6 Survey challenges

Some of the encountered challenges while creating the survey was concerns of the survey being in English language, but targeted audience being Finnish passengers. I had doubts if a regular

Finnish responder understands the questions or are as willing to take a survey if it is in English. To mitigate the challenge, translation of the topic (Hiilidioksidipäästö hyvitys) was added right in the cover letter, so the people who had not heard the term offsetting in English before, would at least have immediate understanding what the survey was about. Also, when publishing the survey online, the invitation letter was always written in Finnish (except travel channel in Jodel which is in English).

There were also challenges in choosing the streams of distributing the survey, as the scope of Finnish airline passengers is quite large and abstract. I did not have previous experience of making an online survey and was not confident of the ways to collect responses. I tried to look for previous theses and quantitative studies, to see which streams others had used to collect survey responses and inspire from those. The thesis supervisor and quantitative lecturer was also asked for recommendations of streams.

There were difficulties in collecting answers from different demographic groups, which was important for the generalizability of the results (Middleton 2019). When publishing the survey in social media channels, the assumption was that the average user of those channels is likely younger population. Based on the survey results, this assumption was right, as 65% of the respondents were under 30 years old. Also, supposed contribution to this percentage was publishing the survey in my own social media, where majority of my contacts are under 30 years old. However, this was a choice I had to make in order to get enough responses to begin with.

Another challenge in the survey was that I failed to be accurate enough, for example in question 4: *How many flights do you take in a year as a passenger?* The question should have been more specific, if one flight is one single leg of a flight, or a return flight. I got feedback about this from the respondents. Also, by starting the response options with ‘less than 5 flights’, I received feedback that it was a high number to start with. The reason I had chosen to start the response options from 5 flights, was that I thought it was a small number of flights (2,5 return flights in a year), as in my experience of how much people fly in a year, but it became apparent that not everyone thinks this was a low number of flights and I should have started from 1-2 flights.

Collecting sufficient number of responses to the survey turned out as a challenge as well. I had an initial goal of 100 answers, to exceed the ideal sample amount of 97 responses. However, after two weeks of the survey being published, the number of responses was only 70, and didn’t seem to grow. Therefore, I started to repost the survey and that’s when I decided to use my own social media channels as well. During the total four weeks I reached 94 responses, of which 90 were completed survey responses.

Research bias

When doing research, it is important to consider biases. Even if biases cannot be completely eliminated, it is important to try and minimize them. A type of bias that can exist in research is called sampling bias. This type of bias can occur, when some members of a population are more likely to be selected (in the sample) than others. If this kind of bias occurs, it can limit the generalizability of results. (Bhandari 2023b). As mentioned in the subchapter 6.3 Research sampling, the method used for sampling in this research ended up being similar to convenience sampling, which is a non-probability sampling method.

Convenience sampling method is riskier to be bias, as the ones who responses the survey, are more likely to be included than others in population (Bhandari 2023b). However, bias was minimized, as explained in chapter 6.4 Data Collection, with different travel groups used to reach ordinary passengers. Also, it was considered that even if my personal contacts were used, they are collection of somewhat different kind of people, therefore they are not representing only one kind of population, which is considered acceptable when my research population is as wide as all Finnish airline passengers.

As mentioned, it was noticed that under 30 years old covered 65% of all survey responders. A way to avoid this, could have been oversampling. Oversampling is a way to avoid sampling bias, in events when some members of the population group are underrepresented (Bhandari 2023b). Older population could have been targeted, to raise their percentage. However, a decision was made that the split between percentage was not big enough for the need to oversample.

A sign of non-biased survey success is the division in responses. There is a good number of split responses ‘for’, and ‘against’ offsets, which is good. For instance, results in question 16: *Have you ever considered purchasing carbon emission offsets when booking a flight?* responses were divided between 46% for yes and 54% for no. This indicated that there was no bias in responses for people who really are supportive of offsetting concept, or people who are really skeptical of them.

Another type of bias that can occur in a survey as a research method, is response bias. This type of bias occurs when people do not answer truthfully, for variety of reasons. Such as desire to follow social norms, desire to appear favorable, desire to appear in line with the objectives of research, or the desire to finish survey quickly. (Nikolopoulou 2022.) Response bias was minimized with making the survey anonymous, where the desires to follow norms or to appear favorable would not be in question, as nobody knows who responded what. The information about anonymity, as well as survey length being only 5 minutes of time, was included in cover letter and in invitation message.

Overall, measures that were taken to minimize response biases ranged from keeping the survey short and neutral in language, to ensuring the questions were engaging with a variety of formats, including multiple choice, Likert scale to open-ended questions. These efforts helped to capture a broad range of perspectives and opinions. The results and a detailed analysis of the collected data will be presented in the following chapter, providing further insights to the attitudes and behaviors of Finnish airline passengers regarding carbon offsetting.

7 Research results and analysis

In this chapter, results of the online survey are presented. The first subchapter explains the method of data analysis, followed by the responses of the demographic questions of participants. Next, a subchapter of each research question theme is included, where results and findings to each survey question are presented. Differences between demographic variables are observed throughout the analysis, and most notable ones are described.

The ideal sample size according to the sample size calculator was 97 responses. I was able to gather 94 submitted surveys, where **90** were actual completed survey responses. Three respondents that did not complete the survey, did not give consent to participate in the research and one chose other than Finland as a country of residence (which ended the survey). The number of responses that were collected are considered to be reasonable enough to ensure reliability, and the results can still be generalized to the population. Although, with less confidence level and larger margin of error. In this case, the recalculated margin of error is 10.33%, which means that the results are still almost as reliable as with 97 respondents.

7.1 Analysis of data

When analyzing quantitative data, two main types of statistical methods are used: descriptive and inferential statistics. In this case, the best way of describing the results of the survey is to use descriptive statistics for metric data. Descriptive statistics help to summarize and present the characteristics of the data clearly. These include measures like the average (mean), the spread (standard deviation), and visual tools such as charts and graphs. Inferential statistics, however, go beyond describing the data, and make predictions and generalizations about a population based on the sample. (Singh 2007, 122-176.) Variables distribution plays a key role in determining the nature of data analysis.

This survey data was collected through Webropol online survey platform, and the platform was used for analyzing as well. It was recommended by quantitative data lecturer Ms. Pirjo Saaranen, to use Webropol as an analyzing tool, and to present the findings of the survey results in the form that Webropol presents them. Webropol tool created a basic report of the results to present and compare the data. The report presents the results in descriptive statistics, in a form of charts, via cross tabulations and correlations. The report has been divided into individual figures of each survey question in the following subchapters. Result presentation starts with respondents' background demographics. Additionally, a report presenting the response variations between gender groups is attached as Appendix 2 to support the reliability of the findings.

7.2 Respondent's background

The survey started with a question of country of residence. 99% (90 respondents) lived in Finland and 1 respondent in other country, which ended the survey for that single respondent, as the scope of the study is airline passengers in Finland.

Next, gender of participants was asked in order to find behavior or attitude differences in environmental aspects between genders. As seen in figure 6, by far, the most participants were female (82%), while 17% were male and one other gender. This large separation in gender groups can be linked to the factors presented in chapter 5.2 attitude-behavior gap in environmental aspects, where studies (Fliegenschee & Schelakovsky 1998; Lehmann 1999, in Kollmus & Agyeman 2002, 248) indicate women being more engaged to environmental problems and more willing for change. Therefore, people with emotional connection to the topic might more likely want to take the survey, leading to the division in respondent's gender.

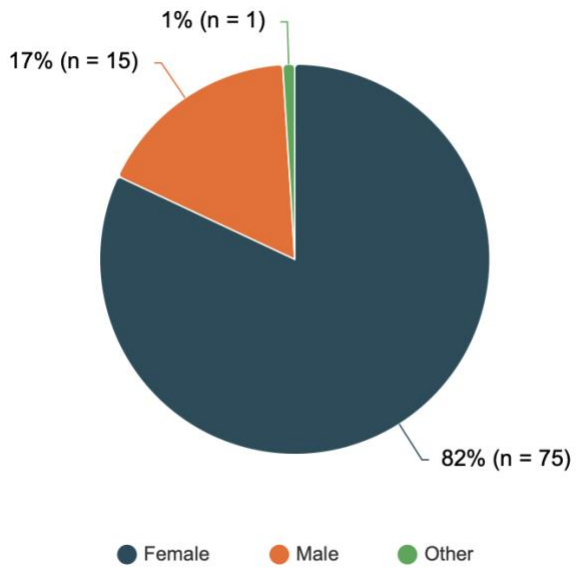

Figure 6. Gender distribution of respondents

Age (figure 7) was also asked, as a demographic variable. Majority of respondents, with 59% (54 participants) were between 20-39-year-olds. As mentioned, this can be a result of the streams that the survey was distributed in, or, it can also reflect a factor mentioned in chapter 5.2, where education was linked to knowledge in environmental matters, and in some cases, to pro-environmental behavior. It can be assumed that most of 20–29-year-olds, are students, or have been students in the recent years, and therefore hold more knowledge towards the topic, and

decided to take the survey. Second highest age demographic was 30–39-year-olds with 25% (23 respondents), which could also be reflection of the educational factor. 40–49-year-olds covered only 5% of participants (4 individuals) and 50–59-year-olds 4% (also 4 individuals) of participants. Over 60-year-olds were only 1% (1 person) and under 20-year-olds 6% (5 people) of the respondents.

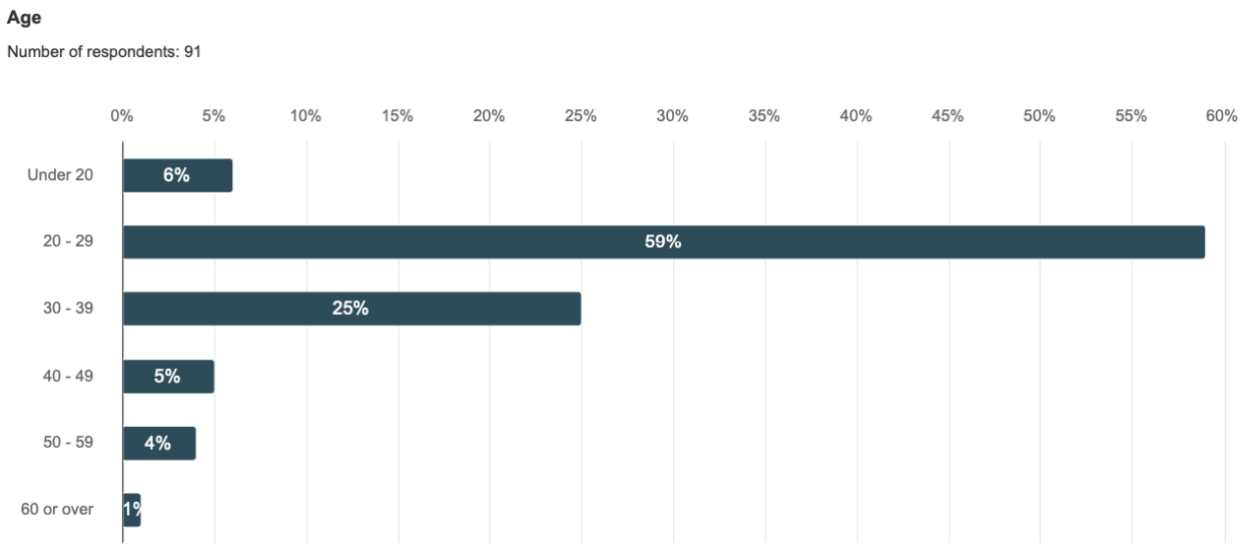

Figure 7. Age distribution of respondents

The following graphic (figure 8) illustrates travel behavior of the respondents, in number of flights taken in a year. Majority of respondents fly less than 5 flights in a year (47%, 43 respondents) and 26% (24 respondents) fly 5-9 flights yearly. 16% (14 individuals) fly approximately 10-14 flights, and only 3% (3 people) fly 15-20 flights. 8% (7 respondents) fly more than 20 flight yearly. The number of flights was asked from respondents in order to have an idea of how frequent flyers the respondents are, and if that affects to their perceptions on offsets. However, as mentioned, there could have been more specific phrasing of this question, as some respondents were not sure if it was a single leg of flight or return flight that was asked. Therefore, it is harder to make assumptions on the travel behavior/frequency in all groups, as the question was not accurately phrased. However, frequent flyers (those over 15 flights a year) are used as a demographic group to observe attitudes and behavior throughout the results analysis.

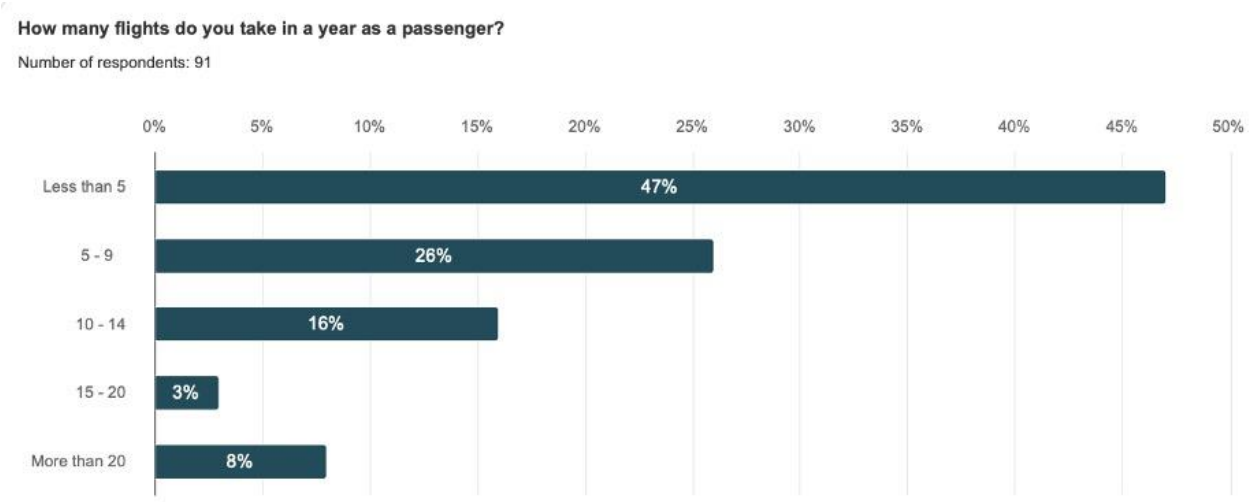

Figure 8. Number of flights in a year of respondents

Final background question (figure 9) was about the perceived level of environmental consciousness of respondents. Interestingly, majority of the respondents did consider themselves 'somewhat' environmentally conscious (58%, 53 respondents) which can also be a reflection on the key factor of respondents wanting to take the survey, if they are conscious/aware of the topic. However, this high rate in environmental consciousness does not translate to pro-environmental behavior (in terms of offsetting), as will be demonstrated in the upcoming results. Additionally, 19% (17 respondents) answered 'no, not really' and 4% (4 respondents) 'not at all' environmentally conscious. Only 5 people, (6%) answered 'unsure' and 12 people (13%) 'yes, very much' conscious.

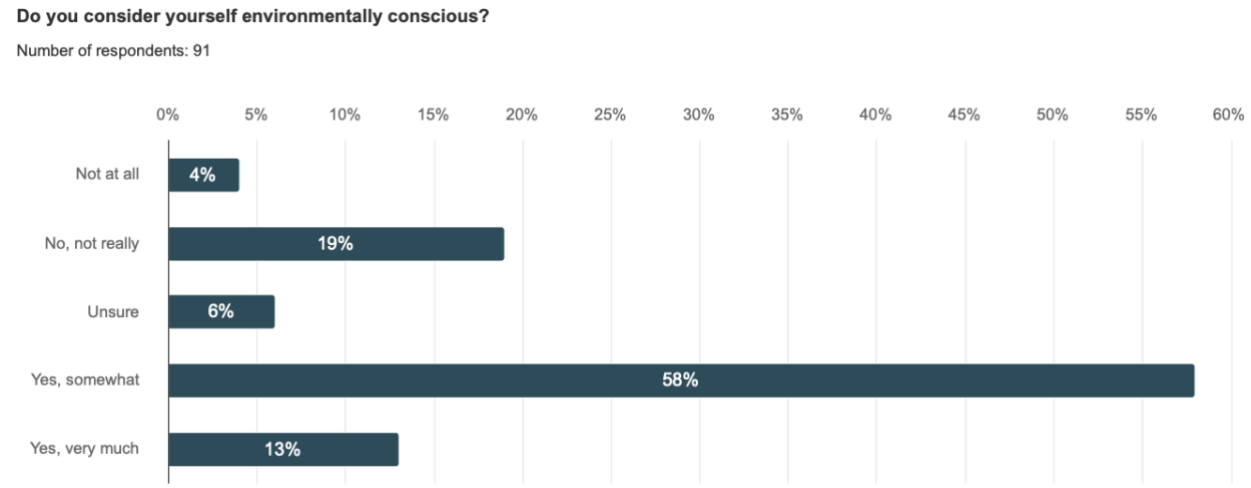

Figure 9. Level of perceived environmental consciousness of respondents

7.3 Factors influencing purchase decision of carbon emission offsets

Factors influencing purchase decision of carbon offsets was the first theme of survey questions. First question (figure 10) was about importance given to environmental impact of air travel, when purchasing a flight ticket. Majority, 34% were neutral, while 27% answered ‘not important’, and 21% ‘not important at all’. Interestingly, while previously shown, majority of responders did consider themselves environmentally somewhat conscious, it is apparent that it does not translate into decision-making process when purchasing a flight ticket, as majority responded it is not an important factor. 12% responded it to be ‘important’ and only 6% ‘extremely important’. Notably, 53% of male respondents had answered ‘not important at all’ while only 13% of females chose this option.

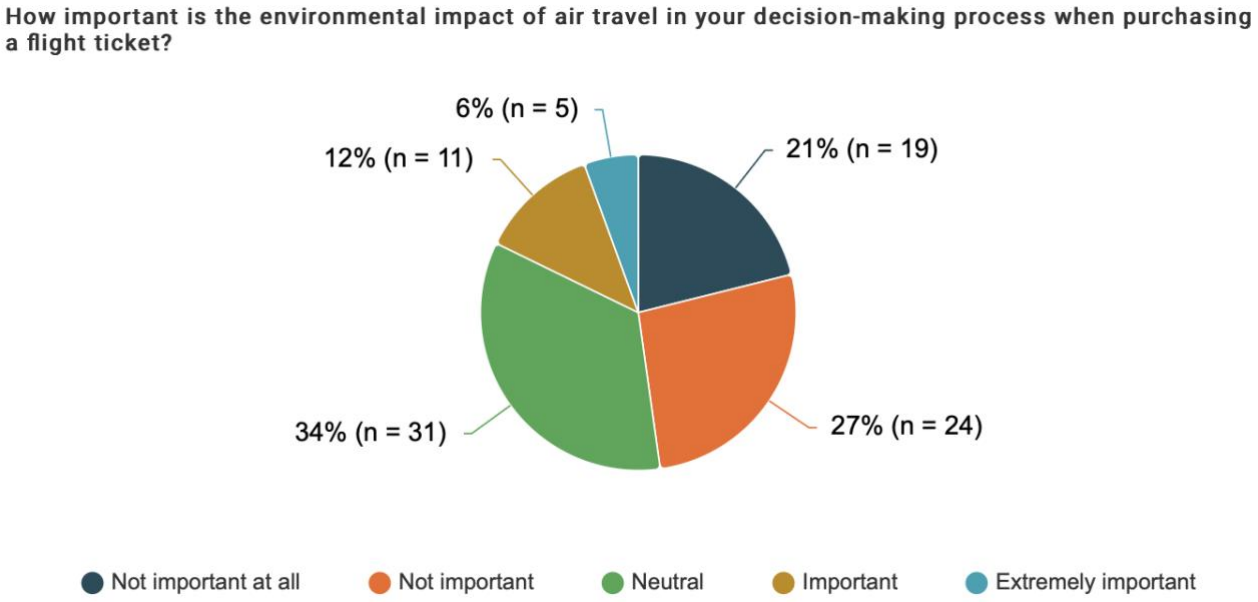

Figure 10. Importance of environmental impact in purchase decision of respondents

The following figure (11) illustrates the number of respondents that had purchased offsets before taking the survey. Only 20 respondents (22%) had purchased, while 70 people (78%) had not ever purchased offsets. If ‘no’ was selected, this answer triggered a rule, which led to next question about the reasons for not purchasing. Interestingly, 1/3 over 30 years olds respondents had purchased offsets before. Which suggests that the cost can be a factor for younger generation for not to purchase.

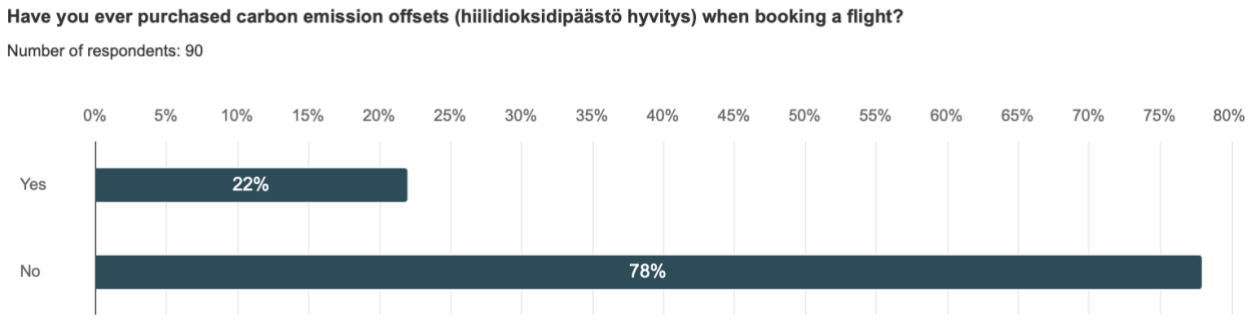

Figure 11. Number of respondents who had purchased offsets before

The options of reasons for not purchasing, were presented in a multi selection form (figure 12). Respondents could select all the reason that apply to them. Most popular reasons were doubts about the effectiveness of offset programs (38 votes), lack of trust in airlines environmental initiatives (33 votes) and perception that offsets are too expensive (31 votes). These three reasons were the most popular in all demographic groups. Lack of understanding how offsets work got 23 votes and 14 selected to write their own answers, which are presented in Table 3.

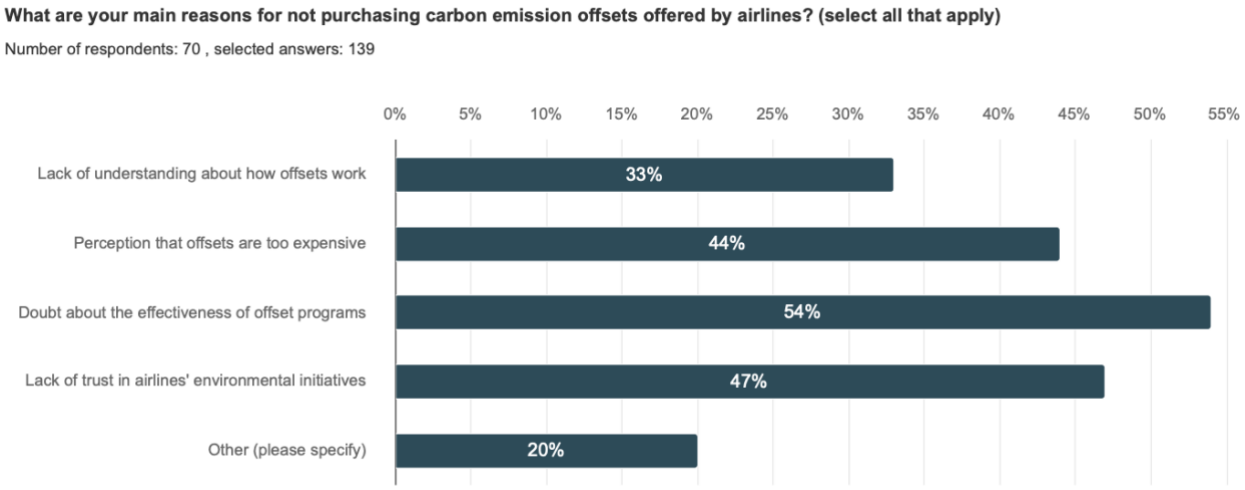

Figure 12. Respondents reasons for not purchasing offsets

The most apparent reasons (table 3) mentioned for not purchasing were *'not interested'*, *'not trusting'* and *'greenwashing/scam'*. Two respondents mentioned that there are no offsetting options available when purchasing airline tickets, suggesting poor marketing. One respondent linked the YLE article about Finnair's offsetting, that was presented in chapter 4.3 Greenwashing. Which is an indication that the news media has indeed affected to the perceptions of passengers about offsetting. Additionally, one respondent indicated that they '*Don't have enough knowledge, there's no information about it'.* Again, suggesting poor marketing and low visibility of offsets programs.

Table 3. Respondents' other reasons for not purchasing offsets

Option names	Text
Other (please specify)	Green wash
Other (please specify)	I don't travel by plane, but if I did, I'd prefer to use a third party service
Other (please specify)	No offsets available when purchasing the tickets
Other (please specify)	It is scam. We as humans can not damage the earth. God did not create the earth so these things can damage it. Also global warming does not exist. Do proper research and youll find the truth.
Other (please specify)	90% tapauksissa suoraa viherpesua
Other (please specify)	I've seen some documents about this subject, I don't trust or believe in the system.
Other (please specify)	I don't care about emissions
Other (please specify)	Not interested.
Other (please specify)	https://yle.fi/a/74-20001277
Other (please specify)	Not enough knowledge, there's no information about it
Other (please specify)	Haven't seen any offering that
Other (please specify)	I dont care about the impact for environment
Other (please specify)	Ei kiinnosta
Other (please specify)	I have read that aviation's emissions are just 2% of world's emissions so it does not feel too harmful to fly long distances

Next, the respondents were asked (figure 13) what factors would encourage them to purchase offsets offered by airlines, when booking a flight. Again, they could choose all options that apply to them. The most popular answer with 51 votes was for transparency in airline's offset programs and affordable offset options with 49 votes. Also, the other two options were quite popular, with 45 votes for incentives offered by airlines (e.g. loyalty points) and 37 votes for awareness of the environmental impact. Frequent flyers (more than 15 flights in a year, 10 respondents), and low environmental conscious passengers (21 respondents) were the biggest demographic groups to vote for incentives offered by airlines, with one frequent flyer specifying that *'the offsetting purchase could be merged to upgrade purchase'.* Suggesting that they would like to contribute but are not willing to pay voluntarily for offsetting, or, that the effort of airlines side would like to be seen. Four respondents chose to write their own answers.

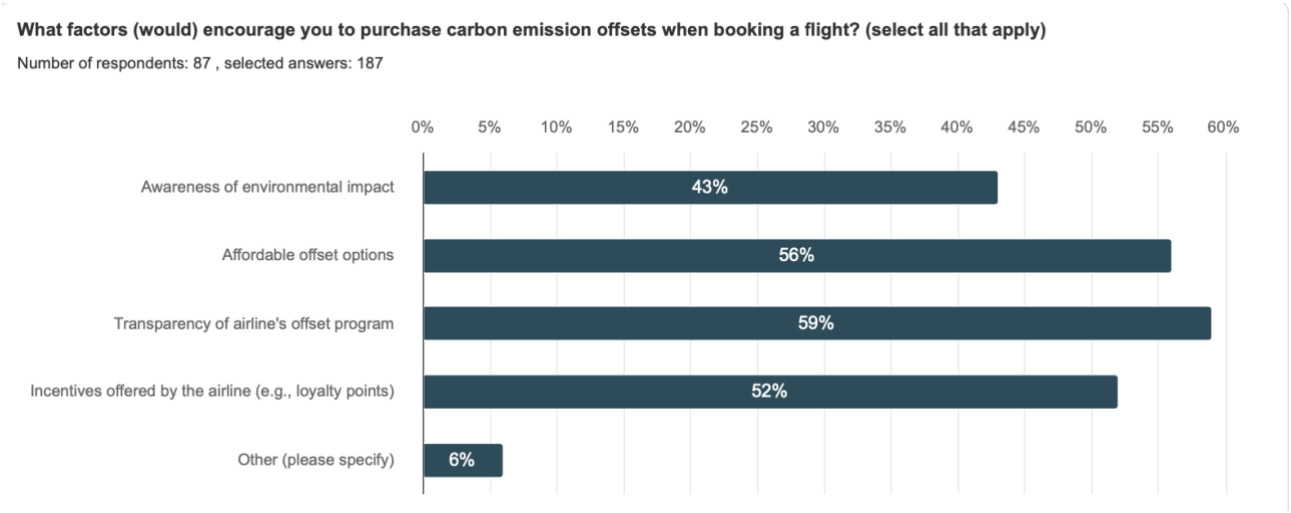

Figure 13. Respondents' factors encouraging to purchase offsets

There were three other answers written (besides the one suggesting merge to upgrades) and those three were quite divided. For instance, one stated that *'scientific evidence about offset's positive impacts could encourage them to purchase'*, while other two responses stated *'nothing'* with one specifying, the only case where they would purchase was *'if it was free'*. Stating that '*they would never use own money for that'.*

The factors discouraging purchase of offsets was asked next (figure 14). Again, respondents could choose all that apply and 64 voted for high cost of offsets as the major discourager. Also, 56 voted for skepticism towards airlines environmental initiatives and 49 votes for lack of trust in effectiveness of offset programs. Only 29 voted for limited understanding of how offsets work, and 5 wanted to write their own answers (shown in table 4). Again, the responses of the question of factors affecting purchase decision suggested mostly cost, skepticism and lack of trust as the major factors.

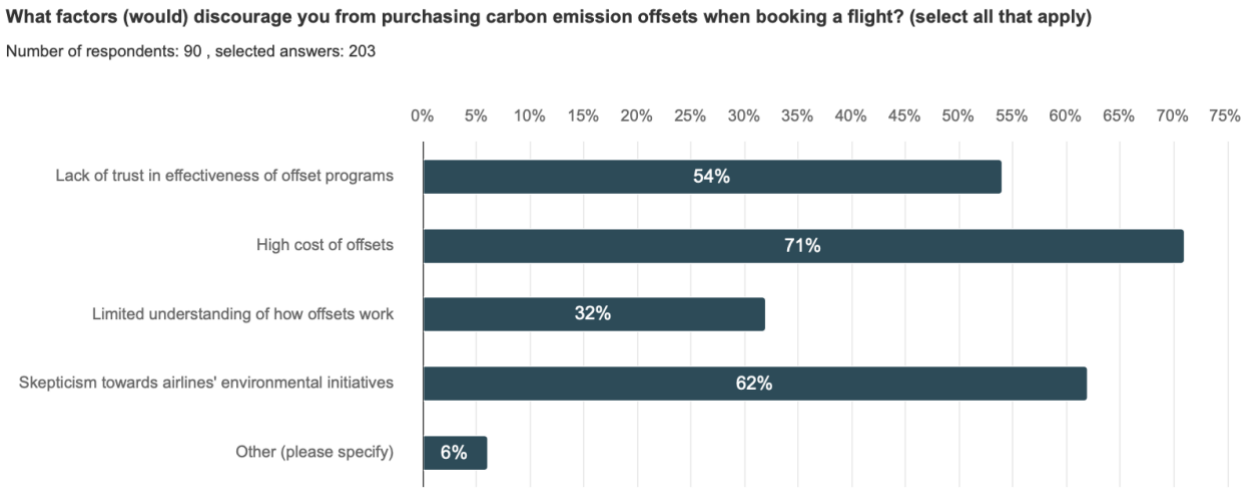

Figure 14. Respondents' factors that discourage to purchase

The open-ended responses (table 4) to factors discouraging the purchase of offsets, emphasized the importance of cost and clear communication from airlines. Two responded the *'lack of information on how the offset money is used by airlines'* as a factor. Other stating the reason to be *'already high prices of airline tickets'* and one explained that *'they don't fly at all, because it's not good for the environment'*.

Table 4. Respondents' other reasons that discourage the purchase of offsets

Option names	Text
Other (please specify)	Already high prices of airline tickets
Other (please specify)	Lack of detailed information in how the money is used
Other (please specify)	I don't flight, because it's not good for environment
Other (please specify)	Airlines does not report visible enough financially, that the income has actually been used to offsettings.

7.4 Awareness of carbon emission offset programs

Related to the second research question of the awareness Finnish passengers hold towards the existence and purpose of offsetting, and what are the key factors influencing their awareness, the questions and results presented in this chapter were included in the survey. First, (in figure 15) the respondents were asked if they had heard about offset programs offered by airlines, before taking the survey. Majority, 77 respondents had heard, while 13 had not heard of offsets. Which demonstrates a high awareness of the existence of offset programs among Finnish airline passengers.

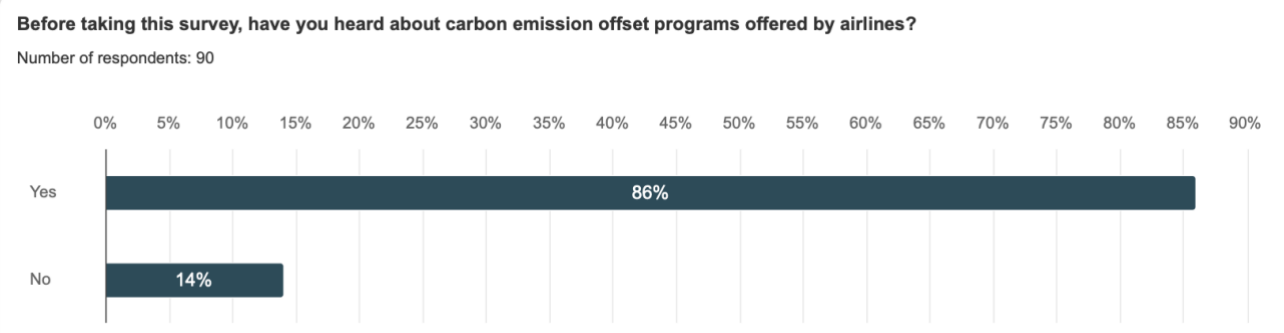

Figure 15. Number of respondents who had heard about offsets before taking the survey

Next, (figure 16) respondent's familiarity to the purpose and functioning of offsets was asked. 22% were neutral, while half were familiar, and other half not familiar (39% each). This demonstrates limited general understanding of the purpose and functioning of offsets, which highlights the importance of educational campaigns of the matter. The biggest demographic group demonstrating familiarity with purpose and functioning of offsets, was over 30-year-olds, and frequent flyers.

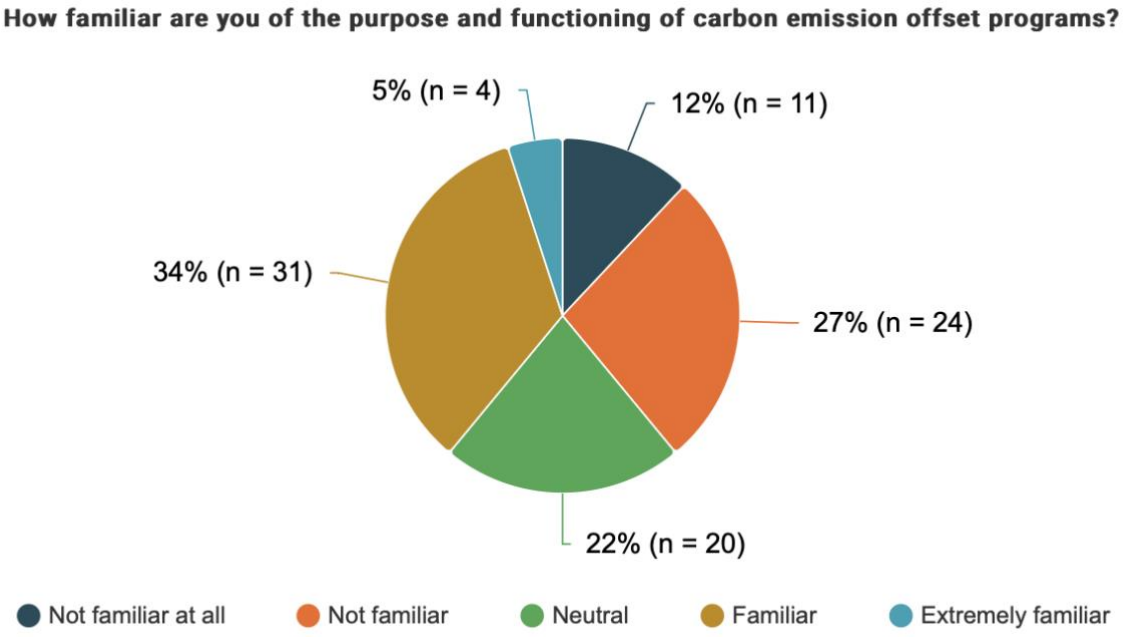

Figure 16. Respondents' familiarity of offsets programs

The primary sources where respondents rely on their information regarding offsets from, was asked next (figure 17). They could select all that apply. 52 respondents chose news articles and 51 airlines websites. 38 chose environmental organizations and 27 social media. Only 12 chose word of mouth and 2 chose to write their own answers. These open-ended answers were '*common sense'* and '*scientific publications on academic journals for example'*. These results highlight the

importance of media communication and airlines clear information on their environmental initiatives.

While most demographic groups chose news articles as their main source of information, 61% of females, 61% of participants under 30 years old, and 70% of frequent flyers primarily relied on airlines websites. In contrast, 87% of male participants and 63% of those over 30 years old, preferred news articles as their source of information. This suggests a clear divide in preferred information sources across demographic groups, highlighting the importance of using diverse communication channels to shape perceptions effectively.

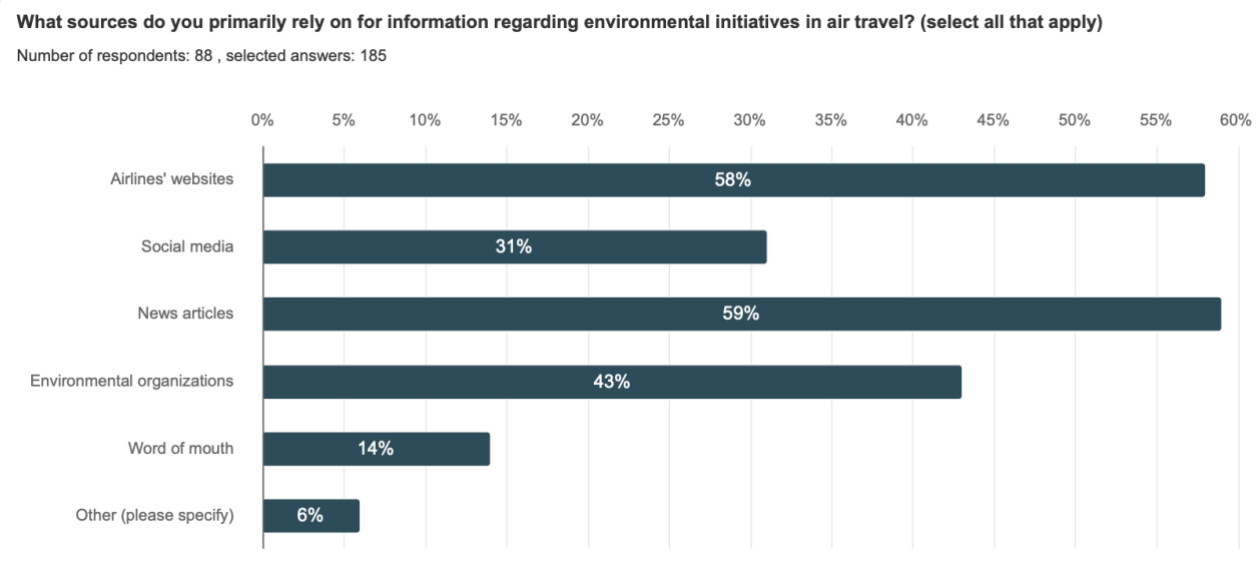

Figure 17. Sources respondents rely for information regarding environmental initiatives in air travel

Next, the motivation factors to learn more about offsets programs were asked (figure 18). Majority, 63 votes was for clear information provided by airlines, while 35 voted for financial incentives for offset purchases (e.g. discounts or loyalty points). 31 voted for educational campaigns by environmental organizations and 32 voted for personal interest in environmental sustainability as a motivation driver. Males were the only demographic group with as many answers to clear information, financial incentives and personal interest. Notably, frequent flyers had almost as many votes for financial incentives (40%), as to clear information by airlines (50%). Open-ended responses included '*being more informed of the impact its does'*, and two responses were for '*nothing'.*

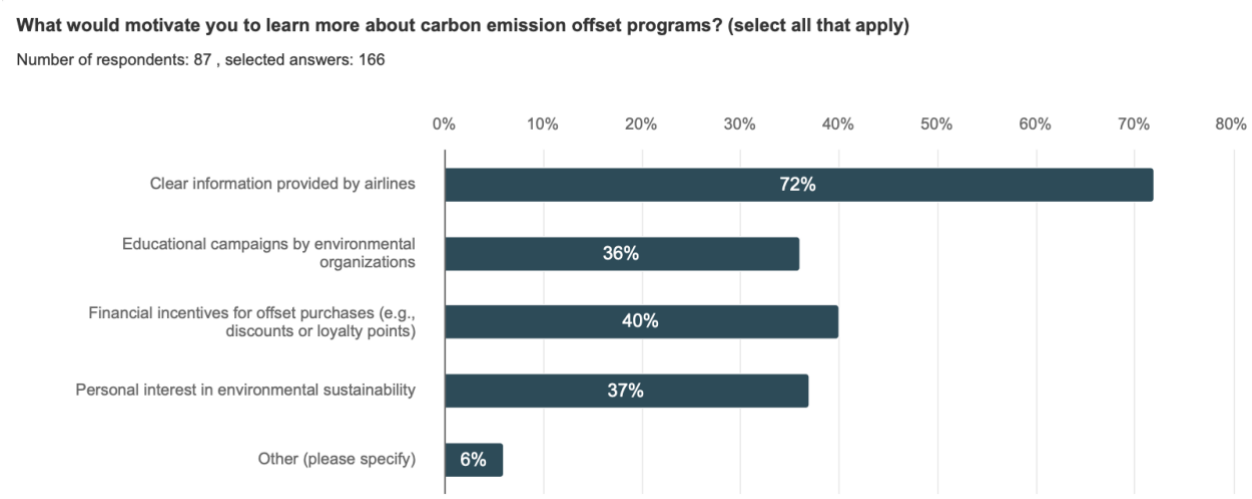

Figure 18. Motivation factors to learn more about carbon emission offset programs

7.5 Perceived barriers to voluntary purchase offsets

The third survey theme was related to research question number three, the perceived barriers to voluntary purchase offsets and how these barriers vary between demographic groups. Firstly, respondents were asked if they have ever considered purchasing offsets when booking a flight (figure 19) to have an idea of intention in relation to the behavior. Surprisingly, the responses were somewhat equally divided, between 54% no's (49 people) and 46% yeses (41 people). This can be considered as a good sign of non-biased survey success, as not one attitude or another type of passenger chose to take the survey more than the other.

Furthermore, when looked at the variations between demographic groups in this question, bigger percentage of females (51%) had considered to ever purchasing offsets, while only 20% of males had ever considered it. Also, 70% of frequent flyers had not considered, while 47% of less flying passengers (less than 15 flights a year) had considered purchasing offsets. Additionally, 58% of environmentally conscious passengers had considered purchasing, suggesting link between environmental consciousness and possible intention to purchase.

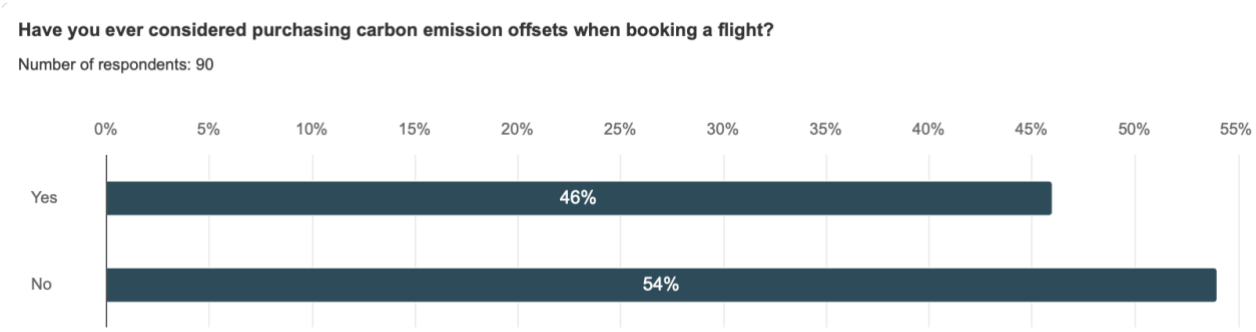

Figure 19. Number of respondents who have considered the purchase of offsets

Next, the respondents were asked to select how much they agree with the statement *'I would be more likely to purchase carbon emission offsets if they were more affordable'* (figure 20) to find out if barriers are mostly cost related. 30% of respondents agreed with the statement, and 23% strongly agreed. Which demonstrates again the importance of cost in the context of voluntary offset purchase. 31% were neutral, while only 8% disagreed and 8% strongly disagreed. Frequent flyers and males were the most 'neutral' with this statement.

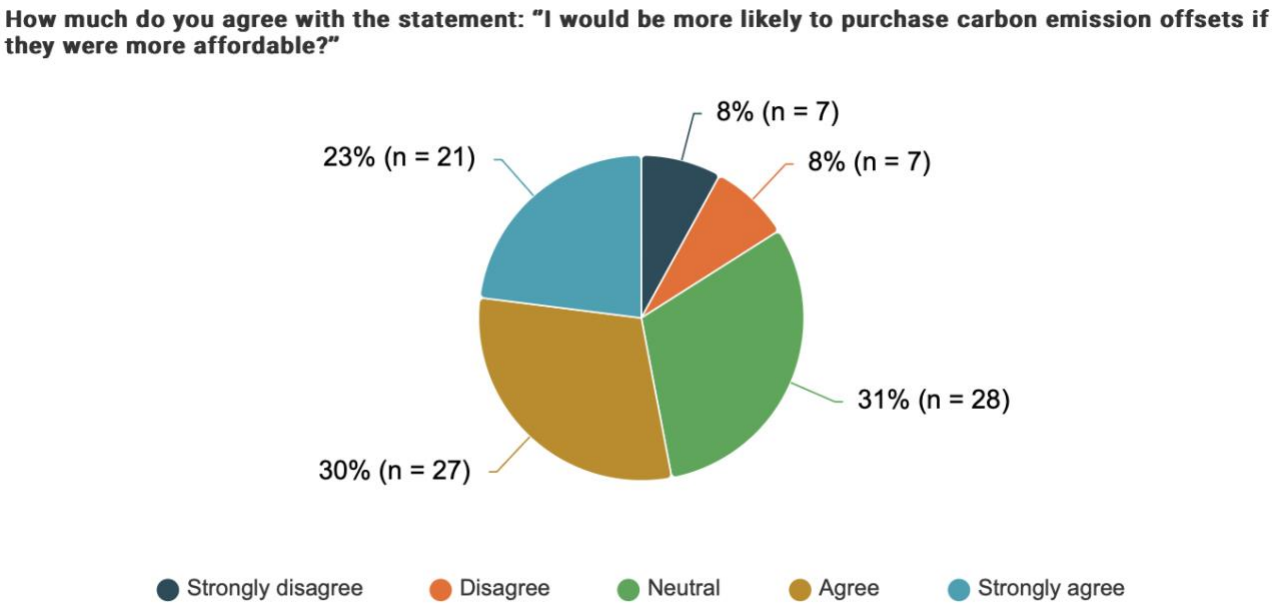

Figure 20. Respondents' perception on offset prices

Next, the actual amount that respondents would be willing to pay for an emission free flight was asked (figure 21). Majority of the responses were for up to 20€ (=46%). The second most responses were for 21-50€ (=24%) and third most was for no extra amount (=16%). 12% of respondents were willing to pay for 51-100€ and only 2% were willing to pay for more than 100€.

The variation in female and male demographic groups was seen in this question similar as before, with 47% of males choosing ‘no extra amount’’ while only 10% of females chose this option.

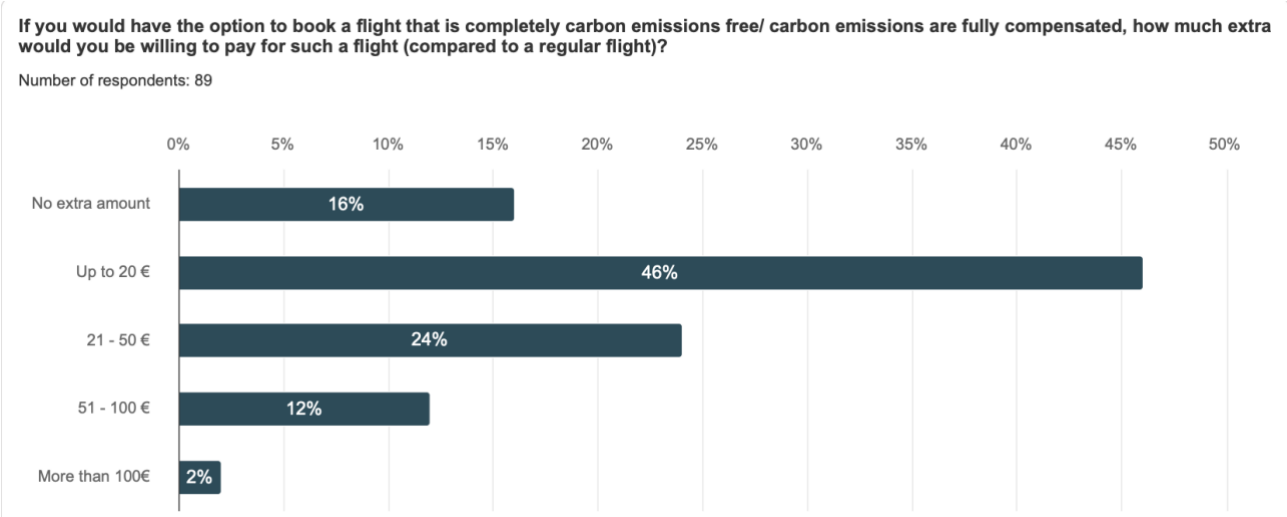

Figure 21. The amount respondents would be willing to pay extra for an emission free flight

The perceived importance of carbon emission offset programs in combating climate change was asked next (figure 22). 44% of respondents indicated importance, while 29% were neutral about it. 11% believed of it as extremely important. Only 6% did not think of it as important, and 10% not important at all. Again, women covered 49% votes for ‘important’ while male only 27% (with the most votes for ‘not important at all’). Another interesting founding was that the *most* frequent flyers (with more than 20 flights a year) did consider offsets important in combating climate change, with 30% of votes for important, and 20% of votes for extremely important.

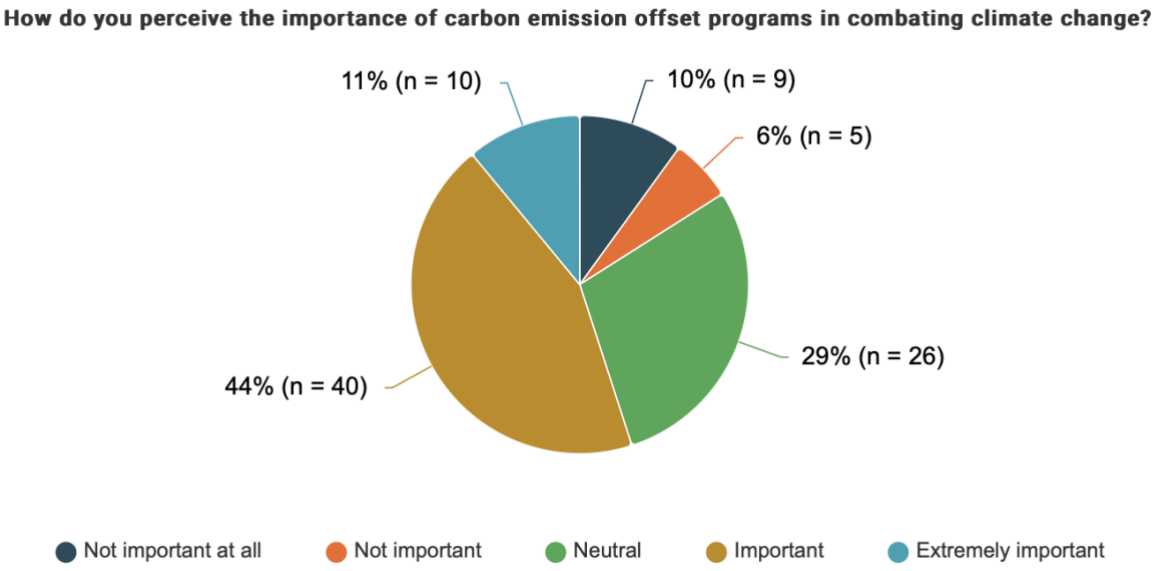

Figure 22. Respondents perceived importance of carbon emission offset programs in combating climate change

Respondents were also asked to indicate the extend that concerns about the legitimacy and effectiveness of offset programs impact their willingness to purchase them (figure 23). Most, with 32% indicated that it impacts moderately, 23% significantly, while 30% were neutral. 8% of respondents indicated quite little concern and 7% no concern at all. The biggest variations in demographic groups were for most of males, and majority of frequent flyers voting for ‘significant’ impact of concerns for the legitimacy and effectiveness of offset programs affecting their willingness to purchase them, while most women voted for moderate impact.

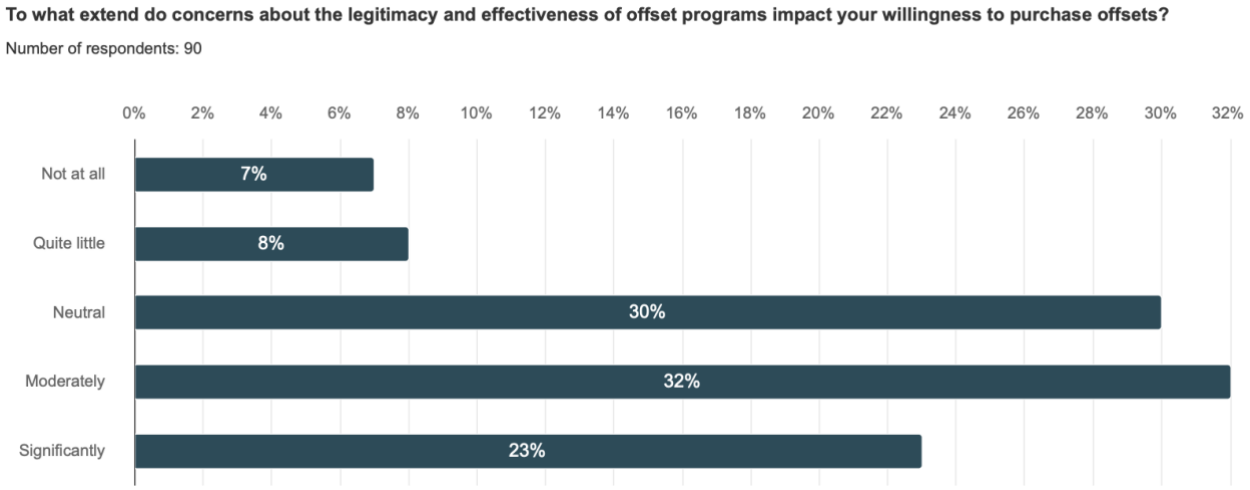

Figure 23. Respondents level for concerns about legitimacy and effectiveness of offsets, impacting their willingness to purchase them

Lastly, an open-ended text box was included for respondents to freely write their thoughts and opinions on which strategies could airlines (and the aviation industry) implement to enhance the visibility, accessibility, and perceived value of emission offset programs, among Finnish passengers. The color-coded results are visible in Appendix 3. The responses were moved to a Word table format, from those in Webropol, for clarity and better color coding. The original responses are still seen in Appendix 2.

Most of the responses were of expressing skepticism towards offsetting, the need for clearer communication, and showing clearly how the offsetting money is used. Another common theme that was mentioned several times was about airline tickets being already highly priced, and therefore it not being tempting to pay additional. However, few respondents did mention that the offset amount should be mandatory and already included in ticket prices. While few also mentioned that they believe sustainable aviation fuel to be the only way towards carbon neutral aviation.

The responses were analyzed using color-coding (Appendix 3). Green font was used for responses linked to greenwashing or expressing skepticism or indifference. For example, ‘*’There are no strategies that could change my mind”* and *‘’not necessarily anything, air travel is increasing so fast (especially in Asia) that any offsetting is marginal”*. In total, green font was used in majority of responses, in 11 out of the total 21 responses.

Second most used color, yellow font was used for responses related to clear communication and transparency by airlines and using media streams for marketing and promoting offsets. For instance*, ‘’Showing numbers more widely and openly”* and *‘’Concrete examples of how and where the programs work”.* Yellow color was used in total 10 responses.

More sparsely used colors were of pink, blue and purple. Pink font was used for responses related to cost or incentives, as in *‘’Flight tickets are already too expensive”* and *‘’ Marketing and offered perks from taking part of offset programs e.g. Travel points”.* Pink color was used in 3 responses. Blue font was also used in 3 responses, for answers suggesting how offset money should be used. These suggestions were of sustainable aviation fuel and new technologies. Purple color was used for answers related to opinions stating that offsetting prices should be integrated in flight ticket prices*: ‘’mandatory for all”.* These responses were only 2 out of the total 21 responses.

Overall, the open-ended responses from survey participants emphasizes the importance of clear communication for how offset money is used, to build trust among Finnish passengers. The current attitudes are clearly doubtful and skeptical. Notably, when looked at the differences in responses between gender groups (Appendix 2), two out of seven male respondents suggest only biofuel will be the way towards carbon neutral aviation. With four of seven responses stating

indifference/nothing to enhance the value of offsets among passengers. Indicating noticeable skepticism among males towards offsetting as a method towards reducing carbon emissions. While in female answers there are more hopefulness noticeable.

In the next chapter, the survey results are discussed in relation to the original research questions and the existing theory. Key findings are highlighted, focusing on the factors and barriers influencing Finnish passengers' decisions on carbon emission offsetting and how these findings meet the prior research. The discussion connects the data to the theoretical framework, offering insights into the challenges and potential for voluntary carbon offsetting. Additionally, the chapter after discussion, presents the study’s conclusions, contributions, and recommendations for future research.

8 Discussion

In this chapter the original research questions are answered with the help of survey results data, and in light of the theory and prior research. The key findings are described, and most interesting and significant results are introduced. How well the new and old information meet is examined, and what are the main changes from prior studies introduced in literature section of the thesis. The result of the survey provides insight to the factors influencing Finnish passengers' decisions regarding voluntary carbon offsets, particularly in the context of offsets offered by airlines.

Chat GPT was used as a supportive tool for additional ideation and to refine text in analysis process. Written survey results were submitted to Chat GPT, asking the AI tool to present key findings in relation to the research questions. However, careful consideration was used when choosing which suggestions to take as part of the results discussion, as some of the findings from Chat GPT included errors. Only thoroughly reviewed and double-checked findings were included.

What are the primary factors influencing Finnish passengers' decisions regarding the purchase of carbon emission offsets offered by airlines?

The survey results highlight several key factors influencing Finnish passengers' decisions regarding the purchase of carbon emission offsets offered by airlines. While majority of respondents identify as environmentally conscious, only few had ever purchased offsets. This suggests a generally negative or indifferent perceptions towards offsetting. Which is further emphasized by the fact that many respondents did not consider the environmental impact of air travel important, when purchasing flight tickets. This mirrors the findings from 2015 study by The Finnish society for tourism research (Ruuska & Hakkarainen), where the awareness of environmental matters did not necessarily lead to action, supporting the theory of attitude-behavior gap in environmental aspects (Barr, Gilg & Shaw, 2011) of environmentally conscious people who normally acts pro-environmentally, does not do so, in the matter of air travel. However, difference to the 2015 study by The Finnish society for tourism research is that in 2015, passengers generally had more positive than negative attitudes towards offsetting. Which suggests that in the past 9 years, the light of which offsetting has been seen in the media in Finland, has planted doubts and skepticism among passengers.

The study identified **cost**, **doubts** about effectiveness, and **skepticism** towards airlines environmental initiatives (often seen as greenwashing) as the most influential factors affecting offset purchase. Notably, 59% of respondents indicated that they would be more likely to purchase offsets if airline's offset programs were more transparent, suggesting improvement in communication and program clarity, could help to address these concerns. These themes can be

mirrored to Ajzen's (2005) planned behavior model, which highlights three factors affecting behavioral intention: personal attitudes, social influence and sense of control. In this case, negative personal attitudes towards offsetting, marked by doubts and skepticism about their effectiveness, and perceived control, specifically concerns about cost, emerged as key factors. Passengers questioned the value of their individual contributions and whether they had the resources to make a difference with their individual participation. Notably, unlike Ajzen's model, social norms did not appear to significantly influence Finnish passengers' decisions regarding offsetting.

Overall, personal attitudes and perceived behavioral control, especially in relation to affordability and program transparency, are the most significant factors influencing the decision of Finnish airline passengers to purchase carbon emission offsets offered by airlines. The findings suggest that price, trust and perceived effectiveness are the primary concerns, with 54% of respondents indicating doubts about effectiveness of offsets, 47% indicating lack of trust in airlines environmental initiatives, and 44% perceiving offsets too expensive. Encouraging factors include greater transparency and affordability, with clear communication and more accessible pricing structures being crucial to increase offset uptake. Offering incentives, such as travel miles, or incorporating the cost of offsets into the ticket prices could further enhance the success of these programs.

How aware are Finnish passengers of the existence and purpose of carbon emission offset programs and what are the key factors influencing their awareness?

Finnish passengers demonstrate high level of awareness regarding carbon offset programs. With 86% of respondents reporting, they had heard of such programs before taking the survey. However, while the general awareness is high, familiarity with the functioning and purpose of offsets remains limited. With half of the respondents indicating they were familiar with the purpose and functioning of offsets, while another half were not. Notably, 72% of respondents stated that they would be more motivated to learn about offsets if clear information was provided by airlines. This aligns with the findings form Gösslings et al. (2009) and Zhang et al. (2019) study, which highlight the importance of effective communication and messaging in promoting offset programs.

The key sources of information shaping Finnish passengers' awareness regarding carbon offset programs are primarily news articles, airlines websites and environmental organizations. These sources play a crucial role in shaping awareness and attitudes; therefore, the quality and clarity of information is essential to converting awareness into action. Additionally, respondents expressed that educational campaigns from environmental organizations could further increase their understanding in offsets. This need for clear, factual information about the effectiveness and

impact of offsets programs is critical to raise awareness and the likelihood of purchasing. Which also emphasizes Rotaris et al. (2020) study in Italy, that the willingness to pay for offsets is lower, if target projects are not mentioned. Notably, Rotaris et al. (2020) study found that respondents prefer initiatives such as forest conservation, afforestation, improvements in aircraft technology and sustainable aviation fuel. From which SAF and improvements in aircraft technology aligns with suggestions from participants in this study.

A notable change compared to older studies, is the growth in awareness in carbon emissions offsets. In this study, 86% of respondents were aware of carbon offset programs, whereas compared to study by Glössling et al in 2009, out of 300 passengers, 71% was not aware of the concept of carbon emission offsets. Similarly, in 2008 study conducted by Hooper et al. (2008) only 50% of 487 respondents were familiar of emission offsetting. These comparisons suggest that over the past 17 years, awareness of carbon offsets has significantly increased.

What are the perceived barriers to voluntary purchase offsets among Finnish airline passengers and does these barriers vary across demographic groups?

The survey results indicate several barriers to the voluntary purchase of carbon offsets among Finnish airline passengers. One of the most prominent barriers is cost. When asked whether the participants would be more likely to purchase offsets if they were more affordable, 53% of respondents either agreed or strongly agreed, indicating that financial constraints play a significant role in preventing passengers from purchasing offsets. Additionally, when respondents were asked how much they would be willing to pay for an emission-free flight, 46% indicated they would pay only up to 20€, while 16% were unwilling to pay anything extra. This suggests that although there is some willingness to contribute, affordability remains a major concern.

Despite the low uptake of offsets and the fact that most respondents did not prioritize environmental impact when purchasing flight tickets, a majority still viewed offset programs as important in combating climate change. This suggests that Finnish passengers may be inclined to participate in offsetting but are hesitant due to prices or skepticism about the effectiveness of the programs. Notably, 46% of respondents reported having considered purchasing offsets when booking a flight, indicating that the desire for change exists, but the barriers, such as cost, and doubts remain significant.

The survey also revealed demographic differences, particularly in terms of gender (report visible as Appendix 2). Females were more likely to consider purchasing carbon offsets, with 51% indicating they had thought about it, compared to only 20% of males. Similarly, 49% of females rated carbon offsets as important in addressing climate change, whereas only 27% of males shared that view.

Males were also more inclined to dismiss the importance of offsets, with a larger portion selecting ‘not important at all’.

Additionally, 47% of male respondents indicated they would pay ‘no extra amount’ for an emissions-free flight, compared to just 10% of females, highlighting a gender disparity in how cost is perceived as a barrier. These results suggest that gender plays a significant role in both awareness and willingness to engage in carbon offset programs, with females showing higher levels of concern and engagement in environmental issues. Previous research (Fliegenschnee & Schelakovsky 1998; Lehmann 1999, in Kollmuss & Agyeman 2002) supports these findings, indicating that women tend to have a stronger emotional connection to environmental causes, making them more likely to engage in pro-environmental behaviors like offsetting.

Age also emerged as an important demographic factor, with younger respondents (aged 20-29) represented the largest group in the survey (59%) and were generally more environmentally conscious. However, despite this awareness, they still encountered barriers related to cost and skepticism. Respondents who identified as ‘very much environmentally conscious’ were more likely to view offsets as important, yet even within this group, cost and distrust were significant obstacles. Another key demographic variation was with frequent flyers, predominantly male, who take more than 20 flights per year. This group showed a higher likelihood of perceiving carbon offsets as important in addressing climate change, with more respondents selecting ‘important’ or ‘extremely important.’ Their frequent exposure to air travel may heighten their sense of responsibility for mitigating its environmental impact. However, they were also more price-sensitive, noting that they would be more inclined to purchase offsets if incentives were provided.

In conclusion, the primary barriers to voluntary carbon offset purchases among Finnish airline passengers include financial concerns, skepticism about the effectiveness of offset programs, and a lack of clear communication. These barriers vary between demographic groups, as females are more likely to consider purchasing offsets and view them as important, while frequent flyers demonstrate higher awareness of offsets' potential role in mitigating climate change. As referenced in the theoretical framework, Blake (1999) identified three barriers between environmental concern and action. Individuality, responsibility, and practicality. The survey results align with Blake's model, showing that individual factors, such as personal attitudes and skepticism, play a significant role. Addressing these barriers, particularly by reducing cost, increasing transparency, and building trust, is key to closing the attitude-behavior gap and encouraging greater participation in carbon offset programs among Finnish passengers.

9 Conclusions

This thesis set out to examine the factors influencing Finnish airline passengers' decisions regarding voluntary carbon offsetting, aiming to understand their attitudes and the barriers that hinder participation. The focus was placed on passengers' awareness of these programs, the perceived factors preventing greater engagement, and the role of demographic factors. The findings underscore the existence of an attitude-behavior gap, where environmental concern does not consistently lead to action. Although many respondents identified as environmentally conscious, environmental impact of air travel still play a minor role in their purchasing decisions. Through an online survey, valuable insights were collected and analyzed in the context of existing literature, revealing both new perspectives and consistencies with past research.

Awareness of offset programs has increased over time, as evidenced by the 86% of respondents who were familiar with their existence, a significant rise compared to earlier studies (e.g., Glössling et al., 2009). However, despite high awareness, knowledge about how offsets work and trust in their effectiveness remain limited. Only 22% of respondents had purchased offsets, highlighting the disconnect between awareness and action. This lack of engagement can be explained through Blake's (1999) model of barriers: individuality, responsibility and practicality, which manifests in this study through the skepticism and doubts about the effectiveness of offset programs and the reluctance to pay for them.

The **individuality barrier**, related to attitudes and personal doubts, was evident in the skepticism respondents expressed toward carbon offsets. Concerns about greenwashing were frequent, with 54% indicating distrust in airline-led offset programs. This distrust is most likely intensified by past accusations of misleading marketing and recent EU investigations into greenwashing by airlines. Media coverage, such as YLE's documentary on offsetting projects, has further fueled public skepticism, leading to negative perceptions of the programs.

The **responsibility barrier** reflects individuals' feelings of powerlessness in making a meaningful environmental impact, which was evident in doubts about the effectiveness of personal contributions to offset programs. While many respondents viewed carbon offsets as important in combating climate change, they also questioned whether their individual actions could have a tangible effect. This skepticism is deepened by a perceived lack of transparency and credibility in airlines' offset programs.

The **practicality barrier** proved to be the most significant factor. Cost was the largest obstacle, cited by 71% of respondents. While 53% indicated they would be more likely to purchase offsets if

they were more affordable. However, trust issues persist, making affordability alone insufficient to drive participation. The combination of high costs and doubts about the programs' effectiveness prevents higher engagement. Respondents' willingness to pay was generally low in amount, with 46% stating they would only pay up to 20€, and 16% were unwilling to pay anything extra for an emission-free flight.

In conclusion, while awareness of carbon offset programs has increased, the gap between knowledge and action persists due to the perceived barriers identified in Blake's (1999) model. Individual doubts about the value of offsetting, a lack of perceived responsibility, and practical concerns such as cost and distrust, remain key obstacles to greater engagement. Addressing these barriers through enhanced transparency, improved affordability or pricing structures, and clearer communication about the effectiveness of offset programs will be essential in encouraging higher participation among Finnish airline passengers.

9.1 Contributions

This study offers valuable insights into consumer behavior, decision-making, and the challenges of promoting sustainable practices within the airline industry. The findings provide actionable contributions for several key stakeholders:

Airlines and aviation industry can leverage the insights to better understand the barriers preventing passengers from purchasing carbon emission offsets. Addressing issues such as cost, lack of transparency, and skepticism about the effectiveness of offset programs, airlines can refine their sustainability strategies. By enhancing transparency and offering clearer information on the value and impact of offset programs, airlines may increase consumer trust and engagement. Additionally, aligning offset initiatives with consumer expectations, particularly by emphasizing affordability, transparency, and corporate social responsibility, can help airlines improve both their environmental reputation and participation rates in offset programs.

Policymakers and environmental organizations can use these findings to develop targeted policies and incentives that encourage both airlines and consumers to engage more actively in carbon offsetting. Understanding the psychological and practical barriers to participation will enable policymakers to craft regulations and incentives that promote sustainable air travel. Furthermore, environmental organizations can benefit from the study by tailoring their outreach and educational campaigns. Focusing on building consumer trust, improving affordability, and clarifying how carbon offsets work will make offsetting initiatives more accessible and appealing to the public.

Overall, this study contributes to a deeper understanding of the obstacles preventing voluntary carbon emission offsetting in aviation. By addressing these challenges, various stakeholders can foster more effective and sustainable practices within the industry and beyond.

9.2 Suggestions for future research

The findings of this research offer valuable, case-specific data that future researchers can build upon to further explore the complex dynamics of pro-environmental decision-making. A key area for future research is the exploration of cultural differences in pro-environmental behavior. While this study focused on Finnish passengers, a comparative analysis across different cultural contexts could enlighten on how varying social norms, values, and national policies influence consumer behavior towards voluntary carbon offsets. Understanding these cultural nuances can help identify strategies that are more effective in promoting sustainable behavior in different regions.

Further research could also investigate policy interventions and incentive structures that may bridge the gap between environmental awareness and action. This study highlights barriers such as cost, doubts and skepticism, suggesting that the right combination of incentives, such as loyalty rewards, might encourage higher participation in offset programs. Future studies could test the effectiveness of these approaches in reducing barriers and increasing consumer engagement with sustainable practices.

Additionally, researchers could expand on the role of trust in offset programs, particularly in light of concerns about greenwashing. Future studies might explore the specific conditions under which consumers are more likely to trust and participate in offsetting programs, examining the impact of transparency, third-party verification, and the involvement of reputable environmental organizations.

Lastly, future research could benefit from a longstanding approach, tracking changes in consumer attitudes and behaviors over time. As awareness of environmental issues and the urgency of climate change continues to grow, longstanding studies could provide insights whether these factors eventually lead to increased participation in carbon offset programs.

Overall, the findings from this study pave the way for further investigation into the factors that can help close the attitude-behavior gap, particularly in the context of air travel and voluntary carbon offsetting. By addressing the psychological, cultural, and structural barriers to pro-environmental action, future research can contribute to more effective and sustainable solutions.

9.3 Reflection of the thesis process

The thesis process began with a desire to explore people's attitudes toward voluntary carbon offsetting, a topic that I found interesting during my courses in my master's studies in sustainable aviation business, particularly due to its importance and the controversy surrounding it. I started by submitting my topic proposal in January 2024 and began writing in February, while still finishing my last courses. By March, after completing my coursework, I was able to fully focus on the thesis. I took study leave occasionally, and during the summer months, I paused the project completely for a summer vacation. In reflection, I questioned whether taking this summer break was a wise decision, as it was harder than expected to resume where I left off. Additionally, by the time I returned to writing, new developments may have emerged in the field, but I decided to focus on the analysis and methodology instead of revisiting the literature review.

One of the most helpful aspects of my thesis journey was to attend the online thesis workshops during spring months (at the start of the project). I participated in nearly all of them, gaining useful tips and tricks that helped my project. The workshops of using Webropol and finding peer-reviewed and other legitimate sources for my research was especially helpful. Another key factor for staying on track, was setting personal (quite loose) deadlines. Those helped me maintain a steady pace without higher stress and overall, I was able to follow my schedule I had set.

The most challenging aspect of the thesis process was managing such a large project. At times, I found it difficult to structure the various themes and sections, particularly toward the end when it came to drawing conclusions and writing the discussion. Balancing multiple topics and keeping everything organized was overwhelming at times. What helped me overcome these challenges were the workshops, support from the quantitative research lecturer during the survey phase, and the flexibility I had since there was no external commissioner dictating the thesis timeline.

Despite the difficulties, I'm proud of completing the project within the original schedule I set for myself. One piece of advice from my supervisor I found especially helpful: a reminder that thesis is iterative project, and it's natural to revisit and refine sections as the work progresses. This guidance gave me the confidence to keep moving forward and not the get stuck in certain phases. For example, I added a section on greenwashing to the theoretical framework later on, after it emerged as a key theme in the survey responses.

I believe that the insights I gained from researching this topic will be valuable for my future career, particularly as sustainability and carbon neutral aviation become increasingly important areas of focus in aviation industry.

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Appendices

Appendix 1. The online survey

Attitudes Towards Carbon Emission Offsetting
Survey for Master's Thesis

☐ Mandatory questions are marked with a star (*)

Dear Respondent,

You are invited to participate in a research study aimed at understanding attitudes and barriers to voluntary carbon emission offsetting (hiilidioksidipäästö hyvitys) among Finnish airline passengers. This survey is conducted as part of a Master's thesis within the Sustainable Aviation Business, Master of Business Administration Degree Programme at Haaga-Helia University of Applied Sciences.

Your input is valuable in gaining insights to the perspectives and behaviours of Finnish airline passengers regarding carbon emission offsetting. Through your participation, you will contribute to our collective efforts in achieving CO2 neutrality goals in civil aviation.

Your responses will be handled confidentially and responses cannot be identified with you personally.

Please take the time to answer the following questions honestly and to the best of your ability.

Thank you for your participation.

1. I have reviewed the research and consent announcement, and I give my consent to participate in the research. *

◯ Yes

◯ No. Completing the form requires giving consent.

Background information

2. Place of residence *

- ◯ Finland
- ◯ Other (please note that this survey is for Finnish airline passengers and therefore the answer "Other" will end the survey)

3. Gender *

- ◯ Female
- ◯ Male
- ◯ Other

4. Age *

- ◯ Under 20
- ◯ 20 - 29
- ◯ 30 - 39
- ◯ 40 - 49
- ◯ 50 - 59
- ◯ 60 or over

5. How many flights do you take in a year as a passenger?

- ◯ Less than 5
- ◯ 5 - 9
- ◯ 10 - 14
- ◯ 15 - 20
- ◯ More than 20

6. Do you consider yourself environmentally conscious? *

- ◯ Not at all
- ◯ No, not really
- ◯ Unsure
- ◯ Yes, somewhat
- ◯ Yes, very much

Factors Influencing Purchase of Carbon Emission Offsets

7. Please choose the most suitable option: *

	Not important at all	Not important	Neutral	Important	Extremely important
How important is the environmental impact of air travel in your decision-making process when purchasing a flight ticket?	○	○	○	○	○

8. Have you ever purchased carbon emission offsets (hiilidioksidipäästö hyvitys) when booking a flight? *

○ Yes

○ No

9. What are your main reasons for not purchasing carbon emission offsets offered by airlines? (select all that apply) *

☐ Lack of understanding about how offsets work

☐ Perception that offsets are too expensive

☐ Doubt about the effectiveness of offset programs

☐ Lack of trust in airlines' environmental initiatives

☐ Other (please specify) _____

10. What factors (would) encourage you to purchase carbon emission offsets when booking a flight? (select all that apply)

- ☐ Awareness of environmental impact
- ☐ Affordable offset options
- ☐ Transparency of airline's offset program
- ☐ Incentives offered by the airline (e.g., loyalty points)
- ☐ Other (please specify) _____

11. What factors (would) discourage you from purchasing carbon emission offsets when booking a flight? (select all that apply)

- ☐ Lack of trust in effectiveness of offset programs
- ☐ High cost of offsets
- ☐ Limited understanding of how offsets work
- ☐ Skepticism towards airlines' environmental initiatives
- ☐ Other (please specify) _____

Awareness of Carbon Emission Offset Programs

12. Before taking this survey, have you heard about carbon emission offset programs offered by airlines? *

- ◯ Yes
- ◯ No

13. Please choose the most suitable option: *

	Not familiar at all	Not familiar	Neutral	Familiar	Extremely familiar
How familiar are you of the purpose and functioning of carbon emission offset programs?	◯	◯	◯	◯	◯

14. What sources do you primarily rely on for information regarding environmental initiatives in air travel? (select all that apply)

- ☐ Airlines' websites
- ☐ Social media
- ☐ News articles
- ☐ Environmental organizations
- ☐ Word of mouth
- ☐ Other (please specify) _____

15. What would motivate you to learn more about carbon emission offset programs? (select all that apply)

- ☐ Clear information provided by airlines
- ☐ Educational campaigns by environmental organizations
- ☐ Financial incentives for offset purchases (e.g., discounts or loyalty points)
- ☐ Personal interest in environmental sustainability
- ☐ Other (please specify) _____

Perceived Barriers to Voluntary Purchase of Offsets

16. Have you ever considered purchasing carbon emission offsets when booking a flight?

- ◯ Yes
- ◯ No

17. Please mark how true is the following statement:

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
How much do you agree with the statement: ''I would be more likely to purchase carbon emission offsets if they were more affordable?''	◯	◯	◯	◯	◯

18. If you would have the option to book a flight that is completely carbon emissions free/ carbon emissions are fully compensated, how much extra would you be willing to pay for such a flight (compared to a regular flight)?

- ◯ No extra amount
- ◯ Up to 20 €
- ◯ 21 - 50 €
- ◯ 51 - 100 €
- ◯ More than 100€

19. Please choose the most suitable option: *

	Not important at all	Not important	Neutral	Important	Extremely important
How do you perceive the importance of carbon emission offset programs in combating climate change?	○	○	○	○	○

20. To what extend do concerns about the legitimacy and effectiveness of offset programs impact your willingness to purchase offsets? *

- ○ Not at all
- ○ Quite little
- ○ Neutral
- ○ Moderately
- ○ Significantly

21. In your opinion, what strategies can airlines (and the aviation industry) implement to enhance the visibility, accessibility, and perceived value of emission offset programs among Finnish passengers?

Thank you for taking the time to complete this survey. Your input is greatly appreciated.

Appendix 2. Survey result variations between gender groups

Basic report

Attitudes Towards Carbon Emission Offsetting Survey for Master's Thesis

Total number of respondents: 94

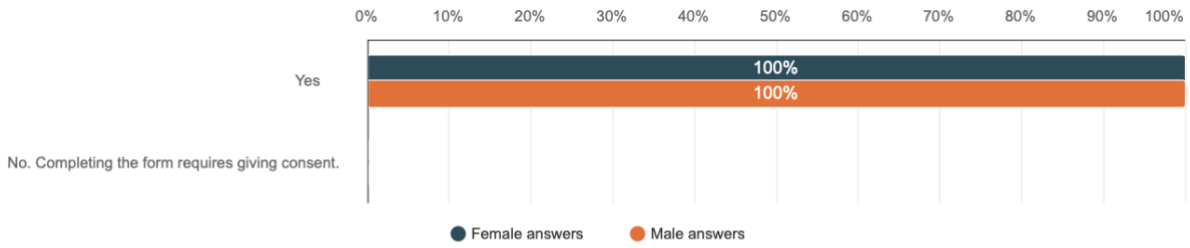
Group Conditions:

Female answers:
Conditions:
Answer Option(s): Female
(Question: Gender)

Male answers:
Conditions:
Answer Option(s): Male
(Question: Gender)

1. I have reviewed the research and consent announcement, and I give my consent to participate in the research.

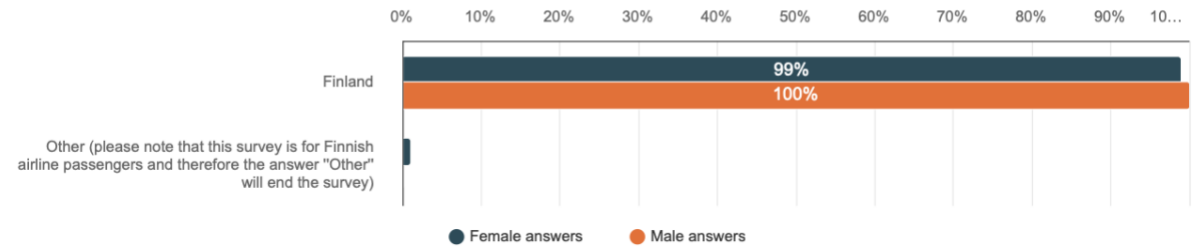
Number of respondents: 94



	Female answers		Male answers		
	n	Percent	n	Percent	Total
Yes	75	100.0%	15	100.0%	90
No. Completing the form requires giving consent.	0	0.0%	0	0.0%	0
Total	**75**		**15**		**90**

2. Place of residence

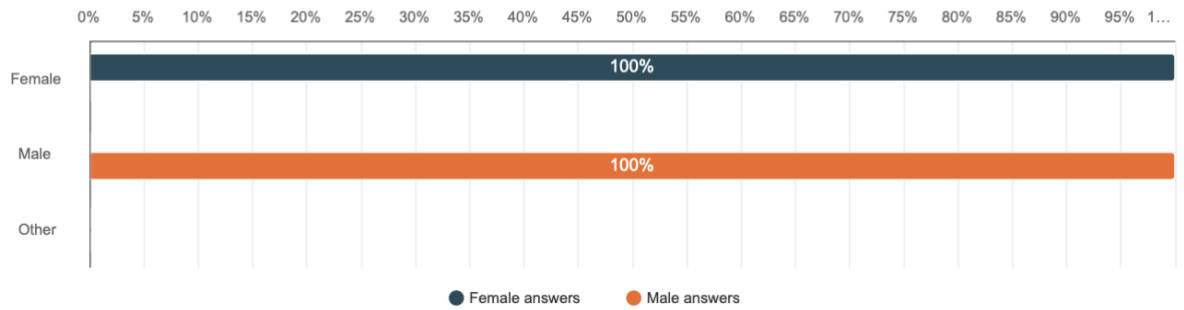
Number of respondents: 91



	Female answers		Male answers		
	n	Percent	n	Percent	Total
Finland	74	98.7%	15	100.0%	89
Other (please note that this survey is for Finnish airline passengers and therefore the answer "Other" will end the survey)	1	1.3%	0	0.0%	1
Total	**75**		**15**		**90**

3. Gender

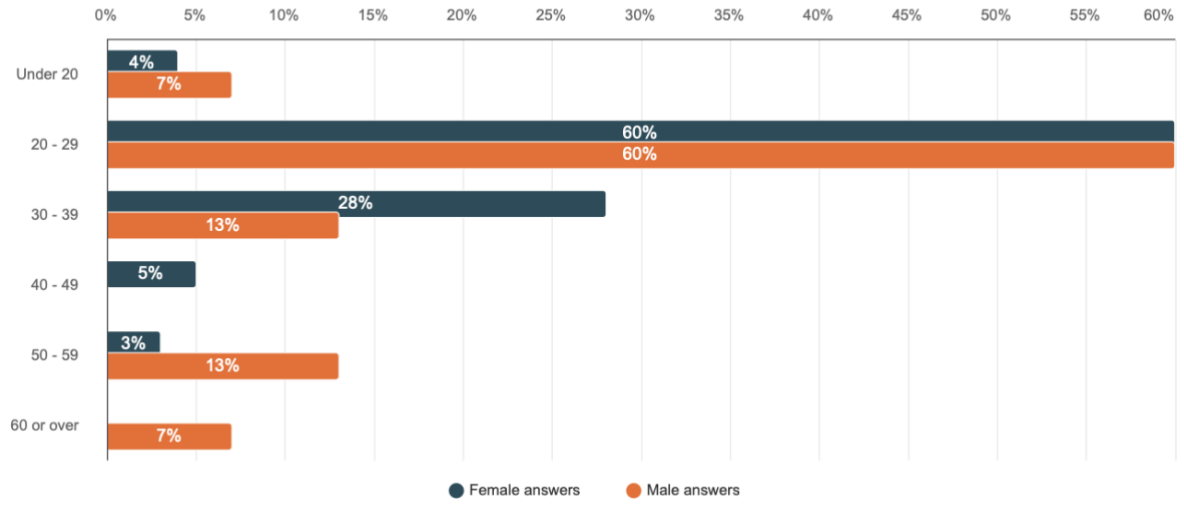
Number of respondents: 91



	Female answers		Male answers		
	n	Percent	n	Percent	Total
Female	75	100.0%	0	0.0%	75
Male	0	0.0%	15	100.0%	15
Other	0	0.0%	0	0.0%	0
Total	**75**		**15**		**90**

4. Age

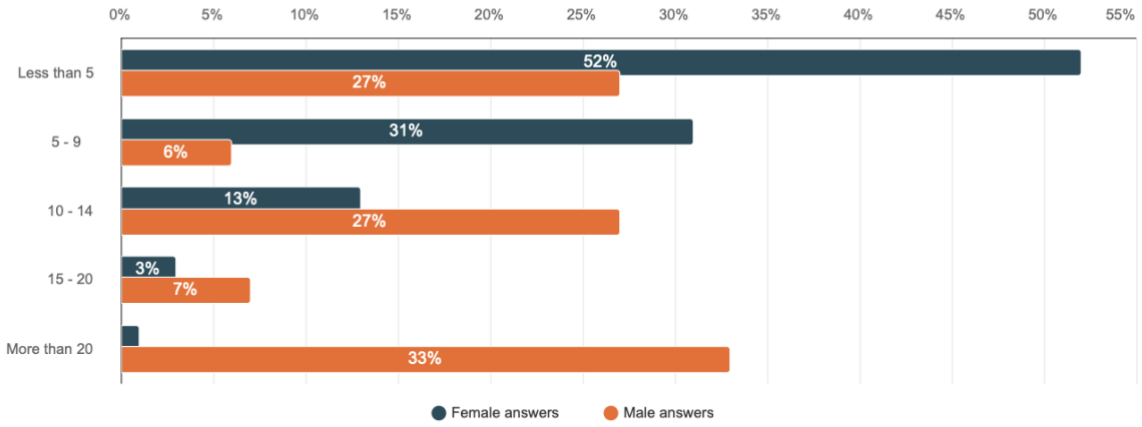
Number of respondents: 91



	Female answers		Male answers		
	n	Percent	n	Percent	Total
Under 20	3	4.0%	1	6.7%	4
20 - 29	45	60.0%	9	60.0%	54
30 - 39	21	28.0%	2	13.3%	23
40 - 49	4	5.3%	0	0.0%	4
50 - 59	2	2.7%	2	13.3%	4
60 or over	0	0.0%	1	6.7%	1
Total	**75**		**15**		**90**

5. How many flights do you take in a year as a passenger?

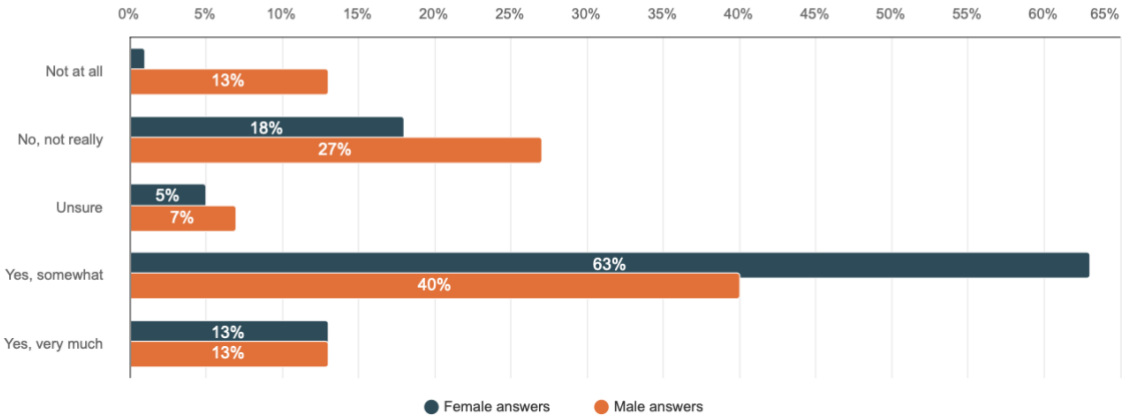
Number of respondents: 91



	Female answers		Male answers		
	n	Percent	n	Percent	Total
Less than 5	39	52.0%	4	26.7%	43
5 - 9	23	30.7%	1	6.6%	24
10 - 14	10	13.3%	4	26.7%	14
15 - 20	2	2.7%	1	6.7%	3
More than 20	1	1.3%	5	33.3%	6
Total	**75**		**15**		**90**

6. Do you consider yourself environmentally conscious?

Number of respondents: 91



	Female answers		Male answers		
	n	Percent	n	Percent	Total
Not at all	1	1.3%	2	13.3%	3
No, not really	13	17.4%	4	26.7%	17
Unsure	4	5.3%	1	6.7%	5
Yes, somewhat	47	62.7%	6	40.0%	53
Yes, very much	10	13.3%	2	13.3%	12
Total	**75**		**15**		**90**

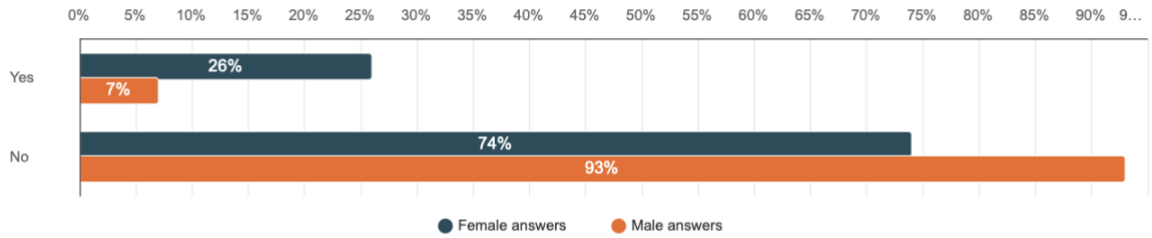
7. Please choose the most suitable option:

Number of respondents: 90

How important is the environmental impact of air travel in your decision-making process when purchasing a flight ticket?	Not important at all	Not important	Neutral	Important	Extremely important	Average	Median
Female answers	13.5%	27.0%	37.8%	14.9%	6.8%	2.7	3.0
Male answers	53.3%	26.7%	20.0%	0.0%	0.0%	1.7	1.0

8. Have you ever purchased carbon emission offsets (hiilidioksidipäästö hyvitys) when booking a flight?

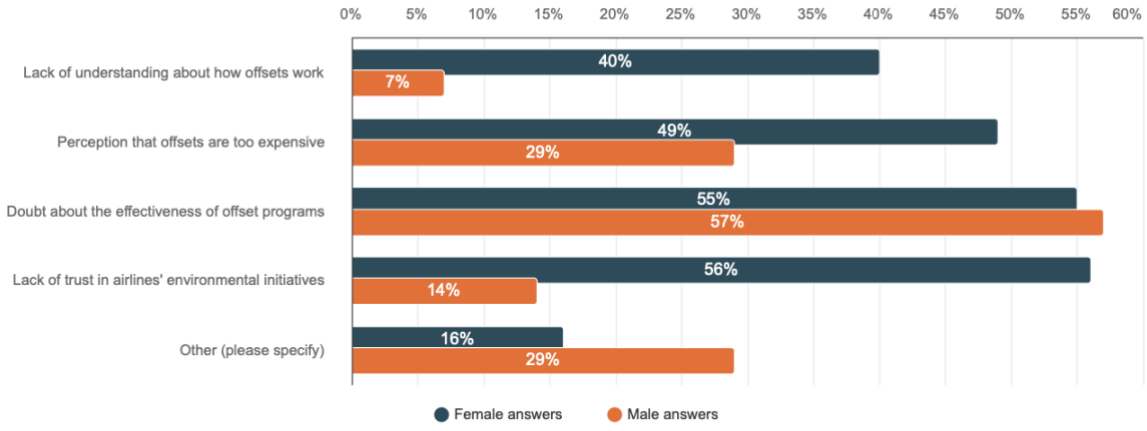
Number of respondents: 90



	Female answers		Male answers		
	n	Percent	n	Percent	Total
Yes	19	25.7%	1	6.7%	20
No	55	74.3%	14	93.3%	69
Total	**74**		**15**		**89**

9. What are your main reasons for not purchasing carbon emission offsets offered by airlines? (select all that apply)

Number of respondents: 70 , selected answers: 139

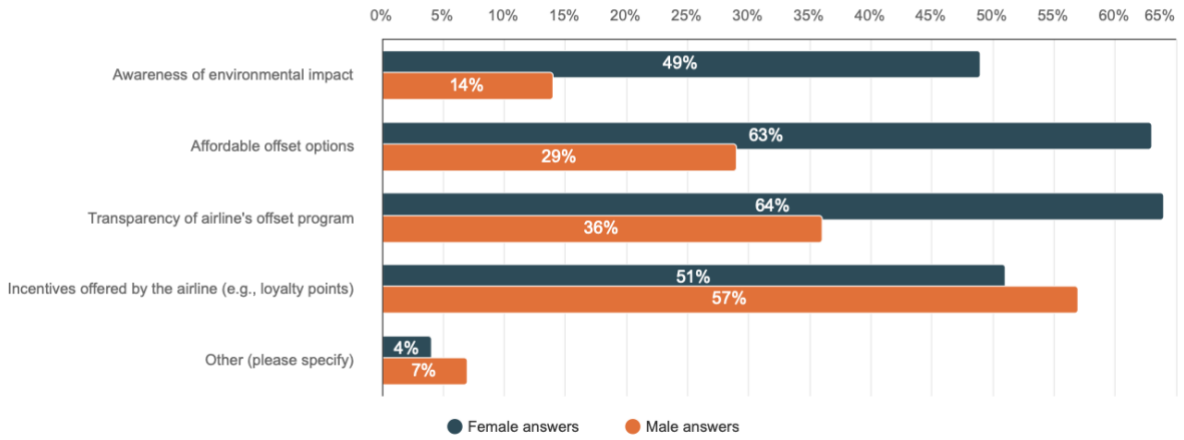


	Female answers		Male answers		
	n	Percent	n	Percent	Total
Lack of understanding about how offsets work	22	40.0%	1	7.1%	23
Perception that offsets are too expensive	27	49.1%	4	28.6%	31
Doubt about the effectiveness of offset programs	30	54.5%	8	57.1%	38
Lack of trust in airlines' environmental initiatives	31	56.4%	2	14.3%	33
Other (please specify)	9	16.4%	4	28.6%	13
Total	**119**		**19**		**138**

Option names	Text
Other (please specify)	I don't travel by plane, but if I did, I'd prefer to use a third party service
Other (please specify)	90% tapauksissa suoraa viherpesua
Other (please specify)	I've seen some documents about this subject, I don't trust or believe in the system.
Other (please specify)	https://yle.fi/a/74-20001277
Other (please specify)	Not enough knowledge, there's no information about it
Other (please specify)	Haven't seen any offering that
Other (please specify)	I dont care about the impact for environment
Other (please specify)	Ei kiinnosta
Other (please specify)	I have read that aviation's emissions are just 2% of world's emissions so it does not feel too harmful to fly long distances
Other (please specify)	Green wash
Other (please specify)	No offsets available when purchasing the tickets
Other (please specify)	It is scam. We as humans can not damage the earth. God did not create the earth so these things can damage it. Also global warming does not exist. Do proper research and youll find the truth.
Other (please	I don't care about emissions

10. What factors (would) encourage you to purchase carbon emission offsets when booking a flight? (select all that apply)

Number of respondents: 87 , selected answers: 187



	Female answers		Male answers		
	n	Percent	n	Percent	Total
Awareness of environmental impact	35	48.6%	2	14.3%	37
Affordable offset options	45	62.5%	4	28.6%	49
Transparency of airline's offset program	46	63.9%	5	35.7%	51
Incentives offered by the airline (e.g., loyalty points)	37	51.4%	8	57.1%	45
Other (please specify)	3	4.2%	1	7.1%	4
Total	**166**		**20**		**186**

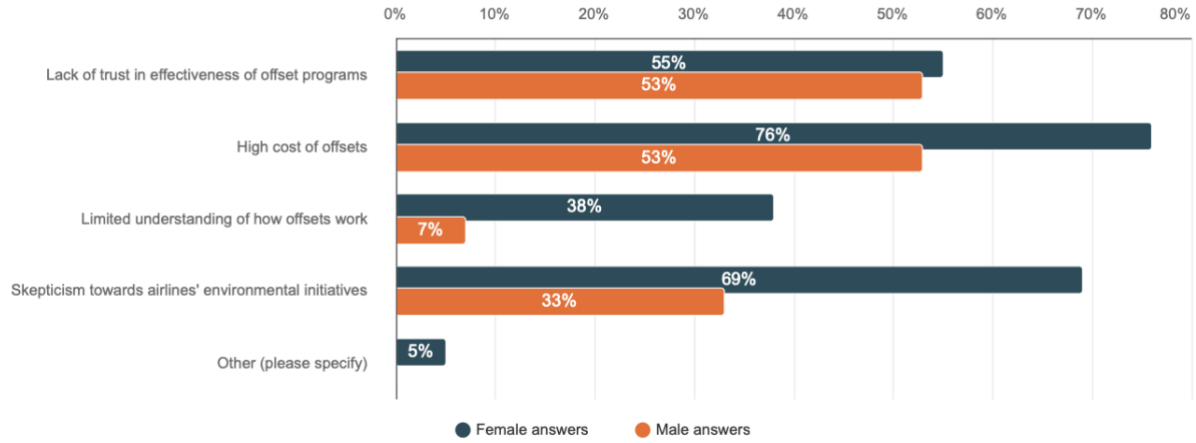
Answers given into textfield

Show all

Option names	Text
Other (please specify)	Scientific evidence about the positive impact of those offsets.
Other (please specify)	The offsetting purchase could be merged to upgrade purchase.
Other (please specify)	The only case where I can see me "purchasing" it would be if it was free. I would never use any money for that.
Other (please specify)	Nothing

11. What factors (would) discourage you from purchasing carbon emission offsets when booking a flight? (select all that apply)

Number of respondents: 90 , selected answers: 203



	Female answers		Male answers		
	n	Percent	n	Percent	Total
Lack of trust in effectiveness of offset programs	41	55.4%	8	53.3%	49
High cost of offsets	56	75.7%	8	53.3%	64
Limited understanding of how offsets work	28	37.8%	1	6.7%	29
Skepticism towards airlines' environmental initiatives	51	68.9%	5	33.3%	56
Other (please specify)	4	5.4%	0	0.0%	4
Total	**180**		**22**		**202**

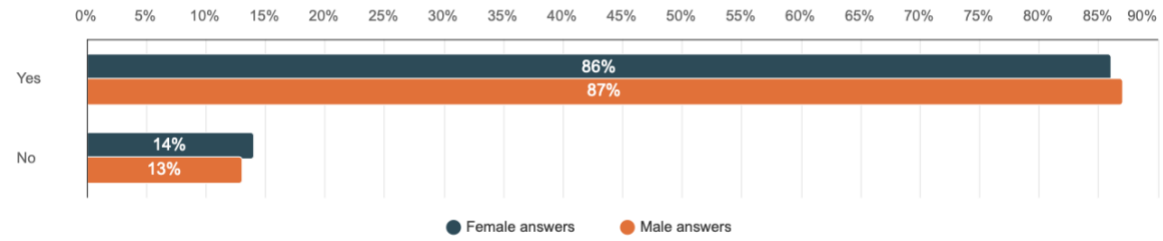
Answers given into textfield

Show all

Option names	Text
Other (please specify)	Already high prices of airline tickets
Other (please specify)	Lack of detailed information in how the money is used
Other (please specify)	I don't flight, because it's not good for environment
Other (please specify)	Airlines does not report visible enough financially, that the income has actually been used to offsettings.

12. Before taking this survey, have you heard about carbon emission offset programs offered by airlines?

Number of respondents: 90



	Female answers		Male answers		
	n	Percent	n	Percent	Total
Yes	64	86.5%	13	86.7%	77
No	10	13.5%	2	13.3%	12
Total	**74**		**15**		**89**

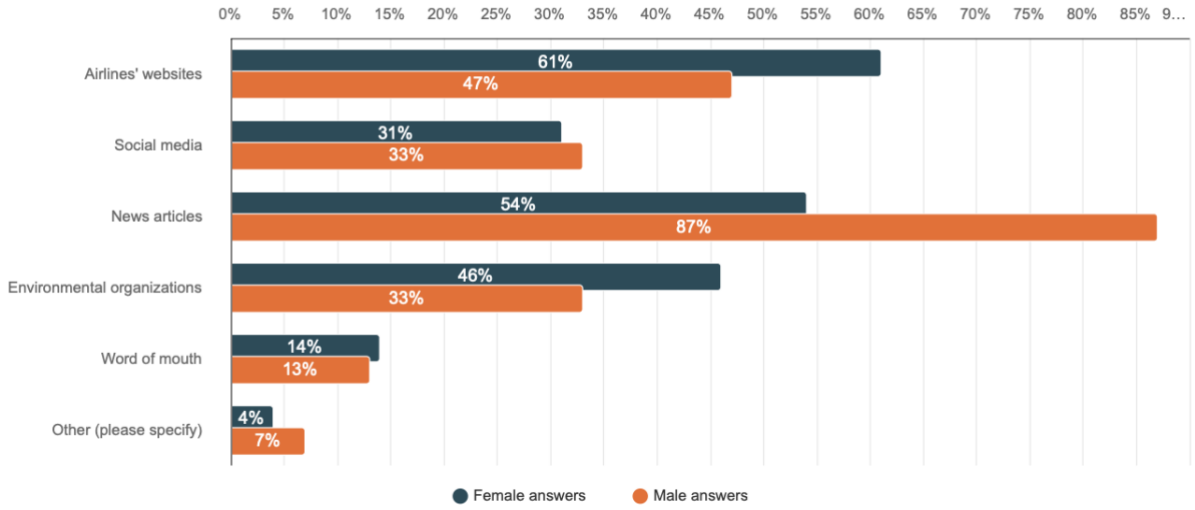
13. Please choose the most suitable option:

Number of respondents: 90

How familiar are you of the purpose and functioning of carbon emission offset programs?	Not familiar at all	Not familiar	Neutral	Familiar	Extremely familiar	Average	Median
Female answers	10.8%	29.7%	21.6%	33.8%	4.1%	2.9	3.0
Male answers	13.3%	13.3%	26.7%	40.0%	6.7%	3.1	3.0

14. What sources do you primarily rely on for information regarding environmental initiatives in air travel? (select all that apply)

Number of respondents: 88 , selected answers: 185



	Female answers		Male answers		
	n	Percent	n	Percent	Total
Airlines' websites	44	61.1%	7	46.7%	51
Social media	22	30.6%	5	33.3%	27
News articles	39	54.2%	13	86.7%	52
Environmental organizations	33	45.8%	5	33.3%	38
Word of mouth	10	13.9%	2	13.3%	12
Other (please specify)	3	4.2%	1	6.7%	4
Total	**151**		**33**		**184**

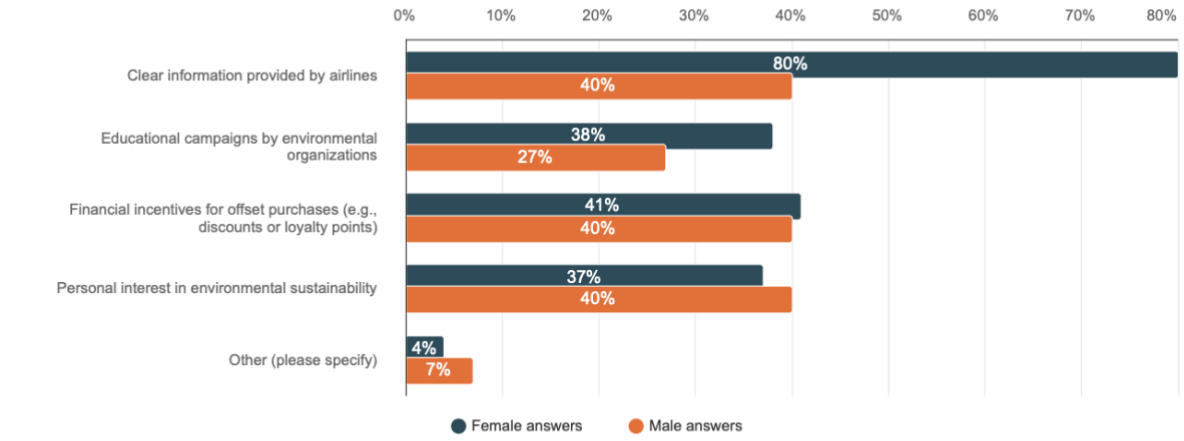
Answers given into textfield

Show all

Option names	Text
Other (please specify)	Scientific publications on academic journals for example
Other (please specify)	Common sense

15. What would motivate you to learn more about carbon emission offset programs? (select all that apply)

Number of respondents: 87 , selected answers: 166



	Female answers		Male answers		
	n	Percent	n	Percent	Total
Clear information provided by airlines	57	80.3%	6	40.0%	63
Educational campaigns by environmental organizations	27	38.0%	4	26.7%	31
Financial incentives for offset purchases (e.g., discounts or loyalty points)	29	40.8%	6	40.0%	35
Personal interest in environmental sustainability	26	36.6%	6	40.0%	32
Other (please specify)	3	4.2%	1	6.7%	4
Total	**142**		**23**		**165**

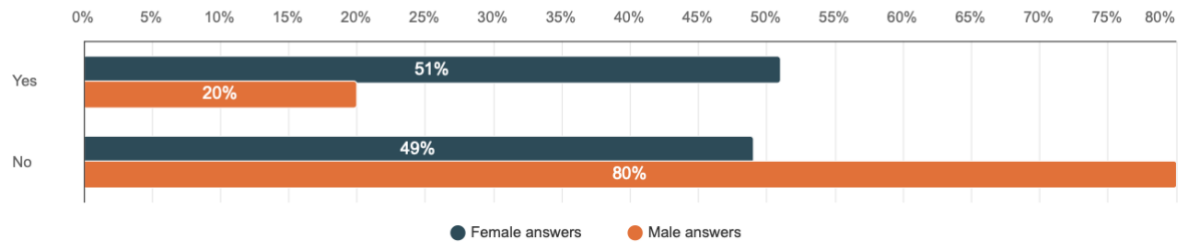
Answers given into textfield

Show all

Option names	Text
Other (please specify)	Being more informed of the impact it does
Other (please specify)	Nothing.
Other (please specify)	Non to be honest

16. Have you ever considered purchasing carbon emission offsets when booking a flight?

Number of respondents: 90



	Female answers		Male answers		
	n	Percent	n	Percent	Total
Yes	38	51.4%	3	20.0%	41
No	36	48.6%	12	80.0%	48
Total	**74**		**15**		**89**

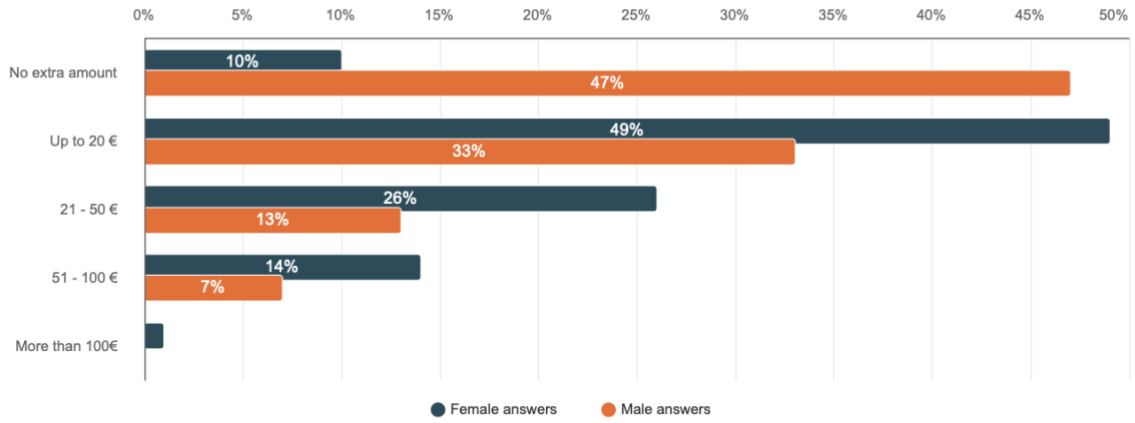
17. Please mark how true is the following statement:

Number of respondents: 90

How much do you agree with the statement: ''I would be more likely to purchase carbon emission offsets if they were more affordable?''	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Average	Median
Female answers	5.4%	6.7%	25.7%	33.8%	28.4%	3.7	4.0
Male answers	13.4%	13.3%	60.0%	13.3%	0.0%	2.7	3.0

18. If you would have the option to book a flight that is completely carbon emissions free/ carbon emissions are fully compensated, how much extra would you be willing to pay for such a flight (compared to a regular flight)?

Number of respondents: 89



	Female answers		Male answers		
	n	Percent	n	Percent	Total
No extra amount	7	9.6%	7	46.7%	14
Up to 20 €	36	49.3%	5	33.3%	41
21 - 50 €	19	26.0%	2	13.3%	21
51 - 100 €	10	13.7%	1	6.7%	11
More than 100€	1	1.4%	0	0.0%	1
Total	**73**		**15**		**88**

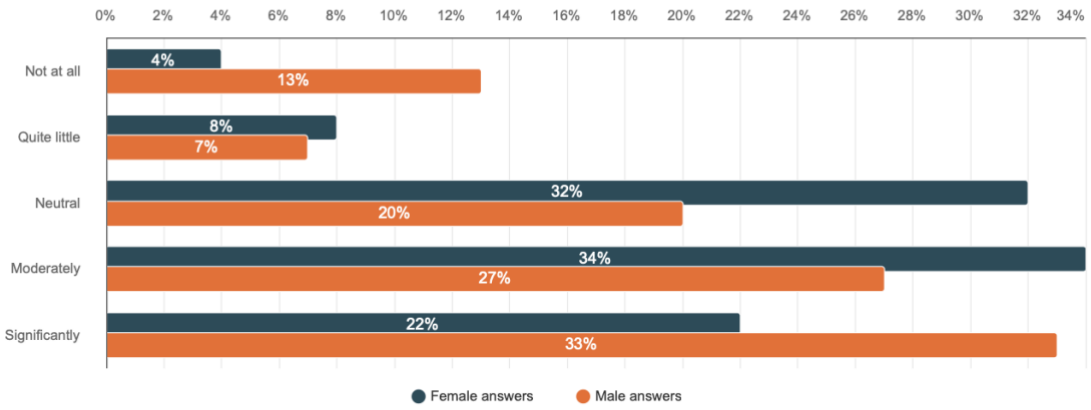
19. Please choose the most suitable option:

Number of respondents: 90

How do you perceive the importance of carbon emission offset programs in combating climate change?	Not important at all	Not important	Neutral	Important	Extremely important	Average	Median
Female answers	4.1%	5.4%	29.7%	48.6%	12.2%	3.6	4.0
Male answers	33.3%	6.6%	26.7%	26.7%	6.7%	2.7	3.0

20. To what extend do concerns about the legitimacy and effectiveness of offset programs impact your willingness to purchase offsets?

Number of respondents: 90



	Female answers		Male answers		
	n	Percent	n	Percent	Total
Not at all	3	4.1%	2	13.3%	5
Quite little	6	8.1%	1	6.7%	7
Neutral	24	32.4%	3	20.0%	27
Moderately	25	33.8%	4	26.7%	29
Significantly	16	21.6%	5	33.3%	21
Total	**74**		**15**		**89**

21. In your opinion, what strategies can airlines (and the aviation industry) implement to enhance the visibility, accessibility, and perceived value of emission offset programs among Finnish passengers?

Number of respondents: 22

Female answers	Male answers
Kompensatiomaksujen pitäisi kohdistua biopolttoaineen saatavuuden parantamiseen, eikä esim. mihinkään puiden istuttamiseen maapallon toisella puolella, missä paikalliset kärsii muutenkin kuivuudesta. Tämän vuoksi en enää maksa kompensaatiomaksuja, koska niistä ei ole mitään merkittävää hyötyä.	Green wash
I think they could be mandatory for all airline passengers.	Stopping it completely
Marketing and offered perks from taking part of offset programs e.g. Travel points	Forget the silly phobia of carbon and focus on keeping our air and earth clean from pollution caused by aviation industry
Let us know exactly what is done with the extra amount, and much it helps to cancel out the affects of air travel. The amount of people flying frequently in private jets does also decrease my motivation to pay extra for emission offset programs. I doubt it has any affect in reality when you look at the whole situation.	emission offset programs could be more prominently displayed by people when booking flights and at the airport
-	By educating and promoting awareness in collaboration with environment organizations.
Viestiä selkeästi, jos tekevät yhteistyötä niin toisen yrityksen tulisi tehdä vastuullista työtä muuten kuin rahankiiltosilmissä. Olla läpinäkyviä viestinnässä ja välttää viherpesua.	Actual transparent outcome of the offset programs, preferrable in Finland (or whatever countries the airline offering the program operates at).Currently I believe that Sustainable Aviation Fuel is the only way towards carbon neutral aviation.
I think airlines should add the emission offset prices already to the airplane tickets so it would be mandarory for everyone to pay	Not nescessary anything. Air travel is increasing so fast(especially in Asia) that any offsetting is marginal. New technology(engines and biofuel) will eventually reduce carbon emissions.
Flight tickets are already expensive. 2020-> everything is expensive so I cant afford put anything extra when taylor swift fly 24/7 for example :D its sad but true. And i saw a document in yle about finnairs strategy about this what they really do in india with this, and it was ridicilous, totally waste of money and lying customers about how it works… i really wish airlines would come up something better with this.	
He voisivat myöntää tekevänsä täyttä viherpesua ja minimoida lentojen määrän. Lennättää vain täysiä koneellesia ja panostaa kehitykseen, jolla saadaan aidosti ympäristöystävällisempää lentämistä aikaiseksi.	
Maybe working with social media influencers so large groups of people can get information through social media about emission offset programs. Also using different social medias could help, because people as young/younger than me are mostly in Tiktok, so that could also provide a new way to share the information.	
Showing number more widely and openly.	
Concrete examples of how and where the programme works. I cannot be sure how it actually works, without the airline giving me some numbers. Simply knowing it exists and "compensates" something isn't saying that much.	
There are no strategies that would change my mind.	
Mielenkiintoinen kysely! Haluaisin nähdä/kuulla informaatiota riippumattomista lähteistä miten päästöjen hyvittäminen vaikuttaa toimintaan ja minkälaisia konkreettisia asioita sillä tuetaan. Lentoyhtiöt eivät mielestäni ole olleet kovin luotettavassa asemassa jos mietitään esimerkiksi Finnairia ja yhtiöön kohdistuneita "viherpesusyytteitä". Minusta tuntuu väärältä hyvittää hiilijalanjälkeäni toimijani kautta, jonka markkinointiin tai viestintään en voi luottaa. Lentolippujen hinnat ovat myös kalliita ja usein kuluttaja maksaa pienistä lisäpalveluista suhteessa kallista hintaa ja mikäli päälle vielä kysytään maksatko lisää ei konkreettisesta "hiilijalanjäljen hyvittämisestä", tarjous ei ole kovin houkutteleva. Jos esimerkiksi joku luotettava länsimainen media tekisi asiasta tutkimusta lentoyhtiötasolla, voisin hyvinkin tukea myös firmaa, jolla on konkreettisia näyttöjä.	
Social media posts, showing statistics of the impact, comparisons of air travel's effect on climate with or without emission offset program	

Appendix 3. Survey responses to question 21

Green wash
Kompensaatiomaksujen pitäisi kohdistua biopolttoaineen saatavuuden parantamiseen, eikä esim. mihinkään puiden istuttamiseen maapallon toisella puolella, missä paikalliset kärsii muutenkin kuivuudesta. Tämän vuoksi en enää maksa kompensaatiomaksuja, koska niistä ei ole mitään merkittävää hyötyä.
I think they could be mandatory for all airline passengers.
Marketing and offered perks from taking part of offset programs e.g. Travel points
Let us know exactly what is done with the extra amount, and much it helps to cancel out the effects of air travel. The amount of people flying frequently in private jets does also decrease my motivation to pay extra for emission offset programs. I doubt it has any affect in reality when you look at the whole situation.
Stopping it completely
Viestiä selkeästi, jos tekevät yhteistyötä niin toisen yrityksen tulisi tehdä vastuullista työtä muuten kuin rahankiiltosilmissä. Olla läpinäkyviä viestinnässä ja välttää viherpesua.
I think airlines should add the emission offset prices already to the airplane tickets so it would be mandatory for everyone to pay
Flight tickets are already expensive. 2020-> everything is expensive so I can't afford put anything extra when Taylor Swift fly 24/7 for example :D it's sad but true. And i saw a document in Yle about Finnair's strategy about this what they really do in India with this, and it was ridiculous, totally waste of money and lying customers about how it works… I really wish airlines would come up something better with this.
Forget the silly phobia of carbon and focus on keeping our air and earth clean from pollution caused by aviation industry
emission offset programs could be more prominently displayed by people when booking flights and at the airport
He voisivat myöntää tekevänsä täyttä viherpesua ja minimoida lentojen määrän. Lennättää vain täysiä koneellisia ja panostaa kehitykseen, jolla saadaan aidosti ympäristöystävällisempää lentämistä aikaiseksi.
By educating and promoting awareness in collaboration with environment organizations.
Maybe working with social media influencers so large groups of people can get information through social media about emission offset programs. Also using different social medias could help, because people as young/younger than me are mostly in TikTok, so that could also provide a new way to share the information.
Showing number more widely and openly.
Actual transparent outcome of the offset programs, preferrable in Finland (or whatever countries the airline offering the program operates at). Currently I believe that Sustainable Aviation Fuel is the only way towards carbon neutral aviation.
Concrete examples of how and where the programme works. I cannot be sure how it actually works, without the airline giving me some numbers. Simply knowing it exists and "compensates" something isn't saying that much.
There are no strategies that would change my mind.
Mielenkiintoinen kysely! Haluaisin nähdä/kuulla informaatiota riippumattomista lähteistä, miten päästöjen hyvittäminen vaikuttaa toimintaan ja minkälaisia konkreettisia asioita sillä tuetaan. Lentoyhtiöt eivät mielestäni ole olleet kovin luotettavassa asemassa, jos mietitään esimerkiksi Finnairia ja yhtiöön kohdistuneita "viherpesusyytteitä". Minusta tuntuu väärältä hyvittää hiilijalanjälkeäni toimijani kautta, jonka markkinointiin tai viestintään en voi luottaa. Lentolippujen hinnat ovat myös kalliita ja usein kuluttaja maksaa pienistä lisäpalveluista suhteessa kallista hintaa ja mikäli päälle vielä kysytään maksatko lisää ei konkreettisesta "hiilijalanjäljen hyvittämisestä", tarjous ei ole kovin houkutteleva. Jos esimerkiksi joku luotettava länsimainen media tekisi asiasta tutkimusta lentoyhtiötasolla, voisin hyvinkin tukea myös firmaa, jolla on konkreettisia näyttöjä.
Not necessary anything. Air travel is increasing so fast (especially in Asia) that any offsetting is marginal. New technology (engines and biofuel) will eventually reduce carbon emissions.
Social media posts, showing statistics of the impact, comparisons of air travel's effect on climate with or without emission offset program