

**Willingness to Pay for Carbon
Neutral Flying –
A Discrete Choice Experiment in
Finland**

MSc Thesis

Study programme: Environmental Sciences
Environmental Economics and Natural Resources Group

Laura Marie Kothe

Student number: 1042980

Supervisor:

Prof. Francisco Alpizar Rodriguez

Course code: ENR80436

Wageningen University and Research

Date: 11.05.2022

Contents

List of Tables	ii
List of Figures	iii
Acronyms	iii
1 Introduction	1
1.1 Objective	2
1.2 Research questions	2
2 Methodology	3
2.1 Attribute identification	3
2.1.1 Literature review	3
2.1.2 Focus group	4
2.1.3 Result of attribute identification	5
2.2 Choice experiment	6
2.2.1 Selection of attributes and levels	7
2.2.2 Cost attribute	9
2.2.3 Experimental design	10
2.2.4 Survey design	11
2.2.5 Pilot survey and adjustments	12
2.2.6 Sample selection	14
2.3 Modelling approach	15
2.3.1 Conditional logit model	16
2.3.2 Mixed logit model	17
2.3.3 Willingness to pay	18
3 Results	19
3.1 Socio-demographic characteristics	19
3.2 Setting and environmental impact awareness	21
3.3 Independent preferences	23
3.4 Attribute non-attendance	23
3.5 Logit model outcomes	24
3.6 WTP estimates	25
4 Discussion	27
4.1 Contributions to knowledge	27
4.2 Feedback during conduction phase	28
4.3 Limitations	30
5 Conclusion	32
A Appendices	39
A.1 Full survey	40
A.2 Comments on reasons why not buying o sets	51
A.3 Comments received within survey	52
A.4 Facebook post	53

List of Tables

1	Source of focus group participants	4
2	Results and explanation of attribute ranking	5
3	Coding of attributes and levels	7
4	Fractional factorial design	10
5	Sample compared to Finnish census socio-demographics	19
6	Environmental impact awareness	21
7	Have you ever seen the option to offset your flight?	21
8	Have you ever purchased compensation for your emissions?	22
9	Why have you never purchased a carbon offset?	22
10	Independent stated preferences	23
11	Attribute non-attendance	24
12	Overview conditional and mixed logit model	25
13	WTP for attributes of carbon neutral flying	26
14	Share of respondents with negative WTP	26
15	Reasons why not buying offsets	51
16	Comments during the conduction phase of the survey	52

List of Figures

1	Example Choice Set	13
2	Facebook post: request to participate in the survey	53

Acronyms

CL Conditional logit model. 2

DCE Discrete Choice Experiment. 6{9

FFD Fractional Factorial Design. 12

MXL Mixed logit model. 2

VCM Voluntary Carbon Market. 1

WTP Willingness To Pay. 1, 2, 6, 9

1 Introduction

The warming of the global climate is undeniable. According to the Fifth Assessment Cycle of the IPCC each of the last three decades has been successively warmer than any preceding decade since 1850. Ice sheets are losing mass, glaciers have continued to shrink, sea levels are rising and extreme weather events are likely to become more frequent in the future (Stocker 2014). In light of these facts, 195 countries have signed the Paris Agreement and its goal to limit global warming to well below 2°C - preferably to 1.5°C - compared to pre-industrial levels. To limit global warming to 1.5°C global net anthropogenic CO₂ emissions need to decline by about 45% by 2030 compared to 2010 levels and reach net-zero by around 2050 (Masson-Delmotte et al. 2018). However, projections regarding the national mitigation targets as submitted under the Paris Agreement are indicating that current ambitions are not yet sufficient to limit global warming to 1.5 °C (Masson-Delmotte et al. 2018). A fundamental shift of the global economy towards sustainable allocation of resources and capital to climate action is needed. This is where the Voluntary Carbon Market (VCM) might play a crucial role in the future. The VCM is driven by demand from companies which want to reduce their emissions on a voluntary basis. More than 1,100 companies have voluntary commitments to Net Zero targets, including for example Marks and Spencer, EasyJet, Atos and Volkswagen (ICROA 2020). In 2019, 104Mt carbon credits have been traded on the Voluntary Carbon Market, which is an increase of 6% compared to 2018 (ICROA 2020). Even the global COVID-19 pandemic could not halt this trend - the number of companies committed to climate-neutral or net-zero targets has doubled during 2020 (ICROA 2020).

The thesis will study the Willingness To Pay for carbon credits in the context of leisure air travel. Voluntary carbon offsets for leisure air travel is of importance for two reasons: First, flight emissions represents a major market for individual carbon compensation. Second, offsetting the flight emissions is often the first time that consumers come into contact with carbon credits.

1.1 Objective

The study aims to assess consumers preferences and willingness to pay for different attributes of carbon credits in a Finnish context. Despite the promising growth of the Voluntary Carbon Market, there is little research which explores consumer's preferences and Willingness To Pay (WTP) for attributes of carbon credits. Aligning consumer expectations with emission reduction project development could increase the overall reputation and therefore demand for carbon credits. Brokers and developers could improve their pricing strategies making voluntary carbon action more cost-efficient. Overall, more insights on consumer's WTP can increase the profitability of the product leading to growing investments being channelled into climate action.

1.2 Research questions

The research questions are:

1. What carbon credits attributes are most important to consumers in Finland when booking a flight ticket?
2. What are consumers willing to pay for these attributes?

The first research question was addressed by identifying attributes and assignment of levels. This step involved a literature review to get an overview of potential relevant attributes. Thereafter qualitative research in form of an interview with an expert and a pre-study with a focus group was conducted. Finally levels were defined and attributes hierarchically ordered to be used for the final survey. To limit the number of attributes, 3 most important attributes, in addition to the cost attribute, were selected. As stated by Ryan et al. (2012) if too many attributes are included, there is the risk that individuals will not consider all information but adopt simple decision-making strategies, hence trade-offs would not be estimated correctly. Research question two was addressed by collecting data via an online survey in Finland. The statistical analysis of the survey data is based on a random utility model - namely Conditional logit model and Mixed logit model, from which WTP estimates can be derived.

2 Methodology

The following chapter lays out the methodology used for studying the WTP for attributes of carbon credits in Finland. The first section presents the attribute identification, which can be understood as the groundwork for the following Choice Experiment.

2.1 Attribute identification

The approach to determine which attributes of carbon credits are most relevant to Finns consisted of two parts. A broad and preliminary list of possible attributes was compiled by doing a literature review (1). Thereafter, the identified list of attributes was narrowed down together with a focus group, who was asked to rank the attributes according to their preference (2).

2.1.1 Literature review

First, main attributes of carbon credits were identified by conducting a literature review. Sources included academic articles and online publications by relevant market players in the field of the voluntary carbon market. Academic studies were sourced through Google Scholar with emphasis on studies published after 2000. Keywords helped identifying suitable articles (e.g. carbon credits, voluntary carbon market, aviation carbon offset). Literature turned out to offer limited resources to identify attributes. Some studies in this field have either identified socio-demographic factors that are influencing carbon offsetting preferences, such as gender (Segerstedt and Grote 2016), or age (Choi et al. 2018). Others have identified psychological attributes such as understanding of environmental issues (Lu and Wang 2018) or awareness of offsetting programmes (MacKerron et al. 2009).

Studies which have investigated product attributes of aviation carbon offset and helped in identifying the broad list of possible attributes include Blasch and Farsi (2014), Choi and Ritchie (2014), Brouwer et al. (2008), Araghi et al. (2016) and Ritchie et al. (2021).

Another source which was crucial in not only identifying attributes but also in getting a better understanding of the voluntary carbon market in general are the annual "State of the Voluntary Carbon Markets" reports published by an US-based non-profit organisation

called Forest Trend. The first report was published in 2007 (Hamilton et al. 2007) and the latest in 2020 (Donofrio et al. 2020).

2.1.2 Focus group

Second, focus group discussions were used to revise the list of potential attributes and to determine the final attributes to be included in the Choice Experiment.

Kanninen (2007) suggests that the selection of attributes for stated choice studies should be chosen through a ranking exercise. The ranking exercise included that the participants of the focus group were asked to pick three attributes which appear most important to them personally. The focus group consisted of thirteen individuals. Participants were sourced using social media platforms (LinkedIn and Facebook) and the questions were distributed via a google form as social distancing was required during the time of this research due to the COVID-19 pandemic. In Table 1 information about the groups and social media platforms to source participants can be found.

Table 1: Source of focus group participants

Name	Platform	No. of Members	URL
University of Helsinki Alumni	LinkedIn	5.8k	Link
Helsinki School of Economics	LinkedIn	4.9k	Link
Sustainability Professionals Finland	LinkedIn	242	Link
Young Helsinki Locals and Expats	Facebook	189	Link
Helsinkiäisten Helsinki	Facebook	7.4k	Link

To diversify the sample, the social media groups consisted of groups where a certain knowledge around the topic of compensation can be expected (e.g. Helsinki School of Economics) and others where no prior knowledge can be expected (e.g. Helsinkiäisten Helsinki). After an introductory briefing, in which the research and aviation carbon offsets were explained, participants were asked about their knowledge around carbon compensation and experience when booking flights tickets. Open questions were formulated to prevent in uencing participants and to create an atmosphere in which participants do not feel judged on technical details but to freely be able to raise their opinion. The participants were asked to rank their three preferred attributes among a list of ten potential

Table 2: Results and explanation of attribute ranking

	Rank 1 (3 points)	Rank 2 (2 points)	Rank 3 (1 point)	Total
Co-Benefits	15	6	1	22
Co-Benefits: Social or environmental outcomes of the project in addition to purely lowering GHG emissions.				
Transparency	9	4	3	16
Transparency: A detailed price breakdown about how the money is spend across different stakeholders.				
Type	3	10	2	15
Type: Project type that is used to avoid emissions and increase carbon sequestration.				
Standard	6	4	3	13
Standard: Carbon offset program that provides quality assurance for carbon credits.				
Provider	6	0	1	7
Provider: Project developer or broker that acts as a retailer for selling the carbon credits.				
Contribution	0	0	3	3
Contribution: Ability to calculate the exact amount of added-value for every single buyer of the project.				
Location	0	2	0	2
Location: Region or country where the emission reduction project has been implemented.				
Vintage	0	0	0	0
Vintage: The year in which the emission reduction occurred.				
Illustration	0	0	0	0
Illustration: Marketing material such as videos and photos available to illustrate the project.				

attributes. To calculate the overall weighting, the most important attribute received a score of three points. Two points were given to the second most important attribute and one point to the third important attribute. A ranking was achieved by summing up the weighted points. An overview of the outcome can be seen in Table 2. The highest ranking attribute was "co-benefits" scoring eleven points. The score for the second and third most important attribute was quite balanced with "transparency" having a total score of 16 and "type" a total score of 15 points. The lowest ranking attributes were "location", "vintage" and "illustration".

2.1.3 Result of attribute identification

With the number of participants being relatively small (13 participants), the results should not be considered a generalisation for the Finnish population. Nonetheless, the ranking exercise yields an estimate of the most important offsetting attributes and will therefore be used for the Choice Experiment. The three highest scoring attributes were "co-benefits", "transparency" and "type". The fourth-placed attribute "standard" (13 points) could have been taken into consideration, but was disregarded in order to keep the number of attributes low and reduce complexity for respondents.

Interestingly to note is that "vintage" was not considered highly important by any

of the participants. According to online resources such as www.oasetguide.org the vintage "may present a quality concern" (Institute 2019) if for example the credits have remained unsold for a long time. The attribute "illustration" might not be too important to individual oaset consumers but it can be expected that if the focus group would have consisted of corporate ESG decision-makers the result would have been different, since photos and videos are of high value for marketing purposes.

2.2 Choice experiment

A Discrete Choice Experiment (DCE) is a survey-based methodology to gather stated preference data, which means that respondents give information on what they would do instead of what they are actually doing (revealed preference data). Since most likely not all respondents have purchased carbon credits, DCE was the preferred method to present hypothetical choices rather than asking about actual behaviour.

A Discrete Choice Experiment expects that a product (here carbon credits) can be specified in terms of its characteristics (OECD 2018). It is of high interest for consumer economics, as it can identify which combination of characteristics make the most appealing offer for consumers and provides the ability to define a value for each attribute instead of the value of the carbon credits in its entirety. However, the DCE gives rise to some limitations such as increased cognitive burden and fatigue effects related to high complexity and unfamiliarity of the scenarios to the respondent (Hanley et al. 2001)

The following chapter portrays the methodology used to create the Choice Experiment. Section 2.2.1 presents the previously identified attributes and assigned levels and section 2.2.2 describes the payment vehicle. Thereafter the survey design (2.2.3) and sample selection (2.2.4) are elaborated. Chapter 2.3 is explaining the econometric models, namely conditional logit model and mixed logit model. Finally, chapter 2.4 is outlining the methodology used to determine the WTP for the selected attributes.

2.2.1 Selection of attributes and levels

The previous chapter identified the following three attributes to be used in the DCE: "co-Benefits", "transparency" and "type". In order to be able to design the survey more precisely, "type" was renamed to "project type" and "transparency" to "price transparency".

A summary of all attributes and their codes used for the choice modelling exercise in Stata can be found in table 3.

Table 3: Coding of attributes and levels

Attribute	Code	Level	Code
Co-Benefits	CB	No Co-Benefits	0
		Social Co-Benefits	1
		Environmental Co-Benefits	2
Price Transparency	PT	No Information	0
		Price Breakdown	1
Project Type	TY	Forest Protection	1
		Renewable Energy	2
Price	EUR	5	1
		10	2
		15	3
		20	4
		25	5

DCEs are commonly used in surveys using multiple choice sets, each of which contains hypothetical choices from which respondents will have to choose. Each choice is described by a set of attributes with multiple levels. The levels are indicating the range of characteristics that differ between choices (Lancsar and Louviere 2008). According to Ryan et al. (2012) the selection of attributes and levels should not only be informed by literature and be based on qualitative work such as focus group (which has been covered under chapter 2.1.1 and 2.1.2), but also be potentially actionable. To meet this aspect, the levels of attributes were established and confirmed with the help of an expert (Anna Lemström, Deputy Managing Director South Pole Finland).

Co-benefits The benefits of an offsetting project can go beyond emission reduction. Co-benefits are any additional impacts that are not directly related to reducing GHG

emissions. An example can be replacing coal- fire with solar-powered cookstoves, which not only reduces emissions but also improves air quality (SecondNature 2019). Consequently, the risk of household members developing respiratory infection is reduced. Other co-benefits could be environmental (e.g. protecting endangered species) or economical (e.g. providing new income streams for local community). In regards to co-benefits three levels have been selected for the DCE:

- ^ Social co-benefits: The offsetting project is addressing social co-benefits in addition to reducing emissions.
- ^ Environmental co-benefits: The offsetting project is addressing environmental co-benefits in addition to reducing emissions.
- ^ No co-benefits: The offsetting project is purely reducing emissions without any co-benefits.

Price transparency The price of compensation is made up of many factors, including the actual project activities and salaries for local stakeholders but also the standard, the third-party verification and the national administration cost for the offset provider (Hamilton et al. 2007). A detailed breakdown of pricing could provide more transparency to the end-buyer and make it possible to estimate if a reasonable price has been paid (McKinsey 2020). In regards to transparency two levels have been selected for the DCE:

- ^ Price breakdown: The information provided includes a price breakdown which informs the end buyer exactly how much money is going into the project, to different parties involved and to the offset provider.
- ^ No information: No information about the price breakdown is provided, in other words no price transparency is given.

Project type Carbon offset credits can be generated through a variety of project types that reduce emissions or increase carbon sequestration. For example, a carbon offset

project might be based on renewable energy, forest protection, reforestation or community related activities. In regards to project type two levels have been selected for the DCE:

- ^ Forest protection: The offsetting measure is based on the amount of carbon stored by avoiding deforestation.
- ^ Renewable energy: The offsetting measure is based on reducing fossil-fuel emissions from conventional power plants by investing in renewable energy sources, such as solar, wind or hydro power.

2.2.2 Cost attribute

To be able to determine how Finns value different product attributes of carbon credits, a cost attribute was added to the survey. The cost attributes allowed to identify respondents' WTP for a specific level of attribute (Bennett and Blamey 2001).

The price of carbon credits transacted in the Voluntary Carbon Market varies strongly due to numerous factors. According to the State of Voluntary Carbon Markets 2021 report published by Forest Trends' Ecosystem, a credit (equivalent to 1 ton of CO₂) issued by renewable energy projects, such as solar or run-of-river hydro power, were sold at an average price between USD 0.8 and USD 1.5. Forestry and land use projects were much more expensive showing an average price between USD 4.4 and USD 8.1 for a reforestation and reforestation projects (Marketplace 2021). The numbers given by the State of Voluntary Carbon Market report 2021 mostly include volumes traded by brokers and companies (Marketplace 2021), hence the expected price for individual voluntary offsetting was expected to be higher due to smaller volumes transacted.

To find a realistic price for the choice experiment, prices given by different airlines offsetting initiatives were compared. Since the final price depends on the total amount of CO₂ emitted, which relates to the distance of the flight, an invented route from London (LHR) to New York (JFK) was used. Following prices were stated:

- ^ Finnair: at EUR 12.45 EUR/t (<https://finnair.choose.today/>)
- ^ Lufthansa: at EUR 6.86 (www.lufthansa.com/paid)

^ Jet Blue: at USD 12/EUR 10.35 (www.carbonfund.org/partners/jetblue/)

^ British Airways: at USD 15.00/EUR 12.95 (www.pureleapfrog.org/ba/carbonneutral)

Interesting to note is that different platforms indicated different values for the final amount of emissions produced. Finnair's website stated an carbon footprint of 0.66t of CO₂e, whereas Lufthansa's compensaid program calculated 0.34t of CO₂e for the same flight.

Based on the findings from these three airline offsetting programmes, the levels of the cost attribute were set to EUR 5, EUR 10, EUR 15, EUR 20 and EUR 25.

2.2.3 Experimental design

One attribute with three levels, two attributes with two levels and one attribute with five levels resulted in a total of 60 possible combinations for one alternative ($3^1 \cdot 2^2 \cdot 5^1 = 60$). With the number of possible alternatives being too large to have all survey respondents giving their preference on all of them, an experimental design was needed to be created. The purpose of the experimental design was to find the combinations which are the most effective in requiring survey respondents to make trade-offs and hence gather information on their preferences (Weber 2021).

To construct the experimental design SAS JMP was used, which utilises the Bayesian approach. Within the choice-tasks, dominant alternatives were excluded as they do not require the respondents

Table 4: Fractional factorial design

round	CT	CB	PT	TY	EUR
1	1	1	1	2	1
1	2	2	2	1	4
2	1	2	1	2	5
2	2	1	2	1	1
3	1	1	1	2	1
3	2	3	2	1	2
4	1	3	1	2	4
4	2	2	2	1	3
5	1	1	2	2	3
5	2	2	1	1	1
6	1	2	2	2	2
6	2	1	1	1	5
7	1	1	2	1	5
7	2	3	1	2	3
8	1	3	2	1	1
8	2	1	1	2	5
9	1	3	2	2	5
9	2	2	1	1	4
10	1	3	2	1	3
10	2	2	1	2	2
11	1	3	1	1	5
11	2	1	2	2	4
12	1	1	1	1	4
12	2	3	2	2	2

to make any trade-offs. Prior parameters were set according to JMP's manual and the model was run until an efficient choice design with no dominant alternatives was found. An overview of the fractional factorial design is shown in Table 4.

2.2.4 Survey design

The survey was divided into six sections:

- | | |
|-------------------------------|----------------------------------|
| 1. Introduction | 4. Attribute explanation |
| 2. Demographic questions | 5. Choice tasks |
| 3. General offsetting profile | 6. Choice behaviour and comments |

The sections are explained in more detail below.

1. The Introduction part included explanation of the purpose of the survey, the screening question to ask if the respondent has been living for over 3 years in Finland and informed consent to use the aggregate, anonymous data for the research. A branch was added into Qualtrics after the screening question which led to the end of the survey in case the respondent replied "no" to the question. This was the safeguard that only people who were indeed eligible for the survey would be able to answer it.

2. The demographic questions, such as age, gender and education were used to provide information on the characteristics of the sample and allowed for the estimation of variances in preferences across different socio-demographic group of Finns. The options for gender included "non-binary" and "prefer to self-describe", since LGBTQ academics advocate the use of non-binary gender categories to capture a greater variation in identity and to help addressing inequality (Medeiros et al. 2020).

3. The aim of the offsetting profile section was to bring respondents closer to the research topic and profile participants based on knowledge around environmental and compensation awareness. Questions included "do you think about the environmental impact of flying?", "have you ever seen the option to offset your flight emissions?" and "have you ever purchased carbon offsets?". If "no" was answered to the last question, a

branch appeared which asked to specify reasons for not having purchased o sets. This question was intended to give insights into trust and assessment of credibility of carbon compensation as a tool.

4. The following section described the attributes: co-benefits, price transparency and project type. Warm-up questions asking for preference for each attribute were used to increase familiarity with each level and to keep the section interactive. With the last part of section 4, the choice tasks were introduced. Respondents were asked to imagine booking an airline ticket and o setting their emissions.

5. The choice tasks section consisted of 6 choice sets (12 divided over 2 blocks), showing two options with different attributes and levels according to the Fractional Factorial Design. Since there was no "opt-out" option, in other words "I don't want to buy a certificate", the choice set was designed as a forced option scenario to respondents. Therefore the introduction to the choice tasks included the disclaimer saying "we are aware that your most preferred option might not be available or that you might not like either of the alternatives. If this is the case, choose the one you dislike the least." An example of a choice set is present in Figure 1. The full survey can be found in the Appendix A.

6. The last part of the survey was intended to give more insights into the choice behaviour. A question about decision making gave the respondent the chance to state if she/he took all attributes into account or if specific attributes were ignored. As suggested by Alpizar et al. (2001), this is a common way to determine if a respondent chooses to use a lexicographic strategy because of its simplicity. The last question was designed as a text entry question to allow the participants to provide feedback.

2.2.5 Pilot survey and adjustments

By conducting a pre-test prior to sending out the survey to a larger audience, the general understanding of the content and the overall structure of the survey was intended to be improved. Further the pre-test is expected to detect any misleading information, unclear instructions and improve question phrasing (Kanninen 2007). Special focus was given to the fact that the survey was written in English even though it was addressing mostly non-

Figure 1: Example Choice Set

native English speakers. The researcher was present at the time of pre-testing to capture non-verbal communication by the respondent. As recommended by literature (Boyd et al. 1977), the pilot survey was conducted as a cognitive interview in which four participants were instructed to complete the survey while speaking aloud. By means of the cognitive interview, the researcher was able to see where participants didn't fully understand a question and where participants were pausing or taking longer to read certain parts of the survey. Questions were asked in regards to cognitive difficulties of the survey related to the high number of attributes and the abstract nature of the topic.

Feedback from the four participants included that the concept of a setting and the link to global warming is explained in too much depth (1). One pilot study participant asked for examples for each attribute (2) and the length of the part in which attributes were explained seemed tiring for some (3). Some raised concerns about a high level of English comprehension being required to understand the content (4). One participant forgot the explanation of one attribute once he arrived at the choice set (5).

The feedback from the pilot survey resulted in the following improvements: the ex-

planation of the concept of carbon offsetting was simplified and current IPCC findings removed (1). Examples were added to each attribute to make the topic more tangible (2). Small graphics were included to improve the layout of the survey and increase focus (3). The vocabulary was simplified (4) and finally, a button to go to the previous section was set in Qualtrics, together with a sentence in the choice set introduction saying that "If you are unsure about the attributes used, you can always go back to the previous section in which the attributes were explained." (5). After these adjustments, the general understanding regarding the content and structure was expected to be sufficient among survey participants.

2.2.6 Sample selection

Orme's (1998) formula for an adequate choice experiment sample size was used to calculate the minimum sample size required for the survey:

$$N = 500 \frac{NLEV}{NALT \cdot NREP} \quad (1)$$

where N: respondent sample size

NLEV: highest number of levels per attribute

NALT: number of options per choice set

NREP: number of choice sets per block

The choice experiment included six choice sets per block (NREP) and two number of options per choice set (NALT). The highest number of levels per attribute was considered as three, as the price attribute was omitted. This led to the below equation to calculate the minimum sample size required for this survey.

$$N = 500 \frac{3}{2 \cdot 6} = 125 \quad (2)$$

This indicated that a minimum sample size of 125 was required to be able to identify the main effects on preferences. The targeted sample size was set to 200 to allow room

for invalid responses.

The questionnaire was created and distributed with the online tool Qualtrics. To send out the survey, two Facebook groups were used in which the socio-demographic factors appeared to be very evenly distributed. One group selected [Väspanila](#) (link), a local district in Helsinki, with over 9.000 Facebook members. The other group selected was [Suomalaiset Saksassa](#) Finnish for "Finns in Germany" (link) with over 6.000 Facebook members. The post was written in Finnish and included a randomly selected nature photo to attract attention. As gift cards can be an effective incentive to increase the response rate (Smith et al. 2019), the possibility to win a 50 euro gift card for a well-known Finnish supermarket chain was added to the request to participate. The survey was anonymous, which meant that people who wanted to participate in the race had to leave a comment below the post. Facebook brings posts with new comments to the top of the group, thus each comment ensured renewed visibility and the aim of 200 participants was reached very efficiently and remarkably quickly. A screenshot of the post can be found in the appendices.

After 2 weeks, 234 responses were recorded and the survey was closed. 74 respondents did not show a 100 progress rate, which means that they did not complete the full survey. Out of these 160 replies, four respondents have not been living in Finland for over 3 years and therefore did not fulfil the requirements to be eligible for the survey. One person was identified as a speeder because the duration time was below the set minimum standard of 120 seconds. This led to a total of 153 valid responses. Invalid responses were removed by using Microsoft Excel before uploading the data set into Qualtrics.

2.3 Modelling approach

Discrete Choice Modelling is one tool to get an understanding of people's preferences in a hypothetical market (Hanley et al. 2001). The exercise to study preference chosen for this study was a choice experiment, which asks the respondent to choose one alternative within a choice set. A choice experiment is today the most commonly used approach when studying consumer preferences (OECD 2018).

Choice modelling is based on two concepts, Lancaster's theory of value (Lancaster 1966) and the random utility theory (Thurstone 1927). It is linked to the random utility approach for recreational demand modelling using revealed preference data (Bockstael 1991). Respondents are required to choose between several bundles of (environmental) commodities, which are characterised in terms of their attributes and associated levels. Price is often one of these attributes.

The individual within the sample is presumed to have the following utility function:

$$U_{in} = U(Z_{in}; S_n) \quad (3)$$

where, a level of utility will be correlated with any alternative (in this case carbon credits) for any individual n. The individual will choose alternative i instead of j if

$$U_i > U_j \quad (4)$$

The utility is presumed to depend on the attributes Z which are in the case of this study co-benefits, price transparency, project type and price. These attributes can be perceived differently from various socio-demographic backgrounds (S).

The probability that individual n will choose an alternative within a choice set can be displayed with X function, where C is the complete choice set (Hanley et al. 2001). The function can be read as the individual will choose alternative over j if the utility for the observable part is higher than the unobservable part (Hanley et al. 2001).

$$\text{Prob}(ij|C) = \text{Prob}(V_{in} + \epsilon_{in} > V_{jn} + \epsilon_{jn}; \forall j \in C) \quad (5)$$

For the discrete choice experiment two models, being the mixed logit and conditional logit, were applied. These are presented in the following chapters.

2.3.1 Conditional logit model

The suitable model for choice-specific rather than individual specific attributes is the conditional logit model, displayed in function 6, where $j = 1, 2, \dots, J$ stands for a total of J

alternatives (Greene 2018).

$$\text{Prob}(Y_i = j | z_{i1}; z_{i2}; \dots; z_{iJ}) = \frac{e^{z_{ij}}}{\sum_{j=1}^J e^{z_{ij}}} \quad (6)$$

The Conditional Logit Model was developed by McFadden in 1973 and is commonly used to estimate discrete choice experiment data with fixed effects (Chamberlain 1984). Conditional logit differs from logistic regression given that instead of individual characteristics, levels of distinct attributes are presented to individuals, allowing for coefficient beta calculation. The panel participant is asked to choose between two alternatives, which can be represented within the CL model as followed:

$$U(\text{alternative 1}) = \beta_1 X_{1ti} + \alpha_i \quad (7)$$

$$U(\text{alternative } j) = \beta_j X_{jti} + \alpha_{ij} \quad (8)$$

$$Y_i = \text{choice } j \text{ if } U_i(\text{alternative } j) > U_i(\text{alternative } k) \quad \forall k \in j \quad (9)$$

2.3.2 Mixed logit model

Another application of a multinomial logit model is the mixed logit model (or also called random parameters logit). The model is based on a random coefficient formulation. The modification to the basic multinomial logit model is the parameter specification in the distribution of the parameters across individuals i :

$$\beta_{ik} = \beta_k + Z_i \gamma_k + \epsilon_{ik} \quad (10)$$

where $\beta_k + Z_i \gamma_k$ is the mean of the distribution, ϵ_{ik} is normally distributed with correlation matrix R , γ_k is the standard deviation of the distribution, and Z_i is a vector of person specific characteristics (in this case gender, age, education and employment) which do not vary across choices (Greene 2018). The mixed logit model therefore allows analysis

on how preferences vary according to personal characteristics.

2.3.3 Willingness to pay

Since one alternative specific attribute in the survey conducted was a price variable, the willingness to pay for the alternative specific attributes can be determined. The total derivative of the utility function with respect to the price or cost variable z_{ij1} and the other characteristic z_{ij2} is used as the basis, while all other variables remain constant (Bateman 2002). The utility is then maintained by setting the derivative to zero, as followed:

$$du_{ij} = \beta_1 dz_{ij1} + \beta_2 dz_{ij2} = 0 \quad (11)$$

Once the utility remains constant in case of a marginal change to z_{ij2} , the WTP calculation follows by:

$$WTP = -\frac{\beta_x}{\beta_c} \quad (12)$$

Where x is an attribute, β_x the attributes coefficient and β_c is the coefficient of the price attribute. The negative sign implies that the utility is kept constant, if either z_{ij2} or z_{ij1} increase or decreases. A significant negative value being calculated within the conditional or mixed logit model, would result in a negative WTP estimate, meaning that the attribute has a negative effect on the respondents utility and on the WTP for the attribute (Carlsson et al. 2003). To be able to estimate a WTP value, all carbon credit attributes need to be significant.

3 Results

3.1 Socio-demographic characteristics

Table 5 presents the socio-demographic characteristics of the survey respondents and how these compare to the Finnish census.

Table 5: Sample compared to Finnish census socio-demographics

	Sample absolute	Sample relative (%)	Finland Census (%)	Sample - Census
Gender				
Female	124	81.05	50.59	30.46
Male	27	17.65	49.40	-31.75
Non-binary	2	1.30	0.01	1.29
Age				
18 - 24	11	7.19	9.74	-2.55
25 - 34	49	32.03	16.32	15.71
35 - 44	43	28.1	16.42	11.68
45 - 54	28	18.3	15.21	3.09
55 - 64	16	10.46	16.56	-6.10
65 - 74	5	3.27	16.14	-12.87
75 - 84	1	0.65	9.61	-8.96
Education				
Basic education	4	2.63	25.8	-23.17
2nd/vocational edu.	40	26.32	41.6	-15.28
Higher education	108	71.05	32.6	38.45
Employment				
Full-time employed	82	53.59	50.86	2.73
Other	17	11.11	3.87	7.24
Part-time employed	19	12.42	N/A	N/A
Retired	8	5.23	32.01	-26.78
Student	22	14.38	5.44	8.94
Unemployed	5	3.27	7.82	-4.55

The large majority (81.05%) of respondents were female, while males represented only 17.65% of the sample. Non-binary or prefer to self-describe are 2 out of 153 respondents. The age split of the respondents was quite balanced. The majority was between 18 and 44 years old (cum. 67.32%). The highest percentage of respondents was between 25 and 34 years old (32.03%). 6 out of 153 respondents were over 65 years old. Education degree within the respondents was relatively high, with 108 having completed higher education

(71.05%). 44 respondents stated to have obtained only basic and secondary education. Over half of the respondents indicated to be full-time employed (53.59%), followed by students (14.38%), part time employees (12.42%), other (11.11%), retired (5.23%) and unemployed (3.27%).

For simplicity, it was defined for this study that if there was a 20% difference between the sample and Finland's census, then the results were relatively representative for the specific socio-demographic group. This threshold is being displayed in table 5 with green (< 20%) or with a red colour (> 20%). The information on the census was taken from the Statistical database Finland (Fin. tietokannat, www.stat.fi/en/statistical-data). Data was retrieved for the most recent years, which was either 2022, 2021 or 2020. When referring to the last column of table, it becomes evident that the sample's distribution was relatively representative of Finland's population for age and employment. To better reflect different employment groups, more retired people would have been desirable. The survey sample was not representative when it comes to education and gender, with only non-binary and upper secondary education being within the 20% threshold. The sample had a 30% higher proportion for women and -31.75% smaller proportion for men. The author assessed that extending the survey's opening time on Qualtrics would not result in higher rate of male participants, as a balanced gender distribution was to be expected within the selected distribution channels. Therefore, it was decided to close the survey and proceed with the data analysis.

In this context, it is interesting to note that some comparable studies in the field of carbon neutral living also show a larger proportion of women in the sample, while having a significantly larger sample size { see for example Choi and Ritchie (2014) with n=349, male 31% and female 68%. This leaves room to hypothesise whether women are more attracted to this topic or are generally more willing to participate in a survey on the topic of climate protection.

3.2 Carbon setting and environmental impact awareness

Three questions were designed to ask the participants about their awareness regarding the environmental impact of flying and previous touchpoints with carbon setting. As displayed in table 6, over two-third (66.66%) of the respondents stated to think about the environmental impact of flying when planning a trip abroad. 62 out of 153 respondents answered this question with "definitely yes". Only 18.3% have stated "definitely not" or "probably not" to think about the environmental impact. 23 out of 154 respondents replied that they "might or might not" think about the environmental impact.

Table 6: Environmental impact awareness

	Freq.	Percent	Cum.
Definitely yes	62	40.52	40.52
Probably yes	40	26.14	66.66
Might or might not	23	15.03	81.69
Probably not	17	11.11	92.8
Definitely not	11	7.19	100
Total	n=153		

As shown in table 7, a bit over half of the respondents (52.94%) have seen the option to offset flight emission while booking an airline ticket. To 32.68% this option was not familiar, other 14.38% were not sure, by stating "maybe". One quarter of the respondents stated that they have purchased compensation for their emissions (25.49%). The majority of the respondents (74.51%) replied to have never purchased offsets (see table 8).

Table 7: Have you ever seen the option to offset your flight?

	Freq.	Percent	Cum.
Yes	81	52.94	52.94
Maybe	22	14.38	67.32
No	50	32.68	100
Total	153	100	

If the person answered "no" to the question regarding purchase, a command was built into Qualtrics that automatically displayed a follow up question: As you have selected "No" to the previous question, could you please specify why you have never purchased a

Table 8: Have you ever purchased compensation for your emissions?

	Freq.	Percent	Cum.
Yes	39	25.49	25.49
No	114	74.51	100
Total	153	100	

carbon offset?. The results to this question are displayed in table 9. When analysing these results, it should be noted that multiple answers were possible and that the sample of this question was 114 (respondents who have replied No to the previous question"). The most significant reason why people in the survey said they had never bought carbon offsets is that the information provided seems to be insufficient. Many also stated that they did not know that this option was available. 24 people stated that they believe that carbon credits are not a valuable tool for climate action and 14 people who said they did not have enough confidence in this tool. Notably, the statement "it is too expensive" was selected by only 14 people and seems to be the second least important reason. No person stated that they did not believe in climate change, which indicates a very high level of environmental impact awareness among the group.

Table 9: Why have you never purchased a carbon offset?

Reason	Freq.
I don't have enough information on how offsetting works	33
I was not aware that it exists	28
I don't think carbon credits are a valuable tool for climate action	24
Other, please specify	18
I don't trust carbon compensation	15
I find it too expensive	14
I don't think climate change is real	0

24 people took the chance to express themselves freely (under "other, please specify") and the reasons written down were very diverse. The most frequently given reason seemed to be that people fly only very rarely or not at all. Some others stated that the responsibility should lie with the airline or company rather than the individual. The full list of comments can be found in the appendices.

3.3 Independent preferences

In the fourth part of the survey, the attributes were explained and participants were asked to state their preference for every individual attribute. The decision could be taken independent from any other attribute (not part of a choice-set) and without any price associated to the attribute itself.

An overview of the results can be seen in table 10.

Table 10: Independent stated preferences

Attribute	Level	Absolute (n=152)	Relative (%)
Co-Benefits	Environmental co-benefits	118	77.63
	Social co-benefits	34	22.37
Price Transparency	No information	10	6.58
	Price breakdown	142	93.42
Project Type	Forest Protection	88	57.89
	Renewable Energy	64	42.11

Based on these results, the below conclusions can be drawn.

- ^ Co-benefits: The vast majority of respondents stated that they would prefer environmental co-benefits (118 out of 152) over social co-benefits (34 out of 152).
- ^ Price Transparency: 93% of the respondents stated that they prefer a price breakdown over no information where the money spent on the offsetting activities is exactly allocated.
- ^ Project Type: Emission reduction projects related to forest protection were slightly more preferred than renewable energy (57.8% and 42.1% respectively)

3.4 Attribute non-attendance

In a typical DCE application, respondents are expected to examine all of the provided attributes while assessing and selecting their favourite alternative. Contrary, a growing body of evidence suggests that when confronted with a standard choice assignment in a DCE exercise, some respondents may make decisions based on a few selected attributes

while ignoring others (Carlsson et al. 2010). Attribute non-attendance (ANA) or attribute ignoring are terms used to describe this behaviour.

According to Nguyen et al. (2015) there are several reasons why respondents ignore attributes, such as cognitive burden, the design of the choice tasks, lexicographic ordering and protest-like reasons (for example in this case not agreeing with paying for compensation). Carlsson et al. (2010) suggest that when ANA is considered, model performance improves and possible biases in welfare and willingness to pay estimates are reduced. With this background, a question asking "We're curious about how you decided which choice set to choose. Did you ignore any of the attributes when making your decision?" was added after the choice tasks exercise. Multiple answers were allowed. The results from this question in table 11 show that the majority of respondents stated to have ignored at least some attributes. 58 out of the 153 respondents stated that they took all the attributes into account. Due to time constraints of this study, no further analyses were conducted with this data. However, it would be worthwhile for future studies in the context of aviation setting to measure the impact of ANA on welfare estimates. This limitation may lead to possible bias in further results and should be taken into account when these are generalised.

Table 11: Attribute non-attendance

Freq.	Statement
58	No, I took all the attributes into account.
46	Yes, I have ignored the price
30	Yes, I have ignored price transparency
26	Yes, I have ignored project type
25	Yes, I have ignored co-benefits

3.5 Logit model outcomes

Table 12 displays the outcome of running the commands for mixed and conditional logit models in Stata. Co-benefit and price transparency have a positive coefficient at 1% level, whereas project type and price show a negative coefficient at 1% level. These results are in line with prior expectations. This can be translated into an increase in the level of the

attribute either increasing the respondents utility (being the case for co-benefits and price transparency) or decreasing the respondents utility (being the case for project type and price). Hence the respondents do prefer environmental co-benefits and price transparency but show less preference for renewable energy and higher prices.

The mixed logit model takes a look into preference heterogeneity. The mean and standard deviation (SD) of the random parameters are calculated by the ML. Except for the cost parameter, the model assumes that the attribute parameters are random with a normal distribution to account for preference heterogeneity. As a result, these models' coefficients have a standard deviation, which is listed in the last column in the table below.

Table 12: Overview conditional and mixed logit model

Attribute	Conditional logit	Mixed logit	
	LR chi2(4) = 224.44	LR chi2(3) = 41.50	
	Coefficients	Coefficients	
		Mean	SD
Co-Benefits	0.539	0.770	0.614
Price Transparency	0.753	1.077	-0.523
Project Type	-0.245	-0.348	1.177
Price	-0.226	-0.320	

3.6 WTP estimates

The results for the willingness to pay estimation were in line with prior expectations. The preferences indicated for each attribute (see chapter 3.2) showed that the respondents had a clear preference for environmental co-benefits over social co-benefits and for price breakdown rather than no pricing transparency. The WTP estimates are consistent with these findings.

An overview of the WTP values for each attribute can be found in table 13. The estimates of all attributes were significant (1% level). On average respondents were willing to pay 12.03 EUR for environmental co-benefits instead of social co-benefits. To ensure price transparency respondents were willing to pay on average 16.81 EUR in comparison to no price breakdown. Renewable energy as a project type instead of projects related to

forestry decreased the willingness to pay by 5.44 EUR on average. It is important to note that a negative WTP value is not equivalent to a Willingness to Accept value (Adamowicz et al. 1998). The choice experiment would have to include levels of the attributes that are below the status quo levels in order to determine WTA values (Adamowicz et al. 1998). All attributes had wide confidence intervals (visible in the last two columns of table X) ranging from 7.10 EUR for co-benefits, 8,50 EUR for price transparency and 8,24 EUR for the project type.

Table 13: WTP for attributes of carbon neutral logging

Attributes	WTP	(95% CI)	
Co-benefits	12.03	8.48	15.58
Price transparency	16.81	12.56	21.06
Project type	-5.44	-9.56	-1.32

When estimating the share of respondents with negative WTP for the different attributes, it became evident that price transparency resulted in a positive willingness to pay for almost all of the respondents (99.99%), see table 14.

Table 14: Share of respondents with negative WTP

Attributes	Share with negative WTP
Co-benefits	10.00%
Price transparency	0.01%
Project type	61.63%

4 Discussion

This section briefly compares the results of the DCE with other papers published in the field. It then discusses feedback given during the conduction phase of the survey. Thereafter the limitations of the study are elaborated, which are complemented by suggestions for future research in the conclusion section.

4.1 Contributions to knowledge

This research makes several contributions to knowledge in the field of offsetting preferences and behaviour in a Finnish context. Similar studies regarding compensation preferences focused on psychological factors such as attitude (Araghi et al. 2016) or environmental knowledge (Gossling et al. 2009)

Other studies have been conducted considering product attributes such as program location (Blasch and Farsi 2014), offset provider (MacKerron et al. 2009) and emissions amount (Choi et al. 2018). However project type (Choi and Ritchie 2014) and co-benefits (MacKerron et al. 2009) have been studied by few researchers.

With regard to the type of project, Choi and Ritchie (2014) obtained a different result from the one observed in this study. They examined the preferences between forest management and renewable energy, which is slightly different from this study, as they called it forest management instead of forest protection. By conducting a discrete choice experiment in Australia, they concluded that renewable energy is preferred over forest management (coef. of 0.44 significant at $p < 0.01$ with renewable energy being labelled as 1 and forest management as 0). This deviation from the present study may have different underlying causes. First, the number of participants, with 349 useful responses (see Choi and Ritchie (2014) p. 1244), was significantly larger than this study with 153 valid responses. Furthermore, Choi and Ritchie (2014) targeted university students and staff members, whereas this study covered a broader spectrum of the population. The timing of the study - conducted in 2012 being 10 years before this study - may also be one reason. Furthermore, Choi and Ritchie (2014) has chosen to call this project type "project management", whereas the term "protection" has been used for the purpose of

this study. One hypothesis may be that the term protection is met with greater approval than management, as the demand of "need to protect forest and biodiversity" has been voiced very strongly by media and researchers in recent decades (Masson-Delmotte et al. 2018).

Finally, the cultural and country-specific context between an Australian and a Finnish panel should not be ignored. According to the Finnish Ministry of Agriculture and Forestry (2022) Finland has over 75% forest cover, of which almost 12,6% - the highest share in Europe - is protected or under restricted use. Further, Finland has a long history of using wood for manufacturing paper and packaging materials as well as for energy production (Finnish Ministry of Agriculture and Forestry 2022). The proximity to the forest as well as its economic importance provide a reasonable rationale for why forest protection is considered very important in Finland and possibly even more important than in other regions of the world. With regard to co-benefits, the results of this study coincide with those of MacKerron et al.(2008), as they also concluded that conservation and biodiversity were the highest ranked levels according to respondents in the UK.

According to the author's best knowledge, this is the only study considering price transparency as an attribute, which is astonishing since - according to the choice modelling - this has been identified as being the most sensitive attribute within this research. Therefore, the findings on the importance of price transparency could be seen as helping to close an important knowledge gap. Furthermore, the author is not aware of any study examining offsetting attributes and their preferences and WTP in a Finnish context. While some studies have been conducted in Europe (for example in Sweden by Gossling et al.,2009), it is important to have a country and culture specific data base to enable tailor-made offsetting strategies.

4.2 Feedback during conduction phase

The conduction phase to the survey provided room for very interesting feedback discussions, which could no longer influence the structure of this survey, but should be mentioned here in order to improve future, potentially similarly structured studies. One respondent

raised the argument that he selected at the beginning of the survey "I don't think that carbon offsetting is a valuable tool for climate action" and he was displeased with the fact that he was still forced to make a decision on which certificate he would buy. He suggested either adding an introductory sentence to the choice sets, such as "if you would still buy offsetting, then..." or to include a third choice alternative which represents no compensation. He argued that this would be important in order to represent a real-life choice situation. The possibility of including such an alternative, a so-called opt-out option, was rejected by the author after extensive deliberation. Despite the fact that research raises concerns that overlooking opt-out effects in discrete choice experiments can have repercussions for marginal willingness to pay estimation (Campbell and Erdem 2019), a study (Veldwijk et al. 2014) on the effect of opt-out option, showed that over 20% of respondents opted out when given the choice. Further the study suggested that lower educated respondents showed significantly higher opt-out rates. As the time and resources for the present study were limited, losing up-to 20% responses or reducing the response rate with a lower education background could not be accepted. Therefore the survey was set up as a forced choice model.

Another respondent said "in the first part of the survey, there is an assumption made that everyone has recent experience in booking flights. I find this problematic in many ways. Some don't fly and reasons are many. This made me feel a bit of an outsider." Another person wrote a private message to the author saying that he wanted to participate but chose not to because he doesn't fly. The aim of the survey should of course not be that people feel excluded and everyone who wants to participate should feel welcome and integrated. However, for practical reasons, the survey had to be narrowed down and steered in a certain direction. To support people who don't fly and to give them an open space to express their opinion, an option like "I don't fly" or "I don't purchase flight tickets" could be included for future studies. The full list of written comments provided during the survey can be found in the appendices.

4.3 Limitations

Before a conclusion can be drawn, attention should be given towards the limitations of this research. As argued by Ritchie et al. (2021) context is an important factor when studying choice preferences. Choi et al. (2018) came to the conclusion that for national flights, the WTP is higher compared to international flights due to "perceived" frequency of national flights and lower price for flights. According to McLennan et al. (2014) unaccompanied travellers are more likely to decide to offset their flight emissions than within a group booking context. This research did not study the booking context but could be supplemented by adding scenarios to the survey such as "imagine you book a ticket to fly from Helsinki, Finland to Sydney, Australia" vs. "imagine you book a ticket to fly from Helsinki, Finland to Finland" or "Imagine you book a ticket for yourself" versus "Imagine you book a ticket for a group of 5 friends including you" to get more insights on how the booking context influences decision making.

While posing a high number of challenging trade-off questions improves statistical efficiency, response efficiency is higher when presented with a fewer number of straightforward trade-offs (Johnson et al. 2013). Experimental economists and psychologists have discovered evidence indicating there is a limit to how much information participants can process while making decisions. Choice complexity can lead to more random mistakes or at the very least inaccuracy in replies (OECD 2018). With this in mind, another limitation of this study is possible inaccuracies and errors in the original survey dataset used for the analysis. Although precautions were taken, such as minimising the number of attributes and choice sets, imprecision of responses cannot be excluded.

The welfare estimates derived from the DCEs are sensitive to the general research and methodology design (OECD 2018). For example there are certain limitations in regards to the focus group and pre-study conducted. If the sample for the pre-study would have been larger or within a different setup, other attributes might have been prioritised and selected for the survey. This becomes even more evident, when taking into account other studies in this field which have deemed other attributes as important (Araghi et al. 2016; Gössling et al. 2009; Blasch and Farsi 2014; MacKerron et al. 2009; Choi and Ritchie

2014).

Another limitation is due to the hypothetical nature of the choice experiment. Respondents were asked to make a choice on two theoretical alternatives without it having real consequences for the person. Even if a person stated for example a high willingness to pay for price transparency, it can not be concluded that this behaviour and decision making would be identical in a real scenario. Therefore the results, such as WTP estimates should be viewed while presuming a grain of hypothetical bias.

Despite the sample size being larger than suggested by (Orme 1998), it was still relatively small compared to other DCEs. Further, the sample was skewed towards women and young people. Having a larger and more diverse sample size would have decreased the width of the confidence intervals and increased the data quality.

All of the above limitations should be kept in mind while drawing conclusions and generalisations from the results.

5 Conclusion

While this choice experiment is of qualitative and exploratory nature, it does add weight to previous work on preferences for aviation carbon offsets. According to the author's best knowledge, this is the only study considering price transparency as an attribute. The findings on the importance of price transparency could be seen as helping to close an important knowledge gap. Furthermore, the author is not aware of any study examining offsetting attributes and their willingness to pay estimates in a Finnish context. While some studies have been conducted in Europe, it is important to have a country and culture specific data base to enable tailor-made offsetting strategies.

The first objective of this study was to find an answer to the question: What carbon credits attributes are most important to consumers in Finland when booking a flight ticket? The data showed that most important attributes were "co-benefits", "price transparency" and "project type". When it comes to the specific levels of these attributes the vast majority of respondents stated that they would prefer environmental co-benefits over social co-benefits. Nearly all of the respondents stated that they prefer a price breakdown over no price breakdown. Emission reduction projects related to forest protection were slightly more preferred than renewable energy. It must be noted however that the sample was not large enough to generalise the results to the Finnish population.

The second objective of this study was to find an answer to the question: What are consumers willing to pay for these attributes? On average respondents were willing to pay a higher price for environmental co-benefits instead of social co-benefits. To ensure price transparency respondents were willing to pay considerably more in comparison to no price breakdown. Renewable energy as a project type instead of projects related to forestry decreased the willingness to pay. When estimating the share of respondents with negative WTP for the different attributes, it became evident that price transparency resulted in a positive willingness to pay for almost all of the respondents.

Beyond the objective, this study has revealed meaningful insights into environmental and offsetting awareness of Finnish consumers. Over two-third of the respondents stated to think about the environmental impact of flying when planning a trip abroad. About

one third stated to have never seen the option to offset their flight emissions and the majority of the respondents over two thirds replied to have never purchased offsets. The most significant reason why people in the survey said they had never bought carbon offsets is that the information provided seems to be insufficient. Many also stated that they did not know that this option was available.

Based on the results of this study some practical recommendations for airline offsetting programs can be drawn. Since price transparency seems to be the most crucial attribute, offsetting providers should work on giving an accurate price breakdown of where and how the client's money is spent. In order to justify the high price of the credits and to get more money flowing into climate protection, price transparency is crucial. Environmental co-benefits are more valued than social ones, meaning that the focus of project developers should be on agriculture, forestry and other land-use projects that have a strong emphasis on aspects such as biodiversity or the protection of endangered species. Although a high percentage are concerned about the environmental impact, most people said they have never offset emissions. This can be changed through a better visibility and marketing campaign for flight offsetting. Sufficient information must be provided to the consumer to increase trust and facilitate the choice.

With background to the mentioned limitations of this study, avenues for future research can be suggested. Considering the feedback on the missing opt-out alternative, a solution for the future could be to use a dual response, which first forces the participant to make a choice and following asks if they would like to opt out if given the choice. As the rate of responses from the older population and men was low compared to the Finnish census, a broader and comprehensive study would be recommended. It might be worth considering translating the survey into Finnish to reach a broader population segment. Finally, revealed choice data about the actual offsetting behaviour within the Finnish context should be collected. This would allow to compare this data on hypothetical decision making processes with preferences Finnish consumers are having under real life circumstances.

References

- Adamowicz, W., P. Boxall, M. Williams, and J. Louviere (1998). Stated preference approaches for measuring passive use values: choice experiments and contingent valuation. *American journal of agricultural economics* 80(1), 64{75.
- Araghi, Y., M. Kroesen, E. Molin, and B. Van Wee (2016). Revealing heterogeneity in air travelers' responses to passenger-oriented environmental policies: A discrete-choice latent class model. *International Journal of Sustainable Transportation* 10(9), 765{772.
- Bateman, I. (2002). *Economic valuation with stated preference techniques: a manual* Volume 50. Edward Elgar Cheltenham.
- Bennett, J. and R. Blamey (2001). *The choice modelling approach to environmental valuation*. Edward Elgar Publishing.
- Blasch, J. and M. Farsi (2014). Context effects and heterogeneity in voluntary carbon offsetting—a choice experiment in Switzerland. *Journal of Environmental Economics and Policy* 3(1), 1{24.
- Bockstael, N. E. (1991). Recreation, measuring the demand for environmental quality. *Contributions to Economic Analysis* 198227{270.
- Boyd, H. W., R. L. Westfall, and S. F. Stasch (1977) *Marketing research: text and cases* McGraw-Hill/Irwin.
- Brouwer, R., L. Brander, and P. Van Beukering (2008). "A convenient truth": air travel passengers' willingness to pay to offset their CO₂ emissions. *Climate Change* 90(3), 299{313.
- Campbell, D. and S. Erdem (2019). Including opt-out options in discrete choice experiments: issues to consider. *The Patient-Patient-Centered Outcomes Research* 1(2), 1{14.

- Carlsson, F., P. Frykblom, and C. Liljenstolpe (2003). Valuing wetland attributes: an application of choice experiments. *Ecological economics* 47(1), 95-103.
- Carlsson, F., M. Kataria, and E. Lampi (2010). Dealing with ignored attributes in choice experiments on valuation of Sweden's environmental quality objectives. *Environmental and Resource Economics* 47(1), 65-89.
- Chamberlain, G. (1984). Panel data. *Handbook of econometrics*, 2, 1247-1318.
- Choi, A. S., S. Gössling, and B. W. Ritchie (2018). Flying with climate liability? economic valuation of voluntary carbon offsets using forced choices. *Transportation Research Part D: Transport and Environment* 62, 225-235.
- Choi, A. S. and B. W. Ritchie (2014). Willingness to pay for flying carbon neutral in Australia: an exploratory study of offsetter profiles. *Journal of Sustainable Tourism* 22(8), 1236-1256.
- Donofrio, S., P. Maguire, S. Zwick, W. Merry, J. Wildish, and K. Myers (2020). State of the voluntary carbon markets 2020. Second Installment of the 2020 State of the Voluntary Carbon Markets: The only Constant is Change | Featuring Core Carbon & Additional Attributes Offset Prices, Volumes and Insights
- Finnish Ministry of Agriculture and Forestry (2022). Forest Resources in Finland. <https://mmm.fi/en/forests/forestry/forest-resources>.
- Gössling, S., L. Haglund, H. Kallgren, M. Revahl, and J. Hultman (2009). Swedish air travellers and voluntary carbon offsets: towards the co-creation of environmental value? *Current Issues in Tourism* 12(1), 1-19.
- Greene, W. (2018). *Econometric analysis*. Stern School of Business, New York University.
- Hamilton, K., R. Bayon, G. Turner, and D. Higgins (2007). State of the voluntary carbon markets 2007. *Picking up steam*. Washington, DC

- Hanley, N., S. Mourato, and R. E. Wright (2001). Choice modelling approaches: a superior alternative for environmental valuation? *Journal of economic surveys* 15(3), 435-462.
- ICROA (2020). Evolution of voluntary carbon market, [online], accessed 21-04-2021. url : https://voluntarycarbonmarket.org/docs/vcm_interactive-pdf-version-1-with-introduction.pdf.
- Institute, S. E. (2019). Weaker methods: Relying on price or vintage, [online], accessed 10-09-2021. url : <http://www.oasetguide.org/weaker-methods-relying-on-price-or-vintage/>.
- Johnson, F. R., E. Lancsar, D. Marshall, V. Kilambi, A. Muhlbacher, D. A. Regier, B. W. Bresnahan, B. Kanninen, and J. F. Bridges (2013). Constructing experimental designs for discrete-choice experiments: report of the ispor conjoint analysis experimental design good research practices task force. *Value in health* 16(1), 3-13.
- Kanninen, B. J. (2007). Valuing environmental amenities using stated choice studies: a common sense approach to theory and practice. Volume 8. Springer.
- Lancaster, K. J. (1966). A new approach to consumer theory. *Journal of political economy* 74(2), 132-157.
- Lancsar, E. and J. Louviere (2008). Conducting discrete choice experiments to inform healthcare decision making. *Pharmacoeconomics* 28(8), 661-677.
- Lu, J.-L. and C.-Y. Wang (2018). Investigating the impacts of air travellers' environmental knowledge on attitudes toward carbon offsetting and willingness to mitigate the environmental impacts of aviation. *Transportation Research Part D: Transport and Environment* 59, 96-107.
- Mackerron, G. J., C. Egerton, C. Gaskell, A. Parpia, and S. Mourato (2009). Willingness to pay for carbon offset certification and co-benefits among (high-) flying young adults in the uk. *Energy policy* 37(4), 1372-1381.

- Marketplace, F. T. E. (2021). 'Market in Motion', State of Voluntary Carbon Markets 2021, Installment 1. Washington DC: Forest Trends Association.
- Masson-Delmotte, V., P. Zhai, H.-O. Portner, D. Roberts, J. Skea, P. R. Shukla, A. Pirani, W. Moufouma-Okia, C. Pean, R. Pidcock, et al. (2018). Global warming of 1.5 °C. An IPCC Special Report on the impacts of global warming of, 1{9.
- McKinsey (2020). A blueprint for scaling voluntary carbon markets to meet the climate challenge, [online], accessed 10-09-2021. url : <https://www.mckinsey.com/business-functions/sustainability/our-insights/a-blueprint-for-scaling-voluntary-carbon-markets-to-meet-the-climate-challenge>.
- McLennan, C.-I. J., S. Becken, R. Batty, K. K. F. So, et al. (2014). Voluntary carbon offsetting: Who does it? *Tourism Management* 45(C), 194{198.
- Medeiros, M., B. Forest, and P. Ohberg (2020). The case for non-binary gender questions in surveys. *PS: Political Science & Politics* 53(1), 128{135.
- Nguyen, T. C., J. Robinson, J. A. Whitty, S. Kaneko, and T. C. Nguyen (2015). Attribute non-attendance in discrete choice experiments: A case study in a developing country. *Economic Analysis and Policy* 4722{33.
- OECD (2018). Cost-Benefit Analysis and the Environment
- Orme, B. (1998). Sample size issues for conjoint analysis studies. Sequim: Sawtooth Software Technical Paper
- Ritchie, B. W., A. Kemperman, and S. Dolnicar (2021). Which types of product attributes lead to aviation voluntary carbon offsetting among air passengers? *Tourism Management* 85104276.
- Ryan, M., J. R. Kolstad, P. C. Rockers, and C. Dolea (2012). How to conduct a discrete choice experiment for health workforce recruitment and retention in remote and rural areas: a user guide with case studies. Technical report, The World Bank.

- SecondNature (2019). Co-benefits of carbon offset projects: Information for carbon offset procurement, [online], accessed 10-09-2021. url : <https://secondnature.org/wp-content/uploads/co-benefits-document-rev5.pdf>.
- Segerstedt, A. and U. Grote (2016). Increasing adoption of voluntary carbon offsets among tourists. *Journal of Sustainable Tourism* 24(11), 1541-1554.
- Smith, M. G., M. Witte, S. Rocha, and M. Basner (2019). Effectiveness of incentives and follow-up on increasing survey response rates and participation in field studies. *BMC medical research methodology* 19(1), 1-13.
- Stocker, T. (2014). *Climate change 2013: the physical science basis: Working Group I contribution to the Fifth assessment report of the Intergovernmental Panel on Climate Change* Cambridge university press.
- Thurstone, L. L. (1927). A law of comparative judgment. *Psychological review* 34(4), 273.
- Veldwijk, J., M. S. Lambooy, E. W. de Bekker-Grob, H. A. Smit, and G. A. de Wit (2014). The effect of including an opt-out option in discrete choice experiments. *PLoS one* 9(11), e111805.
- Weber, S. (2021). A step-by-step procedure to implement discrete choice experiments in qualtrics. *Social Science Computer Review* 39(9), 903-921.

A Appendices

Introduction/Screening

A.1 Full survey

Welcome and thank you for participating in **the survey for my Master thesis** in Environmental Sciences at the Wageningen University, Netherlands.

The information gained from this survey will give **insights into consumers' preferences on offsetting flight emissions in Finland**. In order to participate in this survey, you must have lived in Finland for at least three years.

Answering all the questions will take **approximately 15 minutes**. The information you provide will remain confidential, and results will only be reported at some aggregate, anonymous level.

If you have any questions about this study or any feedbacks or complaints, please contact me via email at laura.kothe@wur.nl

Thank you!
Laura

,I\RX KDYH V\HDFMG 1R V\WH DERYH TXHM\RQ XQIRUXQDMD \RX GRQWLVWQR V\H UHTXUHP HQW RI V\LV UHM\DUFK
<RX GRQV\CHG V\FRQV\XHI\QJ RXV\WH V\XUH 7KDCN\RX

% FRQV\XQJ Z\LV V\H V\XUH ZHDWXP H\RX JLYH XV\RXULQRUP HGFRQV\QWR XVH V\H DJJUHJDM DCRQ P RXV
GMD IRURXUHM\DUFK

Demographic Questions

: KDWV\RXUJHQHU

- 0DOH
-)HPDOH
- 1RQ ELQDU\
- 3UHIHU WR VHOI GHVFULEH EHZRZ

: KDWV\RXUDJH'

- 8QGHU
-
-
-
-
-
-
-
-
- RU ROGHU

: KDWV\WHKJ\KHM\YH\RI HGXFDWRQ KDWV\RX KDYH FRP SONG'

- %DVLV HGXFDWLRQ

- *HQHUDO XSSHU VHFRQQGDU\ YRFDWLRQDO HGXFDWLRQ
- +LJKHU HGXFDWLRQ

: KFKR V\HIROZIQ EHWSSOH V\RX"

- 6WXGHQW
- 3DUW WLPH HPSOR\HG
-)XOO WLPH HPSOR\HG
- 5HWLUHG
- 8QHPSOR\HG
- 2WKHU

General Offsetting Profile

' R\RX W\QNDERXV\H\HQYLRCP HQDOP SDFVRI IOIQ ZKHQSDGQIQ D WIS DEURDG' b

- 'HILQLWHO\ QRW
- 3UREDEO\ QRW
- 0LJKW RU PLJKW QRW
- 3UREDEO\ \HV
- 'HILQLWHO\ \HV

: KHQERRNQ D IO KW V\HMKDYH\ RX HYHUMHQ V\HRSVRQ V\RI VHV RX IO KWHP L\VRQV\ QH V\H RQH IO V\H IP DJHEHQZ"

VRXUFHOZZWKDQVD FRPSHQVDLG FRP b

- <HV
- 0D\EH
- 1R

+DYH\RXHYHUSXUFKDMHGFRP SHQDMRQIRU RXUHP LMRQV LH DFDUERQRIVHW

- <HV
- 1R

\$V\RXKDYHMHDFMG 1R V\KH SUYMRXV TXHMRQ FRXC\RXSODMV VSHFL\ ZK\RXKDYHGHYHUSXUFKDMHGDFUERQRIVHW

- , ZDV QRW DZDUH WKDW LW H[L VVWV
- , GRQ W KDYH HQRXJK LQVHUPVWDLQRZRRQV KRZ RI
- , GRQ W WUXVW FDUERQ FRPSHQVDWLRQ
- , GRQ W WKLQN FDUERQ FUHGLWV DUH D YDOXDEOH WRRO IRU FOLPDWH DFWLR
- , GRQ W WKLQN FOLPDWH FKDQJH LV UHDO
- , ILQG LW WRR H[SHQVLYH
- 2WKHSDHVDH H[SODLQ

Pre-DCE Questions and Attribute Explanation

Carbon offset attributes

b
 5HGXFQ HP LMRQV LV GHFMDU V\WRS JEDQZDUP IQ 2GHZD V\UHGXFH HP LMRQV LV V\RIVHVSURGFHG HP LMRQV The concept of carbon offsetting is that emissions emitted by an activity, such as flying, are calculated and the corresponding amount is balanced by financing an emission reduction project.;

b
 7KMH FDUERQRIVHVFHUMFDMV FDQKDYH GLIHUHQDMEXMV ZKFK DUH GHVFUEHG LQVHGH V\VFMRQ 3ODVH UHG V\HP FDUHXQ

Co-Benefits



7KEHQHILW RI DQRIVHWQ SURMFWDJR EH RCGHP LMRQV UHGXFMRQ
 Co-benefits are any additional impacts that are not directly related to reducing GHG emissions

\$QH DP SDI FDQEH UHSDI QZ RRGZLV VROUSRZHUHG FRRNRYHV ZKFK GRVROD UHGXFHV HP LMRQV EXVDOR IP SURYHV DLUTXDDV & RQVHTXHQD V\HULN RI KRXV-KRCP HP EHV GHYHGSIQ UHVSUDRU LQHFMRQV UHGXFHG

5HJDLGQ FR EHQHILW \RXZLOKDYH IROZIQ FKREHV b
 b

Social co-benefits 7KHRIVHWQ SURMFWV DGGUHWQ VRFDOFR EHQHILW IQ DGGMRQ V\UHGXFQ HP LMRQV HU UHGXFQ UHVSUDRU GLVDMV
 b

Environmental co-benefits 7KHRIVHWQ SURMFWV DGGUHWQ HQYURCP HQDOFR EHQHILW IQ DGGMRQ V\UHGXFQ HP LMRQV HU SURMFWQ HGGDQHUHG VSHFLV : KFK RI V\HVRVMRQV ZRXC\RX SUHJU

- 6RFLDO FR EHQHILWV
- (QYLURQPHQWDO FR EHQHILWV

Price Transparency



7KH SUIFH RI FRP SHQVDMRQ LV P DGH XS RI P DQ IDFVRU\ LQFOXGLQJ WKH DFWDQFRWRRI WKH SURMFWDFWLYLW\ WKH WLLG SDUW YHULLFDMRQ DQG WKH ILQDODGP LQVWDMRQ FRWWRUWKH RI VHMSURYLGHU

A detailed breakdown of costs could provide more transparency to the end-buyer DGGP DNH\WSRMEOH VR HMVP DM IL D IDLUSUIFH KDV EHQ SDIG

5 HJDLGQJ SUIFH WDG\SDUHCF \ RX Z LQKDYH Z LW WKH IROZ IQJ RSMRQV

b Price breakdown 7KH LQIRUP DMRQ SURYLGHG LQFOXGHV D SUIFH EUHDNGRZ QZ KLEK LQIRUP V WKH HGG EXI HUH DFWD KRZ P XFK P RGH LV JRIQJ LQIR WKH SURMFWVR GLIHUHQ\SDUWHV LQYROYHG DGG VR WKH RI VHMSURYLGHU

b No information 1 R LQIRUP DMRQ DERXVWKH SUIFH EUHDNGRZ Q LV SURYLGHG

b : KLEK RI WKH RSMRQV Z RXG\ RX SUH HU

- 3 ULFH EUHDNGRZQ
- 1 R LQIRUPDWLRQ

Project Type



b & DUERQ RI VHMFUHQW FDQ EH JHQHUDMG WKURXJK a variety of project types that reduce emissions or increase carbon sequestration ([DP SDV RI SURMFWSHV LQFOXGH IRUHV SURMFWRQ LQ RGHUVR DYRLG W HV EHQJ FXVGRZ Q RUHQHZ DEOH QHUJ\ VXFK DV Z LQG RUK\ GUR SRZ HU b

5 HJDLGQJ SURMFWSH \ RX Z LQKDYH WKH IROZ IQJ RSMRQV

b Forest Protection 7KH RI VHMQJ P HDVXUH LV EDVHG RQ WKH DP RXQWRI FDUERQ WRUHG E\ DYRLGQJ GHIRUHMQRRI H\ LMQJ W HV

b Renewable Energy 7KH RI VHMQJ P HDVXUH LV EDVHG RQ UHGXFQJ IRMLOXHOHP LMRQV IURP FROYHQW RQDOSRZ HU SOQW E\ LQYHMQJ LQHQHZ DEOH QHUJ\ VXFUHV VXFK DV VROU Z LQG RUK\ GUR SRZ HU

b : KLEK RI WKH RSMRQV Z RXG\ RX SUH HU

-)RUHVW 3URWHFWLRQ
- 5HQHZDEOH (QHUJ\

Choice Sets

b Please imagine that you book an airplane ticket DGG WDW RX Z DQWR RI VH WKH FDUERQ HP LMRQ FUHDWGIURP \RXUIQKW,QWKHQ\ WHFVRQ\ RX Z LQVH6; different choice sets Z LW VR RI VHMQJ RSMRQV SUHVHQMGHQ\ WR HDFK RWHU

7KHMH DQMLDWHV Z LQFOXGH WKH DMEXWV MWGHFUEHG 3 ODMH VWG ERK LQGHMLODGG indicate which one you are more likely to purchase : H DUH DZ DUH WDW RXUP RWSUH HUHG RSMRQ P LJKVGRVEH DYLDQDEOH RUKDW \RX P LJKVGRVH HUHURI WKH DQMLDWHV ,I WLV LV WKH FDMH FKRRVH WKH RGH\ RX GLDWH WKH ODMW b

,I\ RX DUH XQXUH DERXVWKH DMEXWV XVHG \RX FDQ DQZ D Vgo back to the previous section in which the attributes were explained

CE_Block1 - Nov 26, 2021

\$P RQJ WKH IROZ IQJ RI VHMQJ RSMRQV Z KLEK RGH GR\ RX SUH HU

b	Option 1	Option 2
Co-Benefits	6RFID&R %HCHILW	(QYLRQP HQDC&R %HCHILW
Price Transparency	3UEH %JHDNGRZQ	1 R, QIRUP DMRQ
Project Type	5HCHZDEΘ (CHJ\	) RUHWB URMFVRQ
Price	(85	(85
b <RXU FKRLFH	bb 2 SWLRQ ○	bb 2 SWLRQ ○

\$PRQ WHIROZIQ RIVHWQ RSMRQV ZKFKRCHGR \RXSUHUJ

b	Option 1	Option 2
Co-Benefits	(QYLRQP HQDC&R %HCHILW	6RFID&R %HCHILW
Price Transparency	3UEH %JHDNGRZQ	1 R, QIRUP DMRQ
Project Type	5HCHZDEΘ (CHJ\	) RUHWB URMFVRQ
Price	(85	(85
b <RXU FKRLFH	bb 2 SWLRQ ○	bb 2 SWLRQ ○

\$P RQJ WHIROZIQ RIVHWUJ RSMRQV ZKFK RCH GR \ RX SUHUJ

b	Option 1	Option 2
Co-Benefits	6 RFID&R %HCHIW	1 R&R %HCHIW
Price Transparency	3 UFH %JHNGRZQ	1 R,QIRUP DMRQ
Project Type	5 HGHZ DEΘ (GHU\	) RUHWB URMFVRQ
Price	(85	(85
b	2 SWLRQ	2 SWLRQ
<RXU FKRLFH	○	○

\$P RQJ WHIROZIQ RIVHWUJ RSMRQV ZKFK RCH GR \ RX SUHUJ

b	Option 1	Option 2
Co-Benefits	1 R&R %HCHIW	(QYLRQ HMD&R %HCHIW
Price Transparency	3 UFH %JHNGRZQ	1 R,QIRUP DMRQ
Project Type	5 HGHZ DEΘ (GHU\	) RUHWB URMFVRQ
Price	(85	(85

b	bb	2SWLRQ	2SWLRQ
<RXU FKRLFH	bb	○	○

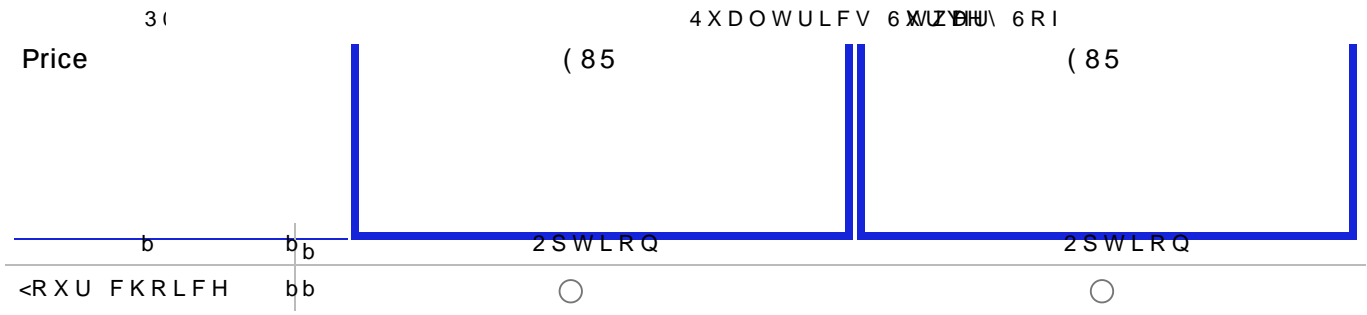
\$PRQJ WHIROZIQ RIVHWU RSMRQ/ ZKFK RCHGR \RX SUHUJ

b	Option 1	Option 2
Co-Benefits	6RFID&R %HCHIW	(QMLRQ HQD&R %HCHIW
Price Transparency	1R,QRUP DMRQ	3UEH%JHDNGRZQ
Project Type	5HQZDEO(CHUJ\	)RUHW\$URMFMRQ
Price	(85	(85

b	bb	2SWLRQ	2SWLRQ
<RXU FKRLFH	bb	○	○

\$PRQJ WHIROZIQ RIVHWU RSMRQ/ ZKFK RCHGR \RX SUHUJ

b	Option 1	Option 2
Co-Benefits	(QMLRQ HQD&R %HCHIW	6RFID&R %HCHIW
Price Transparency	1R,QRUP DMRQ	3UEH%JHDNGRZQ
Project Type	5HQZDEO(CHUJ\	)RUHW\$URMFMRQ



Choice behaviour and comments

: HUHFXURX\DERXWRZ \RXGHGZKLEKFKRLEH\HWRFKRRVH
 'IG\RXLJQRUHQRIWHDMEXM\ZKHQP DNQJ \RXUGFLMRC'
 0 XSGDQZHU\DUHDOZHG

- 1R , WRRN DOO WKH DWWULEXWHV LQWR DFFRXQW
- <HV , KDYH LJQRUHG FR EHQHILWV
- <HV , KDYH LJQRUHG SULFH WUDQVSDUHQF\
- <HV , KDYH LJQRUHG SURMHFW WISH
- <HV , KDYH LJQRUHG WKH SULFH

,I\RX KDYH DQ FRPPHQW RU HPDUN FRGHUQJ WLVXUH SDDVH IHHUHHWRZUMWHP LQWHILG EHZ

CE_Block2 - Nov 26, 2021

+DYH\RX EHQOMQJ LQ) LQCGIRURYHU \HDU'

- <HV
- 1R

\$P RQJ WHIROZIQ RIVHWQJ RSMRQ\ ZKLEK RCHGR \RX SUHUJ

b	Option 1	Option 2
Co-Benefits	6 RFID&R%HCILW	1 R&R%HCILW
Price Transparency	1 R,QIRUP DMRQ	3 UEH%JHDNGRZQ
Project Type	) RUHWB URMVIRQ	5 HQZDEG(GHU\
Price	(85 47	(85

b	bb	2SWLRQ	2SWLRQ
<RXU FKRLFH	bb	○	○

\$PRQJ WHIROZIQ RIVHWUJ RSMRQV ZKFK RCHGR\ RXSUHUJ

b	Option 1	Option 2	
Co-Benefits	1 R&R %HCHIW	6 RFDQ&R %HCHIW	
Price Transparency	1 R,QRUP DMRQ	3 UFH%UHDNGRZQ	
Project Type	) RUHWB URMFVRQ	5 HQZDEQI (QHU\
Price	(85	(85	
b	bb	2SWLRQ	2SWLRQ
<RXU FKRLFH	bb	○	○

\$PRQJ WHIROZIQ RIVHWUJ RSMRQV ZKFK RCHGR\ RXSUHUJ

b	Option 1	Option 2
Co-Benefits	1 R&R %HCHIW	(QMRQF HQDQ&R %HCHIW
Price Transparency	1 R,QRUP DMRQ	3 UFH%UHDNGRZQ
Project Type	5 HQZDEQI (QHU\	) RUHWB URMFVRQ
	48	

Price	(85		(85

b bb 2 SWLRQ 2 SWLRQ
 <RXU FKRLFH bb ○ ○

\$P RQJ WHIROZIQ RIVHWUJ RSMRQV ZKFKRQH GR\RX SUHJU

b	Option 1	Option 2
Co-Benefits	1 R&R %HCHIW	(QYURQP HQMQR %HCHIW
Price Transparency	1 R,QRUP DMRQ	3 UFH%JHDNGRZQ
Project Type	) RUHWB URWFMRQ	5 HQZDEQI (QHJ\
Price	(85	(85

b bb 2 SWLRQ 2 SWLRQ
 <RXU FKRLFH bb ○ ○

\$P RQJ WHIROZIQ RIVHWUJ RSMRQV ZKFKRQH GR\RX SUHJU

b	Option 1	Option 2
Co-Benefits	1 R&R %HCHIW	6 RFIDQR %HCHIW
Price Transparency	3 UFH%JHDNGRZQ	1 R,QRUP DMRQ

49

Project Type	) RUHW3 URMFVRQ	5 HQZ DEØI (QHU\
Price	(85	(85
b	bb	2 SWLRQ
<RXU FKRLFH	bb	○

\$ PRQJ WHIROZIQ RIVHWQ RSMRQV ZKFK RCHGR\ RXSUHUJ

b	Option 1	Option 2
Co-Benefits	6 RFID&R %HCHIW	1 R&R %HCHIW
Price Transparency	3 UFH %JHNGRZQ	1 R,QRUP DMRQ
Project Type	) RUHW3 URMFVRQ	5 HQZ DEØI (QHU\
Price	(85	(85
b	bb	2 SWLRQ
<RXU FKRLFH	bb	○

A.2 Comments on reasons why not buying offsets

Table 15: Reasons why not buying offsets

ID	Could you please specify why you have never purchased a carbon offset?
30	Wasnt available last time I flew
44	I've seen it rarely and in order to purchase it I need more details from the company how they have decided to offset the GHGs
59	I think carbon offsetting should be included on the ticket price and should be the responsibility of the airline.
98	Airlines should invest in carbon neutral flying (biofuels, flying with electricity) and then price the tickets accordingly
109	It so long time ago I was flying (2016), was it even possible..
110	I consider road transportation and food as the main source of carbon emissions. Also, I dont trust corporates. For example, lufthansa is flying empty planes to keep the flying slots at airport, if they care about emissions, they won't do such disgusting practices and same for others.
120	When traveling, I choose other eco-friendlier options if at all possible.
124	I haven't been on a plane since 2016, and I don't remember when I last booked a ticket. Possibly 2009.
127	The possibility has not been highlighted to private persons, I somehow experience it as intended for companies.
130	I work for an airline and I can buy tickets with a discount, it's not possible purchase a carbon offset with staff travel tickets.
135	I am aware of climate change and in my daily life and I try to keep my carbon footprint as small as possible by paying attention on what I consume and how I travel. But I'm flying quite seldom, max twice a year, so I'm not feeling obliged to pay for the carbon compensation.
139	I usually try to save money and I'm not sure I'd be able to afford it. Also I'm not sure it makes a huge difference since the emissions will take place anyhow if I take the flight.
142	Climate change needs system level changes instead of gestures of good will by rich people. Offsetting should be mandatory for airlines, not individual passengers, for example because currently airlines are flying empty planes to keep their take-off and landing slots in high traffic airports
144	I donate regularly to other projects which I trust more.
146	I don't fly at all
147	I did not see this as I last time booked my flight and therefore did not happen to search for it on the Webpage.
149	I fly so seldom.
153	It hasn't been an option (at least I don't remember)

A.3 Comments received within survey

Table 16: Comments during the conduction phase of the survey

ID	Comments
15	Good luck! Keep up the good work!
62	Well built survey
112	Nice taking part
124	In the first part of the survey, there is an assumption made that everyone has recent experience in booking flights. I find this problematic in many ways. Some don't fly and reasons are many. This made me feel a bit of an outsider.
133	Really cool survey, important topic! To me, the only important factor is price transparency. I want to know where my money goes. Although, if I didn't have that option at all, I would still opt for the compensation, pretty much no matter the cost.
137	I often feel like the offset options offered directly by airlines/travel agents are too cheap to make a difference. I would rather always pay the offset on the price of the ticket in the form of tax or surcharge. The seller should always clearly state how much CO2 equivalent the trip will produce.
138	Only looking at the travelling by plane is not enough: change of food in the plate of people towards vegan is best solution, easy, cheap, doable. Thanks so much for all your precious work and contributing. Humanity is proud of you. We are in crisis time and big alarm, we must thrive to a new civilisation which is sustainable. Humanity and nature must live in harmony, otherwise there is no future. Thanks. All the best.
139	I feel the price influences me the most as I have a very low-paid job, even if I'd like to pay more attention to the deal itself I feel like I always "automatically" choose the cheaper one. Also, I tend to ignore the price transparency if the deal includes other option I personally prefer (like forest protection). Altogether it's the combination of things that make out which option I chose. Anyhow, I don't feel like I completely trust CO2 decompensation because it feels like another thing that is a "good idea" but in the end doesn't make a huge difference because most of the costs might as well be used for administrative fees and such, as it often seems to be with charities. I feel there should be more studies and publications presented to the public to gain more trust in carbon compensation and that it actually works.
144	The price transparency is a value in itself, but related and very important is cost efficiency. If for example over 50% of the money goes to management costs and less than 50% to the actual project, I will not purchase the compensation. The price in Euros is not very important to me, but I do care how the money is used.
147	as I did this quite quickly it was difficult to stay coherent
150	It would have been easier to more people to answer if the survey would have been also in Finnish if this is targeted to people who live in Finland

A.4 Facebook post

 **Laura Kothe**
20. Januar · 🌐

Kysely on nyt SULJETTU. Voittajalle on ilmoitettu.
Kiitos und DANKE kaikille osallistujille!

Hi Finns in Deutschland! Ich bin Deutsche und lebe in Helsinki. Ich suche nach Teilnehmern für meine Masterarbeit Umfrage. Würde mich sehr freuen, wenn ihr teilnehmt.

Oletko kiinnostunut ratkaisuihin, joilla voi hillitä ilmastonmuutosta? Päästökompensaatio on yksi niistä.

Osana gradutyötäni teen pientä esitutkimusta suomalaisten kuluttajien mieltymyksistä lentopäästöjen kompensointiin liittyen. Olisin kiitollinen, jos osallistuisit tutkimukseen!

Kyselyyn kuluu noin 10 minuuttia, ja kaikki vastaukset ovat nimettömiä. Kysely on englanninkielinen. Jos jokin on epäselvää, ota rohkeasti yhteyttä minuun.

Kaikkien vastanneiden kesken arvotaan 50 euron S-ryhmä (tai saksalaiseen supermarkettiin 😊) lahjakortti. Koska kysely on anonyymi, lähetä kommentti heti kun olet täyttänyt kyselyn, jos haluat osallistua arvontaan.

https://wur.az1.qualtrics.com/jfe/form/SV_afP3IQF9VQli0p8

Kiitos!




 22  73 Kommentare

Figure 2: Facebook post: request to participate in the survey