Changing attitudes to flying

A dynamic approach to Q methodology to explore changes in air travel attitudes in The Netherlands

Sophie Buteyn
MSc Complex Systems Engineering
and Management

TU Delft

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A dynamic approach to Q methodology to explore changes in air travel attitudes in The Netherlands

by

Sophia Elisabeth Buteyn

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Student number: 4347110
Thesis committee: Prof. dr. B. van Wee, TU Delft, chairman
Dr. ir. M. Kroesen, TU Delft, first supervisor
Dr. ir. C. van Daalen, TU Delft, second supervisor

TU Delft

Summary

Increasing emissions from aviation combined with the intensifying climate change, highlight the need for a sustainable change in the aviation sector. Since innovations making flying in itself more sustainable are taking long to implement, a behavioural change, i.e. flying less or not at all, is necessary.

Recent societal developments show how people's attitudes to flying might play a role in flying behaviour change, and how attitudes might be changing. Earlier research has established a link between people's behaviour and attitudes. However, studies addressing changes in air travel attitudes and what causes those changes are not in abundance.

Hence, the research objective of this thesis was to empirically explore whether and how people have changed their attitudes towards air travel, more specifically what viewpoints can be distinguished in that respect, and to identify what factors can be indicated to explain a change in attitude. The following main research question was central in this study:

> *Whether and how have people's attitudes towards air travel changed and what factors contribute to that change?*

In answering this question, this study has made three scientific contributions. The first is an empirical contribution, as it has added to the currently scarce knowledge base on changing air travel attitudes through conducting a first exploratory and empirical study into how attitudes to flying are changing among a group of Dutch people. The second is a theoretical contribution, as this study successfully applied and therewith partly validated the model on attitude change of Van Wee et al. (2019). Third, this study has made a methodological contribution, as it incorporated a dynamic approach in the Q methodology and thereby addressed its suitability for studying attitude change. Regarding the societal relevance, this research resulted in suggestions for policies that aim at creating attitude change on a larger scale in society, which in turn could stimulate the necessary behavioural changes, i.e. people flying less.

The research consisted of five sub-questions and applied multiple methods. The steps of the Q study were incorporated throughout the research questions.

1: What is the main theory on behaviour and attitude, the relation between attitude and behaviour, and what mechanisms for attitude change can be found?

This was answered through conducting a *literature exploration*. The first step created essential understanding of theoretical relations between attitude and behaviour, specifically to investigate attitude change and the potential causal mechanisms for attitude change. The Theory of Planned Behaviour, Social Cognitive Theory, Transtheoretical Model and Cognitive Dissonance Theory were found to be common attitude and behaviour theories. They suggest attitudes can change and result in assuming a bidirectional causality between attitudes and behaviour. Yet, the exact causal mechanisms leading to attitude change are not captured by them. Here, the comprehensive model of attitude change (van Wee et al., 2019) provided the theoretical lens to interpret identified attitude changes and contributing factors.

2: What are the current attitudes of people towards air travel?

This was answered through conducting a systematic scientific *literature review*. The second research step gained scientific insights into the various existing attitudes and perspectives to flying

that were studied in literature, and initial indications of changes in air travel attitudes and influences on attitudes. It created a general understanding of the aviation discourse around the world. The findings showed how attitudes to flying certainly vary between different people from more positive towards more negative, but could not conclude that one attitude is specifically prevailing. More flying-critical attitudes were seen in the context of climate change, yet, there are inconsistencies between these attitudes and flying behaviour, i.e. the attitude-behaviour gap. Finally, studies indicated attitudes are changing and the COVID-19 pandemic, climate awareness, availability of alternatives and perceived necessity of flying possibly play a role.

3: What changes in attitudes towards air travel can currently be identified?

This was answered through conducting a grey *literature exploration* and six preliminary *interviews*. The third research step identified and created understanding of changes in people's attitudes towards flying that are currently observed among Dutch society, and prevailing air travel attitudes among Dutch society. This provided understanding of the currently prevailing discourses on air travel in the Netherlands specifically. The findings support the results from the previous subquestion. Dutch people are generally positive about air travel, especially its efficiency and possibilities. Nevertheless, a transition towards more negative attitudes seems to take place among various people and in various themes relating to air travel. These include air travel's climate impact, support for certain flying-discouraging and pro-alternatives policy measures, air travel's necessity and self-evidence, its possibilities and consumer's role and responsibility. This information resulted in developing the concourse and final Q set.

4: What are people's viewpoints on air travel and changes in their air travel attitudes and what causes the attitude change?

This was answered through performing a *Q sorting survey*. In the fourth step, a mixed-statement Q study, including statements reflecting current attitudes and attitudes changes, empirically investigated and revealed several attitude changes among 46 respondents from The Netherlands. It identified three different viewpoints that are briefly summarised by the following:

1. Viewpoint 1 (*"Acting more environmentally-aware is our responsibility as flying is harmful"*): They generally hold negative and critical attitudes to flying. They are very aware of climate change and the impact of flying, and express to be more concerned about that compared to five years ago. They have become more critical towards their own flying behaviour and they are more seriously considering the alternatives to flying.

2. Viewpoint 2 (*"Flying is important, although for business less normal and discouraging it never harms"*): They are generally positive about the opportunities that flying offers and how it is a convenient and practical means and efficient compared to alternatives. They have become somewhat more aware of the climate problem, yet, they do not see themselves stopping flying in the near future. They perceive flying for business as less evident than five years ago.

3. Viewpoint 3 (*"Certain aspects of flying have changed, yet, it remains necessary for business"*): They have a rather practical and efficient mindset towards flying, and not necessarily think of it as convenient travel means. Their view to leisure air travel has changed as it has become less normal compared with five years ago. They also have become more aware of the negative consequences due to ease at which everybody flies over the world (i.e. globalisation).

Using the theoretical lens of Van Wee et al. (2019) the attitude changes were analysed and contributing factors were explained. First, the cognitive processes of people knowing more about climate change and the impact of flying on that as well as knowing other options substituting air travel, e.g. online communication or an alternative mode, influence a change in attitude. Second, the affective processes of people feeling climate change importance and concerns and having different

preferences when traveling also influence changes in attitudes. Third, the behavioural processes of people travelling differently, considering alternative transport means and stopping flying influence attitude changes too. Various factors can trigger these processes, such as family situations, encountering climate change information or new experiences with not flying.

5: What relations can be observed between the identified viewpoints and people's actual flying behaviour?

This was answered through the same *survey* of the Q study. In the final step, the flying behaviours per viewpoint, both before and during the pandemic, were analysed. It became clear how only among viewpoint one there were indications of the attitude-behaviour gap. Yet, this viewpoint also typically included people who did not fly at all in the years before the pandemic, showing a consistency between attitude and behaviour. People in viewpoint two have typically continued flying during the pandemic, although less, but they are not frequent-flyers. In the third viewpoint people typically travel by plane more often than the Dutch average, and include the largest share of business travellers. The latter two viewpoint show the most consistent relations between their rather flying-positive attitudes and their flying behaviour.

Conclusion

Finally, this research presented the following conclusions. The results of this research confirm that people in The Netherlands have changed their attitudes in the recent years. The attitude changes were synthesised into three main directions, namely;

- People expressing a *more environmentally-aware view* on air travel,
- People expressing a *more independent view* on air travel, and
- People expressing a *less self-evident view* on air travel.

Based on the extensive analysis in sub-question 4, the factors contributing to the identified changes can be summarised by people knowing more, having different emotions and engaging in certain behaviour.

Policy recommendations

As this research is a first exploratory study into attitude changes and was done among a non-representative sample, it does not easily result in ready-made policy recommendations. Nevertheless, this study has developed initial starting-points for policy measures.

- Policy measures focused on knowledge and awareness: It is recommended to create more widespread knowledge among the population through an information campaign about "responsible daily decisions", in which the climate impact of travelling, and flying specifically, is put in perspective of other impacts of daily life decisions.
- Policy measures focused on emotions: In addition to the first measure, it is recommended to include emotions and personal aspects in the campaign, such as different feelings that people have about climate change and motivations to make responsible decisions, including whether or not to fly.
- Policy measures focused on behaviour: Finally, it is recommended to invest in a campaign that stimulates alternative travel behaviour, for example different holiday behaviour or travelling by train within Europe.

Other suggested recommendations include more monetary measures, such as internalising the environmental effects of flying in flight tickets and making alternatives to flying more affordable and attractive through investing in infrastructure. Nevertheless, this research ends with the critical note that soft policies might not be as fruitful, and more harsh and strong policies are necessary to actually quickly start a behavioural change in the aviation sector.

Preface

This thesis marks the end of my period as a student at the TU Delft that started in 2014. I look back at a valuable time at the faculty of Technology, Policy and Management. Both my bachelor's and master's degree have given me the diverse knowledge and skills that are and will be extremely important to me, being someone with a broad range of interests.

I would like to thank my graduation committee for their guidance. To Maarten Kroesen, many thanks for your supportive words and specific suggestions during our pleasant biweekly meetings. Especially your methodological knowledge was helpful in making the project a success. To Bert van Wee, thank you for your continuous enthusiasm and input during this project and inspiring me to believe in the value of my research. To Els van Daalen, thank you for asking critical questions, bringing your different perspective and offering clear feedback during my research.

Secondly, my thanks go to all the study participants who took the time to participate in my research, making the completion of this project possible.

Finally, I would like to thank my family and friends, who supported me not only during this thesis project, but throughout my entire studies. Especially to my parents, who have always given me the opportunities and continuous support, especially during challenging times. To Robin, thank you for always being there when I needed it the most.

Sophia Elisabeth Buteyn
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1 Introduction

1.1. Background: flying attitudes and behaviour

In August of 2021, the Intergovernmental Panel on Climate Change published its Sixth Assessment Report, warning how climate change is “widespread, rapid and intensifying”. Greenhouse gas emissions from human activities have had an undisputable major influence on this (Intergovernmental Panel on Climate Change, 2021).

With a share of approximately 2.5% in the global CO2 emissions, one clear contributor to rising global temperatures is aviation (Graver et al., 2019; Masson-Delmotte et al., 2021). These emissions are mainly the result of human travel behaviour, as passenger transport accounted for 85% of the global commercial aviation CO2 emissions in 2019 (Graver et al., 2020). Despite improvements in fuel efficiency, efforts are not enough to offset record traffic growth. CO2 emissions from passenger air transport still increased 33% between 2013 and 2019 and in 2050 air travel emissions are forecasted to be 7 to 10 times higher compared to 1990 (Graver et al., 2020; European Parliament, 2019). These facts highlight the need for a sustainable change in the aviation sector. Since technological innovations to make flying more sustainable are not being developed at high pace nor in abundance, this should foremost be a behavioural change. Flying less (far) or not at all are considered promising for reducing CO2-emissions from aviation (Berveling et al., 2020).

One promising development indicates such a behavioural change. In 2017, the anti-flying movement of “flygskam” (flight shame) was born in Sweden, when the Swedish singer Staffan Lindberg pledged to quit flying. Since then it has inspired many people around the world, including climate activist Greta Thunberg, to give up flying for climate reasons, including the negative impact of flying (Reuters, 2020; BBC News, 2020). When Sweden in 2019 experienced a rare 4% drop in air passenger numbers, meaning people flying less, it was suggested this was the result of growing flight shame, that is, changing attitudes to flying (Reuters, 2020; Bloomberg, 2020).

Another recent societal development certainly initiated behaviour change. When in 2020 the COVID-19 pandemic hit, people were forced to stay at home and naturally their flying patterns were broken. A 50 percent drop in global air passenger numbers compared to 2019 was the result (Statista, 2021). Instead of the suggested changed attitudes, this passenger drop was the result of a pandemic. In this case the question arises whether the forced behaviour change itself caused attitudes to flying to change, and whether that results in permanent behaviour change. On top of that, the recent IPCC report and increasing climate crisis news might contribute to people’s climate awareness and sense of urgency nowadays, with that potentially to changing attitudes.

Despite that an actual cause-and-effect between behaviour and attitude was not proven for the above developments, a link between people's behaviour and attitudes has already been established and demonstrated in research. Different relations between attitude (change) and behaviour (change) are established in the theory (see chapter 3), varying from attitudes influencing behaviour to behaviour influencing attitudes. However, it must be noted that empirical studies have explicitly addressed that the relation between attitudes and behaviour is not perfect, due to the so-called 'attitude-behaviour gap' (discussed in chapter 4; i.e. McDonald et al., 2015). People's pro-environmental or anti-flying attitudes are not necessarily consistent with their flying behaviour, hence, attitudes to flying might change, but people's flying behaviour might not. Or, a change in one's flying behaviour does not necessarily lead to a consistent change in attitude. What is more, other factors might be of influence in this relationship as well.

In any case, considering the attitude-behaviour relation, the discussed developments illustrate how people's attitudes to flying might play a role in flying behaviour change, and how attitudes might be malleable. In the light of this and since attitudes are less 'visible' than behaviour, the question arises whether and how the related attitudes to flying are actually changing, what is causing those changes in attitudes and whether those attitude changes could in turn lead to the desired permanent behavioural change in the aviation sector.

1.2. Knowledge gaps and research question

Some research has already been done in the area of attitudes to flying, which is elaborated on in chapter 4. In short, the current research illustrates the existence of a variety of attitudes to air travel. Some bring forward positive attitudes, such as a general liking of air travel (e.g. Kroesen, 2013), the convenience and freedom it offers for travelling (e.g. Higham et al., 2014) and its necessity for business (Nursey-Bray et al., 2019). Other indicate more negative attitudes, such as an overall flying-critical attitude and awareness of the negative impact of flying (e.g. Kroesen, 2013; McDonald et al., 2015; Schrems and Upham, 2020), or concerns during pandemic air travel and decreased propensity to fly (e.g. Lamb et al., 2020). Regarding the latter, multiple studies generally show an increased awareness of the negative environmental effects of flying among people, indicating changes in air travel attitudes. Also the role of the COVID-19 pandemic in changing attitudes is indicated by studies. Considering the literature and the recent societal developments of flight shame, the pandemic and climate urgency, several scientific knowledge gaps remain:

- First, despite the relative wealth of knowledge on people's current attitudes towards flying studied in different contexts, there is a dearth of knowledge on how these attitudes in general have changed over time among a population.
- Secondly, the causes or reasons that people have for attitude changes have not been extensively addressed.

In other words, a study primarily focusing on changes in air travel attitudes and what causes change as well as investigating that in an empirical manner has not been found in the scientific literature. Therefore, the research objective of this study is to empirically explore whether and how people have changed their attitudes towards air travel, more specifically what viewpoints can be distinguished in that respect, and to identify what factors can be indicated to explain a change in attitude. The following main research question is central in this study:

> *Whether and how have people's attitudes towards air travel changed and what factors contribute to that change?*

In answering this question, this study takes a dynamic approach to the Q methodology, as is explained in chapter 2, being the first study to perform this. Therewith, a secondary objective is to

address the suitability of this method. Furthermore, this study addresses attitude changes through applying a new and complex model on attitude change (van Wee et al., 2019), being the first to do so. Therewith, another secondary objective is to apply and partly validate this model.

1.3. Research methodology and sub-questions

1.3.1. Doing a clustering study

Regarding the methodology, an important note has to be made first. Most of the studies into people's air travel attitudes use surveys (e.g. Graham et al., 2020, Ryley et al., 2013) or interviews (e.g. Lamb et al., 2021, Higham et al., 2014), which could be extended to examine if and how changes in these attitudes occur. Following this, investigating attitude change would intuitively and ideally require doing a panel study that objectively measures and quantifies attitude change among a group of people over a period of time. However, for this thesis project it is proposed to study attitude change more conceptually by revealing people's viewpoints in a clustering study through directly and retrospectively asking people themselves about their attitude change. This is for two main reasons. Firstly, this way people's own perspectives on their attitude change can be studied, which includes not only whether and in which direction their attitudes have changed (panel study), but their narratives, motivations, triggers, and behavioural changes as well. Hence, a clustering study can reveal entire viewpoints towards flying based on shared perceptions of change. Despite its subjectivity compared to a panel study, this results in a better understanding of how and why attitudes of people change. The second reason regards feasibility, as conducting a panel study is practically not feasible within the given time for completing a master thesis project at the TU Delft, while a clustering study is.

Here it must be emphasised that this clustering study is not per se better than nor does it rule out a panel study in the future. This study is a first study into changed attitude to flying and has a clear exploratory character. Subsequently, its results can be followed up in other empirical studies, such as a panel study or survey among a representative sample of the population, or be input for modelling studies. Hence, this research rather precedes than excludes these types of studies.

1.3.2. Research approach and sub-questions

In short, the approach to answering the main research question consists of five steps, for which a corresponding research question was formulated. The first step is to create an understanding of attitude change, the relation between attitude and behaviour, and mechanisms for attitude change based on the theory on attitude and behaviour. It provides a theoretical lens to look at the empirical study results in the fourth step.

Sub-question 1: What is the main theory on behaviour and attitude, the relation between attitude and behaviour, and what mechanisms for attitude change can be found?

The second step is to gain insights into people's various, current attitudes to flying found in empirical studies undertaken so far. This furthermore shows initial indications of changes in and influences on attitudes, which is information for the third and fourth step.

Sub-question 2: What are the current attitudes of people towards air travel?

The third step is to identify what changes in people's attitudes towards flying can currently be observed among society and why they take place. This is input for the fourth step.

Sub-question 3: What changes in attitudes towards air travel can currently be identified?

The fourth step is to empirically explore the variety of (changes in) attitudes from the third step among a group of study participants in order to reveal the different viewpoints (i.e. clusters) on air travel, including changes in attitudes and their causes, that exist.

Sub-question 4: What are people's viewpoints on air travel and changes in their air travel attitudes and what causes the attitude change?

The final step is to explore the relations between the identified viewpoints, from the fourth step, and people's flying behaviour to inform policy recommendations aiming at creating broader attitude change among society.

Sub-question 5: What relations can be observed between the identified viewpoints and people's actual flying behaviour?

Conducting this research and clustering study benefits from a mixed-method approach, as it incorporates research elements and requires methods that are both qualitative and quantitative in nature. Moreover, the research elements and methods are clearly interconnected (Creswell, 2014, p.32; Tashakkori and Creswell, 2007). Namely, the research involves conducting desk research including literature explorations (qualitative) to gather the data for the first two steps. This consequently provides input for the empirical data gathering, including interviews and cluster analyses (qualitative and quantitative), in the following three steps.

1.3.3. Q methodology

More specifically, the Q methodology is suitable for the empirically studying and identification of viewpoints on air travel and changes in attitudes in sub-question 4. Namely, Q methodology provides a foundation to systematically study subjectivity, that is people's viewpoints, opinions, attitudes, hence. To do so, a Q study uses people's personal rankings of a set of statements about a certain topic, being a reflection of their subjectivity (Brown, 1993). This enables quantifying and revealing people's subjective and intangible air travel attitudes, which is desired. The Q study furthermore enables conducting a clustering study to reveal segments of subjectivity, which is desired as well. A Q study in itself is also a mixed methods research methodology (Desing and Kajfez, 2020).

The performed Q study included the identification of changes in air travel attitudes (*concourse development*) to result in a set of 50 representative statements about air travel attitudes (*P set sampling*). Then a sampled group of 46 respondents (*P set sampling*) was asked to rank-order the statements (*Q sorting procedure*). Individual rank-orderings were then clustered based on similarity (*Q factor analysis*) after which the resulting viewpoints were interpreted and factors that drive a change in attitude were identified (*interpretation of viewpoints*). The actual Q study was performed during answering sub-question three and four. The entire methodology and research methods are elaborated on in chapter 2.

1.4. Societal relevance and scientific contributions

Conducting this specific exploratory study into changing air travel attitudes not only has societal relevance. What is more, this thesis uniquely makes an empirical, theoretical and methodological contribution. Each of them is separately discussed in the following section.

Societal relevance

First of all, it is societally relevant to gain insights into how attitudes are currently changing, the segments of the population where attitude changes occur, and under what conditions and for which motivations these changes occur. Especially, information on people's attitude changes in a direction that is overall more critical to flying and what has contributed to those changes is interesting, as this could possibly result in these people flying less too. Consequently, this knowledge is useful for developing policy measures that establish the circumstances in which this desired attitude change could, rather autonomously, be triggered and enhanced within the individual that has not or to a lesser extent experienced it. Therewith, policy measures aim at attitude change on a larger scale in society, which in turn could stimulate the necessary behavioural changes, i.e. people flying less, in the aviation sector.

Empirical contribution: air travel attitude changes

This research is furthermore relevant to the scientific community. Up to now, a study that focuses on empirically exploring attitude change and why that happens, with respect to flying specifically, remains scarce (see chapter 4). Being a first exploratory study in this area, its results make an empirical contribution to the scientific knowledge of changes in attitudes to flying as this study can reveal changes in attitudes. It can thereby contribute to filling the identified knowledge gaps from section 1.2.

Theoretical contribution: applying model for attitude change

Regarding exploring why attitudes change, the theoretical models on attitude change that include causal mechanisms are limited (see chapter 3). Only one relatively new and complex model of Van Wee et al. (2019) includes this, although it has not been extensively applied nor validated. This research employs that model as a theoretical lens to look at the empirical findings since it offers the possibility to identify and interpret the revealed viewpoints by recognising motivations for attitude change and by indicating causal relations therein. In doing so, this study is the first to extensively apply and to some extent validate this model, that is, exploring which theoretical links are observed in the findings. Therewith, it makes contributions to the theory on attitude change and can improve understanding of other theories (e.g. Theory of Planned Behaviour, reversed causality) as well.

Methodological contribution: dynamic approach to Q

Due to the proposed methodology, this study consequently has another scientific contribution. In the current research (see chapter 4), only a few studies have included these clustering analyses for studying air travel attitudes (e.g. Kroesen, 2013). However, a clustering methodology has to the best of my knowledge, until this thesis project, not been applied for clustering people based on their perception of how their air travel attitudes have changed, rather than based on what current attitudes and positions they hold. For the Q study this means that people evaluate statements that are more 'dynamic' in nature (see item 2.1), meaning they are about whether people have experienced changes in opinion or position towards flying over time, rather than solely static opinion statements about flying. Therewith, this research also addresses the suitability of a Q clustering study that addresses changes in attitudes, thereby making a methodological contribution as well.

1.5. Scope of the research

In order for this study to be feasible within the given time frame of the master thesis project, several scoping decisions were made to demarcate the project and its research questions.

First of all, the study of attitude change towards flying is geographically limited to Dutch citizens and done in The Netherlands. Other countries are out of the scope. This is for the reasons

that this research has not been conducted in The Netherlands and it makes the research feasible. Consequently, this results in predominant Western perspectives on attitude change. It results in viewpoints that are similar in attitude change, for example a cluster in which people have changed their opinion about flying a lot and a cluster in which people have kept rather the same opinion.

Secondly, the analysis includes the perspectives of travellers who fly for leisure as well as business purposes or both. This decision is based on the fine line between a person flying solely for business purposes and that person including leisure activities on the business trip or flying for leisure too, hence, a hard distinction cannot always be made (Zijlstra et al., 2021). Analysing the perspectives of these different types of travellers will uncover the existing perspectives as much as possible.

Thirdly, the time frame for analysing attitude change is set at approximately the last five years. Five years is well before the COVID-19 pandemic (2020) and the IPCC (2021) climate report, two main events considered of influence on people's attitudes (further discussed in section 5.1). The identified attitude changes from this study are thus specifically applicable to recent years.

Fourth, the exploration of air travel attitude changes is based on people's self-reported change, meaning that respondents make some sort of comparison of their current attitude with their attitude about five years ago. Consequently, the change in attitude that is central in this study is based on people's subjective perception of their attitude change. This study does not deliver objective measurements of changes in people's attitudes to flying nor verify whether the self-reported change has actually taken place.

Fifth, the analysis identifies factors that could contribute to attitude change, which are also based on people's subjective perception of what has caused them to change their opinion or attitude. It does not objectively verify whether these factors are actually the cause nor measure or quantify to what extent they influence attitude change.

On top of that, whether and to what extent the attitude changes seen in this study are in fact causing behaviour change is not studied. This study discusses the attitude-behaviour relation theoretically and can only give indications of it, but does not empirically investigate it.

Finally, the analysis of the flying behaviour per identified cluster is based on the mean number of flights and travelled distance that respondents report before and after the COVID-19 pandemic. Therewith it results merely in indications of the mean flying behaviour of people who hold certain perceptions towards flying.

The above scoping decisions have consequences, namely that the conclusions of this study are applicable for this scope specifically and cannot be immediately generalised, thus this research is not confirmatory in nature. Instead, this underlines and supports the more exploratory character of this research.

1.6. Outline of the report

This thesis report has the following outline. First of all, chapter 2 discusses the different used methods that lie at the basis of this research. Secondly, chapter 3 covers the current knowledge base on behaviour and attitude theory (sub-question 1). Next, chapter 4 is about people's current attitudes towards flying and air travel in general (sub-question 2). Then, chapter 5 investigates the current changes in air travel attitudes (sub-question 3). In chapter 6, the identified viewpoints, observed changes in attitudes and corresponding factors for change are presented (sub-question 4). This chapter also covers the relation between the viewpoints and their flying behaviour (sub-question 5). Finally, chapter 7 presents the conclusions and policy recommendations to this research and discusses limitations and future research.

2

Research methodology and research methods

The research methodology encompasses the set of qualitative and quantitative methods used to conduct this research. For the sake of overview, this chapter first of all describes the Q methodology and its suitability for conducting this research, specifically for revealing the viewpoints in sub-question 4, in section 2.1. Thereafter it describes the used research methods per sub-question.

The research was divided into three phases. First is desk research, more specifically conducting literature reviews, which is a qualitative method. Second is the Q study, being 'mixed-methods', incorporating both qualitative and quantitative methods. The final phase entails studying the flying behaviour, incorporated in the Q study to additionally inform policy recommendations. Each thesis chapter consequently covers the *execution* of the research methods, the *analysis* of the collected data and the *results* corresponding to each question. Table 2.1 presents the overview of this.

Table 2.1: Methods overview and chapter guide

Sub-question	Method(s)	Description	Results
1. What is the main theory on behaviour and attitude, the relation between attitude and behaviour, and what mechanisms for attitude change can be found?	Literature exploration	subsection 2.2.1	chapter 3
2. What are the current attitudes of people towards air travel?	Literature review	subsection 2.2.2	chapter 4
3. What changes in attitudes towards air travel can currently be identified?	Grey literature exploration, interviews	subsection 2.3.1	chapter 5
4. What are people's viewpoints on air travel and changes in their air travel attitudes and what causes the attitude change?	Q sorting survey	subsection 2.3.2	chapter 6
5. What relations can be observed between the identified viewpoints and people's actual flying behaviour?	Post-sorting survey	subsection 2.4.1	chapter 6

2.1. About Q methodology

Within this entire research project, the Q method has its place in the third and fourth step in the second phase, where it is applied (see Figure 2.2). It is inherently a mixed methods research approach, employing both qualitative and quantitative research methods and data analysis procedures (Desing and Kajfez, 2020)

Suitability and advantages

Conducting a Q study is useful for this exploratory study into diverse voices of travellers with respect to air travel. Instead of comparing statements about a certain topic, a key feature of Q is the comparison of individuals, that is the individual's entire pattern of positions to statements, to each other (Kroesen, personal communication, November 30, 2020). Statements are analysed in "their mutual coherence for the respondent" (van Exel and de Graaf, 2005). This means that (the position to) a single statement becomes meaningful only in combination with other (positions to) statements, together representing a person's "narrative". As a result of the comparison of individuals, people who share similar positions to the statements can be clustered. This results in the desirable insights into the complete, shared perspectives of people that each present an entire narrative on air travel attitudes as well as whether and why these have changed. This "story-telling" characteristic is exactly what makes the Q study suitable for this research into attitude change.
The "openly holistic approach" that is inherent to the Q study is a first main advantage (Watts and Stenner, 2005). It brings several other advantages:

- Firstly, by means of the statements, the Q study allows for distinguishing between subtle nuances in air travel opinions and attitude changes.
- It can point out the aspects in which people think the same about in particular as well as *think differently* about (van Exel and de Graaf, 2005). Therewith, a Q study can bring controversies in the air travel discourse to light. For example, the attitude changes that are particularly not shared by everyone.
- This results in the advantage that, through purposively sampling the respondents based on several dimensions, even marginal, easily overlooked viewpoints can be identified (Cuppen et al., 2016).
- Overall, Q uniquely combines the strengths of qualitative and quantitative research techniques (Brown, 1996), as it applies factor analysis to analyse spoken and written data about air travel. The method allows for quantitatively distinguishing and qualitatively interpreting the perspectives of people (Desing and Kajfez, 2020).

Disadvantages and accommodating them

However, the Q methodology "has been criticized for its lack of methodological rigour, structure and systematic process" (Fontein-Kuipers, 2016). Hence, doing Q does not come without its disadvantages, which should be carefully reflected upon and accommodated as much as possible. Firstly, downsides lie in the execution of the Q study.

- The developed set of statements (i.e. concourse) might not cover the entire discourse on air travel and attitude changes.
- In addition to this, the participants are given a prepared variety of statements to evaluate and relate, instead of them engaging solely in their own, naturally occurring discourse (Watts and Stenner, 2005).

- Doing Q relies in many ways on the cooperation and input of respondents. It relies on the availability of the desired participants as well as their actual participation, that is how well they understand the statements and Q sorting task and whether they truthfully sort the statements.
- Despite purposively sampling, the respondents might not represent every viewpoint that exists among the entire population.
- The resulting viewpoints are a 'snapshot' from a certain point in time, making them temporal. However, attitudes and viewpoints might change in the future.
- Altogether, doing Q is relatively time-consuming.

These issues were partly accommodated for in the following ways. According to Brown (1993), a concourse can be gathered in multiple manners, from conversations and interviews to reports, newspapers and other publications, of which interviewing people is the most typical (Desing and Kajfez, 2020). Thus, to maximise the diversity in voices, the concourse in this study was based on both grey literature, giving access to a great number of documented sources, and interviews, giving access to a selection of undocumented attitudes to flying. Furthermore, to minimise the chance of wrongly filled out sorts and inaccurate reflections of opinions, it was ensured the respondents received sufficient explanation of the sorting task beforehand. Respondents were also given the opportunity to leave post-sorting comments for clarifying their choices or could ask questions to the researchers during the sorting procedure. Thereby, the Q study can still yield useful and interesting results.

Secondly, downsides lie in the reliability of the results of the Q study.

- The findings from a Q study are "wholly subjective" and cannot, due to a small sample investigation, be generalised to the entire population, thus posing reliability issues (Brown, 1993; van Exel and de Graaf, 2005; Bashatah, 2016).
- Besides, the Q study might not reveal all factors that contribute to attitude change.

These downsides do, however, not form substantial obstacles for the interpretation of the results. First and foremost, this specific research study has an exploratory goal. Since "only a limited amount of distinct viewpoints exist on any topic" and any Q sample "containing the wide range of existing opinions" on air travel can reveal the different perspectives, this exploratory goal can be reached (van Exel and de Graaf, 2005). Secondly, when the results are used in future surveys examining attitude change within a representative population, this will inform us about the reliability of findings and the extent to which they can be generalised from this research too. Moreover, the interpretation of the viewpoints and factors is done based on the theoretical knowledge, using the theoretical lens of Van Wee et al. (2019) that includes assumptions and mechanisms based on existing theoretical and empirical research into attitude change. This contributes to correct interpretation of the viewpoints and identification of factors for change.

Steps of the Q study

The Q study consists of six distinct steps (Brown, 1993):

1. First, the concourse is identified, which is the "universe of opinions, perspectives or statements" and comprises the "raw materials" for the second step (Lutfallah and Buchanan, 2019; Brown, 1993). Hence, it includes anything that is said or written about changes in attitudes to air travel as well as indications of changes in attitudes.
2. Secondly, the Q sample is set up, which is strategically selected from the concourse. This means that the concourse is reduced to a representative set of 40-60 subjective statements that cover the variety of (changes in) attitudes to air travel.

3. Third, the respondents are purposively selected in a structural manner. The respondent group is referred to as the P-set.

4. The fourth step involves the data collection by means of the so-called Q sorting procedure, being the instrumental basis of the methodology (Brown, 1996). The respondents rank the statements along a "continuum of preference" in a sorting grid (Fontein-Kuipers, 2016), and the resulting specific rank-ordering of one respondent becomes known as the so-called *Q sort* (Coogan and Herrington, 2011).

5. In the fifth step, the individual rankings of all respondents are analysed by applying by-person factor analysis to the Q sorts (Valenta and Wigger, 1997). This is the process of turning separate Q sorts into a number of distinct clusters, i.e. the desired viewpoints.

6. Finally, the resulting subjective viewpoints, representing the various perspectives of people about air travel, can be interpreted. Interpretation is done through analysing the scores that each statement was given within each viewpoint, i.e. the factor scores (Brown, 1993).

Following these steps results in the fact that doing a Q study requires multiple methods, which will be discussed in the following sections. In chapter 5 and chapter 6, the application and execution of the steps will be separately discussed.

New approach to Q: dynamic statements

Important is to discuss how this Q study into changes in air travel attitudes is different and new compared to earlier studies. The difference lies in the nature of the statements that are included in the Q set, more specifically in the formulation of the statements and the corresponding task of relating to them.

Normally, a Q study includes statements that are formulated as current opinion statements. In this case, a variety of statements about air travel with which an individual can agree or disagree. For example, *"I am worried about the impact of flying"*. The respondent can reflect on the statement and decide to what extent it is applicable to them, which measures their current attitude ("can I relate to this attitude?"). Summarised, the statements relate to the present and are constant in time, therefore they are considered more 'static' in nature. Respondents only relate to their current attitude.

Since this research investigates attitude change, the included statements need also address a certain *change* in an air travel attitude. This means that the respondent evaluates statements that are about whether people have experienced changes in opinion or position towards flying over time, rather than solely static opinion statements about flying. This entails they have to make a subjective comparison of their attitude in the past, compared to their attitude now. For example, *"I am more worried about the impact of flying compared to five years ago"*. Again, the respondent can reflect on the statement and decide to what extent that change in attitude is applicable. The difference, however, is that they are retrospectively reflecting on a change in attitude, i.e. being more worried than before, rather than solely the attitude by itself, i.e. being worried. It does not measure their current attitude, but rather measures the extent to which an attitude change is currently applicable ("can I relate to this change in attitude?"). Summarised, the statements relate to the present as well as the past, making them more 'dynamic' in nature. Respondents relate to their current and past attitude. Consequently, attitude changes can be revealed.

The Q set in this study combines both static and dynamic statements, making it a new approach to doing Q. To explore attitude changes, one might intuitively think to include mainly dynamic statements, however, this is not done on purpose for several reasons. The first reason is that attitude changes on their own are less interesting and interpretable without knowing their causes and a

person's overall stance towards air travel, i.e. the narrative around it. Especially the combination of statements can reveal how people currently think about various air travel aspects (serving as a reference), such as whether they find flying convenient or are positive about reducing its emissions, as well as how people themselves perceive they have started to think differently about several air travel aspects in the past five years. This provides a more complete picture of the person's air travel attitude, serving the research objective of exploring people's entire viewpoint.

A second reason to combine static and dynamic statements is that, since not everyone in the population will have changed their attitude, the statements are a better reflection the actual discourse in society, which it should be. Consequently, it gives room to people who still hold the same position to air travel to relate to the statements and complete the sorting procedure too. Making a Q set with solely dynamic statements forces people to think about attitude changes which they might not even have experienced themselves, and sort them. The result is that the Q sort is naturally not a reflection of their opinion, making the results from the entire study less reliable. This could be resolved by only including respondents who indicate to have definitely changed their air travel views, however, it is also and *especially* interesting to know whether people have not changed their attitudes at all, or to a lesser extent.

Another reason to combine the statements regards feasibility of the Q study. Namely, when splitting the statements into a dynamic (for attitude changes) and a separate static (for current attitudes) Q set, it requires the study participants to complete two sorting procedures, which takes more time. This simply makes participating a bigger task and finding willing participants more difficult. Besides, in case of two Q studies, it would be challenging to connect the results to each other, since the factor analyses are done separately, and it would require additional analyses to establish causal relations between the identified viewpoints.

2.2. Phase 1: Desk research

This section elaborates on the methods used during the desk research in the first phase of the research, involving sub-question 1 and 2.

2.2.1. Sub-question 1: Literature exploration

From the introduction, it is clear how behavioural change is needed in order to transform the aviation sector, and how attitude change may play a role in this. Hence, this question aims at creating essential understanding of;

- attitude and behaviour and the theoretical relations between them, specifically to investigate the role of attitude (change) in behaviour (change), and
- attitude change and the potential causal mechanisms for attitude change.

This understanding is useful for the interpretation of the empirical results from this study. Moreover, it leads to one theoretical lens that provides guidance for the interpretation of the identified viewpoints and factors for attitude change (sub-question 4).

For this, (scientific) literature from the travel behaviour and social psychology field addressing theories and models on both *attitudes* and *behaviour* were collected from multiple databases to include grey and scientific literature. More specifically, books or articles presenting overviews of theories, since they assemble the theory, or articles introducing one specific theory or model were of interest. They should include descriptions of the theories and models and their underlying assumptions, preferably relating to attitude change and attitude change mechanisms as well.

Literature exploration

To gather this data, a twofold exploration of the theory was done that searches for behaviour theories and models as well as attitude theories and models, using Google, Google Scholar and Scopus. Eventually, the book of Michie et al. (2014) about behaviour theories and Suedfeld (1968) about attitude change theories were used as guidance and overviews of the theory during the exploration.

The resulting wealth of theories was subsequently analysed through two selection criteria, i.e. prevalence and applicability to this study, to arrive at a set of main theories. The final step was searching for articles describing the specific theories to study them in more detail. Its results are presented in chapter 3 and this enabled answering sub-question 1.

2.2.2. Sub-question 2: Literature review

This question aims at gaining scientific insights into;

- the various existing attitudes and perspectives to flying that were studied in literature, and
- initial indications of changes in air travel attitudes and influences on attitudes.

Therewith, it creates a general understanding of the aviation discourse around the world, being useful information for the third and fourth step. Besides, it underlines the scientific knowledge gap.

For this, scientific research articles that studied attitudes towards air travel were collected from scientific databases. The articles should preferably have an empirical character, and provide information on what the prevailing attitudes are. The studies and resulting attitudes were not geographically limited to The Netherlands only, despite that this is the scope.

Literature review

This data was gathered through conducting a systematic review of the scientific literature. A systematic search through the current body of research on people's attitudes to flying and discourses on air travel was conducted in December 2021 based on a twofold search strategy. First, an orienting search regarding attitudes towards flying was done in Google Scholar to explore potential search terms. Secondly, the literature review was done using selected terms with Boolean operators in Scopus. Regarding the search itself, only peer-reviewed articles in English were included. Since people's attitudes are subject to change, articles should be published within the last ten years to ensure relatively recent information was reflected upon. The search strings and their number of results are presented in Table 2.2.

Finally, the articles resulting from the search strings were analysed and subject to a review based on several criteria in order to arrive at relevant articles only. Its execution, analysis and results are presented in chapter 4, which enabled answering sub-question 2.

Table 2.2: Search strings and number of results (1-12-2021)

Search string	Idea	# of documents
(attitudes OR opinions) AND (flying OR "air travel") AND (consumer OR passenger)	Relatively narrow search to limit results to only specific articles	62
(attitudes OR opinions OR perceptions) AND (flying OR "air travel" OR "air travel behaviour" OR "air mobility") AND (consumer OR passenger OR public)	Extending first search string to widen results and include missed articles	173

2.3. Phase 2: The Q study

This section elaborates on the methods used during the Q study in the second phase of the research, namely sub-questions 3 and 4, and features the concourse and Q set development and factor interpretation of the Q study.

2.3.1. Sub-question 3: Grey literature exploration and interviews

The third question has the aim to identify and understand;

- changes in people's attitudes towards flying that are currently observed among Dutch society, and
- prevailing air travel attitudes among Dutch society.

This provides understanding of the currently prevailing discourses on air travel in the Netherlands specifically, which is the scope of this research. This knowledge was input for the *concourse development* and the *Q set development*

Both written and spoken qualitative data were required. Specifically, grey literature addressing changing attitudes, including reports, news articles and forums about air travel, retrieved from online search engines, i.e. Google and Google Scholar, was collected to include documented insights. Furthermore, actual insights and narratives regarding attitude changes retrieved from different types of travellers, were collected to include more personal, undocumented insights. The attitude changes were collected from Dutch sources to ensure they reflect the discourse in The Netherlands, which is the geographical scope of this study. In addition, despite scarcity, the indications from changes in people's attitudes from international studies in sub-question 2 were used to complement the findings.

To contribute to the the diversity of the concourse, the insights were collected from people who differ on two dimensions, being *flying behaviour (1)* and *flying purpose (2)*. It was namely expected that people who differ in how often they travel by plane and for what primary purpose (i.e. business or leisure) differ in their opinions on air travel. Regarding flying behaviour, it is seen that more frequent flyers in general have a significantly more positive attitude towards air travel than people who fly occasionally; they associate it more with fun rather than dislike (Zijlstra et al., 2021). This indicates differences in attitudes to flying between these two people. Regarding flying purpose, it is seen that people who fly for business purposes have an above-average positive attitude towards flying (Zijlstra et al., 2021). However, the COVID-19 pandemic has led to a restriction on air travel and about one third of the business travellers expect to fly less after the pandemic has ended (Zijlstra et al., 2021). This could indicate an interesting change in attitude, which this type of traveller might bring up. The Dutch nationality was a requirement due to the geographical scope of this study.

Grey literature and interviews

Data for the concourse and Q set was gathered using two methods: a grey literature exploration and six semi-structured interviews with individuals.

First, the recent grey literature was explored, mainly being published in the last five to ten years to ensure recent changes were reflected upon. Since concourse development is usually a rather non-scientific process, the corresponding literature exploration did not follow a fully structured search strategy as well. Yet, the exploration used Dutch search terms to focus on results with Dutch origin, using combinations of different search terms such as air travel, attitudes and changes, and their synonyms. This knowledge was input for both the concourse and interviews.

Secondly (and alongside), six exploratory interviews were conducted with participants who were selected by the researcher based on the two discussed main dimensions, yet, also on expected

differences in their opinions. They were recruited from the researcher's own social network or the social network of friends or family. The interviews followed a semi-structured approach, meaning that the interviewer asked several open-ended questions and guided the interviewee through the conversation. The idea was to let the interviewees talk mostly naturally and as much as possible. Several interview questions and themes were prepared, based on themes identified in chapter 4 and the initial concourse development. The interviews started with an opening question and were divided into three main parts. First, the conversation related to the current attitude towards flying of the interviewee, asking them about their associations, emotions and opinions about flying in general. Secondly, this attitude was taken as a reference to consequently retrospectively ask the interviewee about a change in this attitude when comparing it with approximately five years ago (see section 5.1), and what they thought played a role in that change. In the third part, if necessary, certain themes were brought up if they were not mentioned or discussed by the interviewee. Their socio-demographics and flying behaviour were noted after the conversation, to minimize their bias on the topic before the interview. The interview questions are outlined in Appendix A.

The selected interviewees, interview execution and results are discussed in chapter 5. After transcribing the interviews, the gathered written data was analysed through a statement sampling procedure, which enabled the *concourse development* and the *Q set development* on air travel attitudes. This procedure and its results are described in more detail in chapter 5 and this enabled answering sub-question 3.

2.3.2. Sub-question 4: Q sorting survey

The fourth research question has the aim to empirically explore;

- actual changes in attitudes towards flying, and
- factors contributing to attitude change.

This question thus required empirical data on actual air travel attitudes, specifically people's perceptions on how their attitudes towards flying have developed or changed. Therefore, the developed Q set consisting of attitudes was subject to evaluation by a larger group of people to gather the necessary empirical data.

These air travel attitudes were collected from a group of 46 respondents that varied among four dimensions to aim for a diversity in perspectives (*P set sampling*). The first two sampling dimensions were again *flying behaviour* and *main flying purpose*, similar to the interviewee selection. Yet, since the P set comprises a larger group, two other characteristics were included to result additional variety among respondents and therewith in air travel attitudes. In an earlier clustering study of Kroesen (2013), the more environmentally-aware people had a more flying-critical attitude. This was inspiration to consider the environmental awareness of the respondents in the sampling procedure, since it was expected that more or less environmentally-aware people hold different perspectives to flying. Since environmental attitudes are more difficult to quickly measure, a convenient way to include environmental awareness was through age and education level. Namely, recent climate perspectives research by the CBS show how a larger share of the elderly people (65+) consider the climate as important compared to the younger people (18-25), and how education level is also relevant in climate valuation, despite that the differences between the less and more educated are small (Witt and Schmeets, 2018; CBS, 2021). Hence, *age* and *education level* were the other two sampling dimensions. Gender was not considered since no significant difference in attitude was expected (Witt and Schmeets, 2018). Altogether, the following four dimensions were expected to contribute to a diverse sample, while they were still practical enough to actually sample the respondents:

- flying behaviour
- main flying purpose

- age
- education level

The P-set sampling was geographically limited to The Netherlands and was done within the researcher's own personal and professional network as well as using the social networks of the researcher's friends and family. The selection of the P set and its descriptive statistics are discussed in chapter 6.

Q sorting survey

The attitudes were collected through an online Q survey, including a Q sorting procedure and additional questions. The Q survey practically entailed the respondents were presented with a set of 50 statements and were directly asked to rank-order all the statements based on their own preference, judgement or feeling about them (*Q sorting procedure*) (van Exel and de Graaf, 2005). For this, they were provided with a suggested, yet forced, distribution of the statements that followed a symmetrical and quasi-normal shape, which is the sorting grid from Figure 2.1, and a corresponding rating scale. In this case, since the interest lies in the person's own point of view, respondents ordered the statements along a continuum from most agree (+5) to most disagree (-5) (Brown, 1993; Brown, 1996). The resulting Q sort therewith reflects their perspective on air travel and attitude change.

For time reasons, the Q sorting procedure was not followed with an interview, but rather with a "post-sorting questionnaire" (Watts and Stenner, 2005 to let respondents elaborate their point of view. So, through several written questions, the additional motivations, reasoning and insights into perspectives from respondents were collected. The respondents were asked to deliberate on their choice for statements to which they most agree (+5) and disagree (-5) (Brown, 1993). In the same post-sorting questionnaire, they were also directly asked why, or why not, their attitudes had changed, to gather more explicit insights into their reasoning and factors for change. Finally, several socio-demographics were collected in this questionnaire, namely, *gender*, *year of birth* and *education level*, to evaluate on the characteristics of the P sample. Altogether, the information from the post-sorting questions enabled the more elaborate interpretation of the viewpoints.

The entire survey is presented in Appendix B. Summarised, the Q survey consisted of four separate steps:

1. The initial sorting of statements into three piles, namely a disagree, neutral or agree pile (Brown, 1993).
2. The final Q sorting procedure in the sorting grid from Figure 2.1.
3. The post-sorting questions about the most (dis)agreed with statements.
4. The post-sorting questions about socio-demographics and flying behaviour (both mandatory) and cause for possible attitude change.

After data collection, the resulting Q sorts were analysed and clustered through a factor analysis. Thereafter, the resulting viewpoints were interpreted, specifically reflecting on the attitude changes and factors contributing to change. Comments from respondents were used during interpretation. For analysing the factors for change, the theoretical lens of Van Wee et al. (2019) from sub-question 1 was used as guidance. This procedure and corresponding results are elaborated on in chapter 6. Hence, sub-question 4 could be answered.

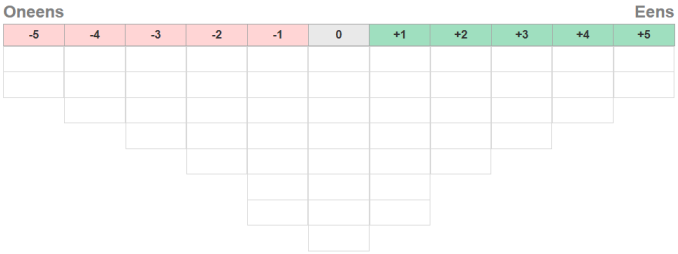


Figure 2.1: Q sorting grid of 50 statements

2.4. Phase 3: Flying behaviour

This section elaborates on the method used during the final phase of the research of answering sub-question 5 and designing policy recommendations

2.4.1. Sub-question 5: Post-sorting survey

The fifth research question aims to explore;

– relations between the identified viewpoints and the objective flying behaviour of people

The resulting average flying behaviour per cluster can contribute to a comprehensive viewpoint interpretation as well as inform the policy recommendations that aim at creating broader attitude change among society.

Subsequently, this question required information about the actual flying behaviour of the respondents in the P set. More specifically, the number of return flights in the two years before the start of the COVID-19 pandemic were gathered, as well as the number of return flights in the two years during the pandemic. The reference point was taken in March 2020, as this was the moment when the coronavirus was considered a pandemic and the Dutch government announced the first flight ban for civil aviation to and from The Netherlands (Rijksoverheid, n.d.-b). Both pre-pandemic and pandemic flying behaviour were asked to evaluate on the differences in flying behaviour between the two periods and the possible effects that the flying restrictions had on people's attitudes. Asking the flying behaviour per two years was considered as the golden mean; people can likely remember the number of flights over such a period and it is broader than just one year. The two years before the pandemic were consequently considered as a representation of the person's average flying behaviour in the years before the pandemic. The calculation of the average flying behaviour per year was also possible. Moreover, the total time of the two periods approximately matches with the chosen time frame for attitude change of five years. Finally, the open comments to the statements could provide additional information about the person's flying behaviour, in case they wanted to explain it.

Post-sorting survey

The additional input from respondents was collected through the same "post-sorting questionnaire" in the Q survey as described in sub-question 4. In the first question, respondents were asked to indicate the number of return flights in the 24 months during the pandemic (since March 2020), followed by the question how many of those flights were for business purposes. In the third question, they were asked to indicate the number of return flights in the 24 months before the pandemic, again followed by asking their number of business flights.

The resulting flying statistics of the respondents were subject to descriptive analyses in Excel. Information on average flying behaviour in The Netherlands from the KiM was used as a reference

for interpreting the flying behaviour and to make comparisons with the average. The results are discussed in the viewpoints in chapter 6 and sub-question 5 could be answered.

2.5. Research flow diagram

The methodology is visualised in Figure 2.2. It shows the three research phases and used methods per sub-question. Each thesis chapter corresponds to one sub-question and explains the execution and results of the methods. Only sub-questions 4 and 5 are part of the same chapter (see Table 2.1).

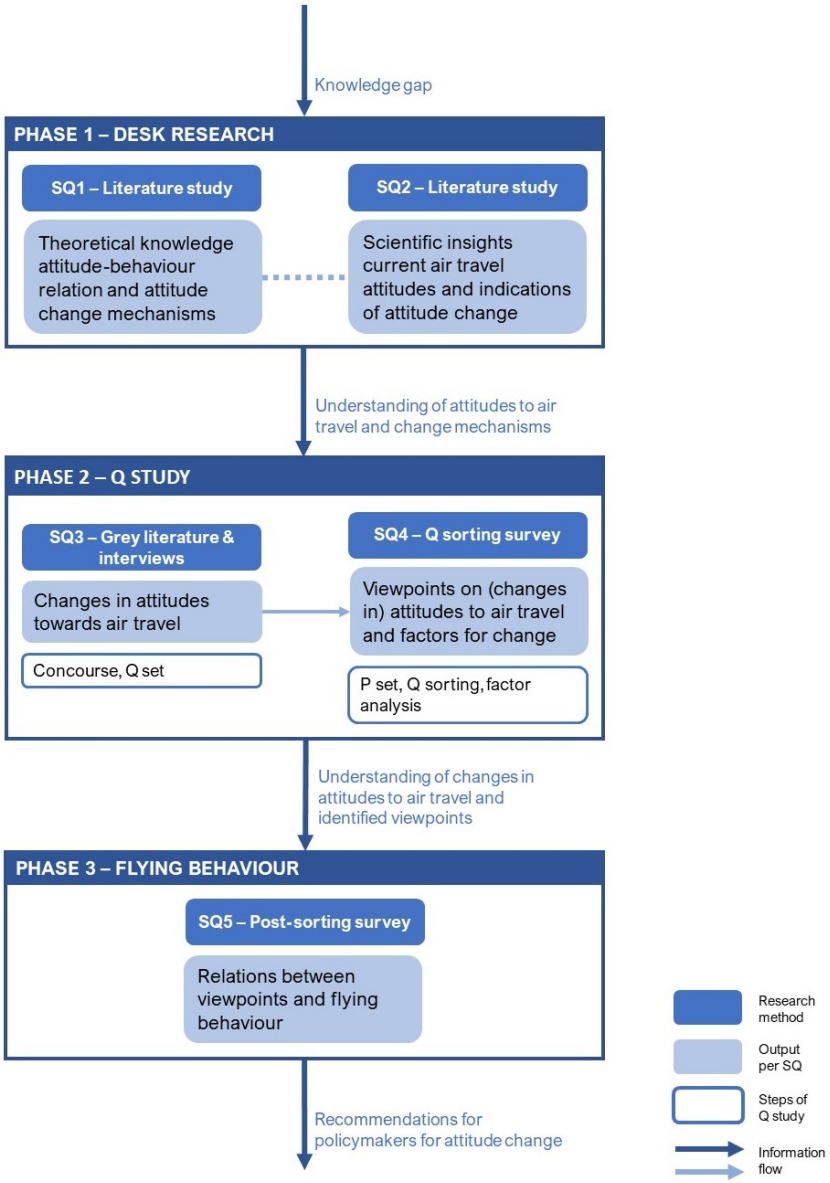


Figure 2.2: Research flow diagram

3

Theory on attitude change

What is the main theory on behaviour and attitude, the relation between attitude and behaviour, and what mechanisms for attitude change can be found?

The aim of this chapter is to provide a theoretical knowledge base on behaviour and attitude change. First in section 3.1, the general definitions of attitude and behaviour are presented, being the main concepts on which this research builds. Secondly, section 3.2 briefly explains the conducted literature exploration and section 3.3 presents the resulting common theories of behaviour and attitude. Thereafter, the role and mechanisms of attitude change in the theories are addressed in section 3.4. Next, section 3.5 presents one new theoretical model on attitude change that is also reflected upon. Finally, section 3.6 summarises the main theories on attitude change and presents the model of Van Wee et al. (2019) as a means to look at the empirical findings, namely to evaluate what causal mechanisms can be found in this study into air travel attitudes.

3.1. Definitions attitude and behaviour

In this research, people's *attitudes* to flying form the main theme under investigation. Yet, a connection between people's attitudes and their behaviour exists, as the theory in this chapter (section 3.3) will further clarify, and this study does not look at people's attitudes to flying in complete isolation from flying *behaviour*. Hence, both attitude and behaviour are important concepts to define.

The Cambridge Dictionary (n.d.-a) defines an attitude as "a feeling or opinion about something or someone", and could also be described as the way how someone looks at something or someone, i.e. a point of view. In Ajzen & Cote (2008) an attitude is defined as the degree to which a person has a favourable or unfavourable evaluation of an object. Hence, an attitude of a person is a subjective, psychological construct that has a cognitive (thinking) and emotional (feeling) component. In the case of travel behaviour research, the attitude would be towards for instance a certain travel mode, travel time or route. In this study, the attitude is towards air travelling in a broad sense. Based on this definition, attitude theories are defined as systems of ideas that are suggested to explain people's attitudes, including their formation and change (Cambridge Dictionary, n.d.-c).

The Cambridge Dictionary (n.d.-b) and Oxford Dictionary (n.d.) define behaviour as "the way that someone behaves; in a particular situation", therewith behaviour entails a person's actions or conduct. Travel behaviour then is defined as how people travel and use transport. Consequently, behaviour (change) theories are systems of ideas that are intended to explain human behaviour and behavioural patterns (Psychology Dictionary, 2013a).

3.2. Literature exploration and its analysis

The literature exploration was done as described in subsection 2.2.1. First, the theory on behaviour (change) was explored in the book of Michie, West, Campbell, Brown & Gainforth (2014). The book describes a total of 83 theories of behaviour change, illustrating the wealth of behaviour theories existing in the literature. Secondly, the attitude change theory was explored in the book of Suedfeld (1968). The book discusses the multiple theories on attitude change and distinguishes two main streams in the literature on attitude change, namely consistency and nonconsistency theories (Suedfeld, 1968, p.5). The first regards theories proposing attitudes change due to a need for cognitive and emotional consistency, and the second regards theories that mostly center around learning and cognition as a basis for attitude change.

This thesis chapter does however not extensively analyse the wealth of existing theories on attitude and behaviour, but rather presents the most common, meaning prevalent in studies, and applicable, meaning fitting to this study on travel behaviour and attitudes. The final selection of the main theories and models was based on their *prevalence* and *applicability* to this study. For the sake of feasibility, the prevalence was based on the claimed popularity by the literature, rather than actually counting the instances where a theory was applied. Regarding applicability, theories should explain individual behaviour or attitudes rather than that of groups or larger social or technological phenomena. This research namely regards individual flying behaviour and attitudes. Moreover, theories should relate to both attitudes and behaviour. Special attention was paid to the constructs, established relations and underlying assumptions of those theories.

3.3. Behaviour and attitude theories

The CommGAP program at the World Bank (n.d.) introduces three main theories of behaviour change that could be used for governance purposes. These are the Theory of Planned Behaviour (TPB), the Social Cognitive Theory (SCT) and the Transtheoretical model (TTM), which attempt to explain why people's behaviour changes. These theories are commonly referred to in the grey literature. The TPB, SCT and TTM are also prevailing behaviour theories in the scientific literature. The review of Davis, Campbell, Hildon, Hobbs, & Michie (2015) into what theories of behaviour (change) exist across social and behavioural sciences, shows how the TPB, SCT and TTM are the most frequently applied.

Another fourth main attitude-behaviour theory was found in the attitude literature, based on the book of Suedfeld (1968). Within the consistency stream, he identifies three major theories: Cognitive Dissonance Theory, Congruity Theory and Balance Theory. Together these theories are part of the Consistency Theory, one major class of theory in social psychology. Specifically the Cognitive Dissonance Theory is popular in the literature (Kruglanski et al., 2018).

Since behaviour theories are found to have particular use in health sciences, it was roughly explored to what extent the TPB, SCT and TTM are used in the field of travel behaviour too. Therefore, each theory was combined with the term travel behaviour in a search in Scopus, in which the number of results in Scopus is taken as a measure for a theory's prevalence. This indicates how the TPB is the most prevalent. Each of the theories are discussed in the next section.

3.3.1. Theory of Planned Behaviour

First, the Theory of Planned Behaviour (TPB), which was first proposed in 1985 by Icek Ajzen (Ajzen, 1991). The theory is extended from the Theory of Reasoned Action (TRA) to address its limitations in dealing with behaviour over which people have incomplete control.

The central factor in the TPB is the intention of an individual to engage in certain behaviour, meaning that people's motivational factors influence and determine their behaviour. The general idea is that the stronger the intention is, the more likely it is to perform that behaviour. Important is that intention can only be expressed in behaviour when the person can decide whether or not to perform the behaviour.

The intention is influenced by a combination of three core components, which are attitude toward the behaviour, subjective norms, and perceived behavioural control. The attitude entails the degree to which an individual has a favourable stance toward and evaluation of the suggested behaviour. Second, the subjective norms are the extent to which the individual perceives "social pressure" to engage in the behaviour. This entails how the individual believes that others in their social environment evaluate the suggested behaviour. Third, the perceived behavioural control, which was the component added to the TRA, is the degree to which the individual perceives that they can actually perform the suggested behaviour, i.e. feelings of self-efficacy. This perception of ability depends on the person's own capabilities as well as the environmental factors that promote the suggested behaviour (Ajzen, 1991). The perceived behavioural control is especially interesting to elicit, as this is both influencing the behavioural intention and the behaviour. Ajzen (1991) assumes that holding attitude as a constant, the perceived behavioural control will likely increase the effort to actually achieve the behaviour.

The relations between the factors in the TPB are depicted in Figure 3.1 below.

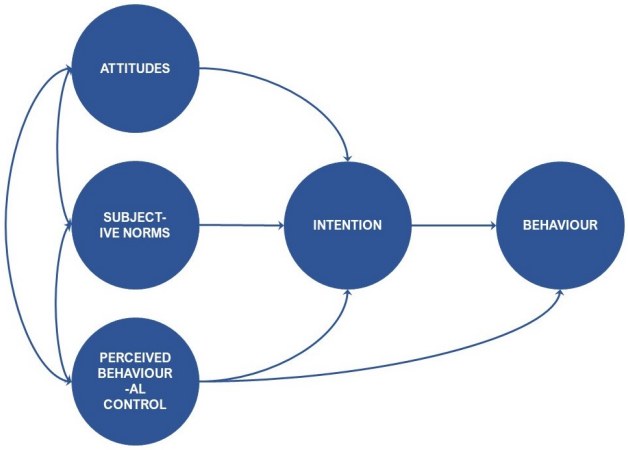


Figure 3.1: Theory of Planned Behaviour

3.3.2. Social Cognitive Theory

Second is the Social Cognitive Theory (SCT) of Albert Bandura established in 1986. It is known as the extension of his initial social learning theory, which posits that people acquire new patterns of behaviour through direct experience, which is trial and error, or observation and imitation of others (Bandura, 1971). The SCT takes a more holistic perspective by including the interaction between people's cognition, their environment and their behaviour. Contrary to the TPB, this theory views behaviour not as being one-sided determined by certain influences, but rather explains behaviour in terms of "triadic reciprocal determinism". This causal structure proposes that cognitive and personal factors, environmental circumstances and behavioural patterns are interacting determinants influencing each other continuously (Bandura, 1989; Bandura, 1999).

Here, behaviour refers to conduct of people that can be rewarded or punished. Cognitive factors relate to the individual's internal personal factors, such as intentions, attitudes, beliefs, values, expectations, past experiences, cognitive competencies, personality characteristics, and biological properties. The environment refers to the context, i.e. situational factors, which is not a fixed entity and can have rewarding and punishing aspects, such as the social norms or community (Bandura, 1989; Bandura, 1999). Based on this theory, both environment and personal factors combine to affect behaviour, thus could change it, and are in turn affected by behaviour. The relations are illustrated in Figure 3.2 below.

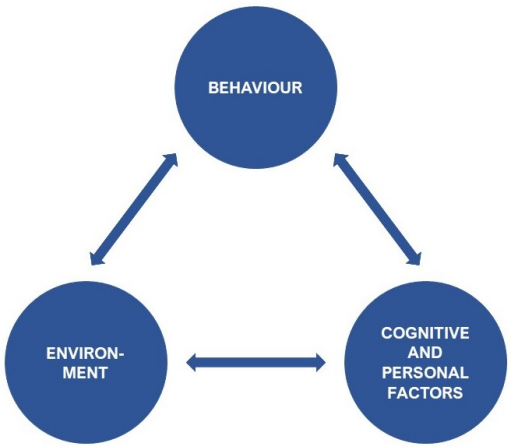


Figure 3.2: Social Cognitive Theory

3.3.3. Transtheoretical Model

Third, the Transtheoretical Model (TTM), also known as the Stages of Change model. The TTM was initially developed by Prochaska in 1979 and employed by Prochaska and DiClemente in 1982 in an empirical analysis of smoking behaviour change (Diclemente and Prochaska, 1982). The TTM is actually a model, not a theory, which integrates various behaviour theories and aims to explain individual's decision-making and their intention to change behaviour. The TTM posits that behaviour change is a cyclical process involving progress through six stages of change. These are precontemplation, contemplation, preparation, action, maintenance and termination (Prochaska and Velicer, 1997).

The precontemplation stage is when an individual has no intention to take action and change their behaviour. In the contemplation stage, the individual intends to change behaviour in the foreseeable future. The third preparation stage is when the individual is prepared to take steps towards behaviour change in the next month. When the individual has recently changed their behaviour and intends to continue with it, this is considered the action stage. The maintenance stage is when the individual maintains the behaviour change for more than six months and aims to prevent relapse. In the final termination stage, the individual has full self-efficacy and is certain a relapse will not happen (Prochaska and Velicer, 1997).

Each stage of change represents a "temporal dimension", hence, according to this model change occurs over time (Prochaska and Velicer, 1997). This stresses the dynamic nature of behaviour change, rather than viewing it as an event. The TTM is depicted in Figure 3.3.

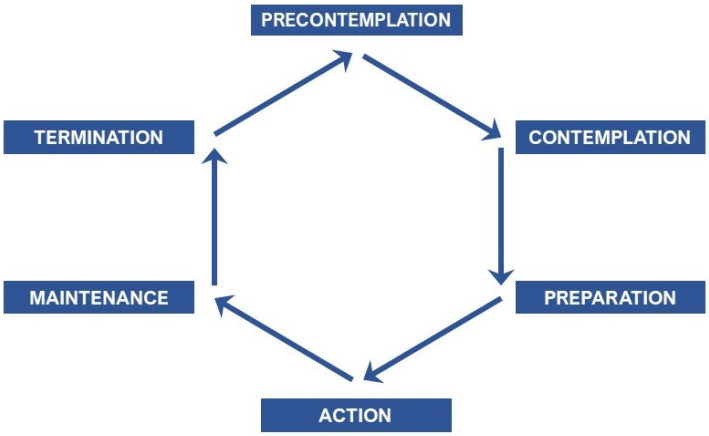


Figure 3.3: Transtheoretical Model

3.3.4. Consistency Theory

Consistency Theory was introduced by psychologist Fritz Heider and is a category of social psychological theory which posits that people are mainly motivated by their desire to “maintain congruence or consistency among their cognitions” (Psychology Dictionary, 2013b; Sam, 2020). Cognitions refer to items of information of a person that are in relation to each other, and these information items may be about behaviour, emotions, opinions, the environment and more (Festinger, 1962). The theory is rooted in the idea that people aim for consistency in their lives and this results in a sort of balanced mental state, i.e. “cognitive balance”, which is pleasant for the individual. Inconsistency on the other hand generates an unpleasant “psychological tension” within the individual, which he or she seeks to eliminate or reduce by changing one of their cognitions (Anderson et al., 1975).

According to Consistency Theory, this means in practice that people seek their knowledge, attitudes, beliefs, values, emotions and behaviours to be consistent with each other, that is non-contradictory (Anderson et al., 1975). Regarding behaviour specifically, it assumes people will behave in the way that maximises cognitive balance (Sam, 2020).

One well-known consistency theory discussed in literature is the Cognitive Dissonance Theory of Festinger (1957) (Kruglanski et al., 2018). It centers around the idea that the incompatibility between two attitudes, beliefs or behaviours results in feelings of dissonance at the individual level. To eliminate this unpleasant state of mind, the person will take action oriented towards reduction of dissonance, meaning one of the two cognitions will change (Festinger, 1957, p.3; Festinger, 1962; American Psychology Association, 2020). For example, when a person’s behaviour is inconsistent with their beliefs or opinions, then this will motivate the person to change their attitude or their behaviour, and thereby the information (cognition) about it (Festinger, 1962). Other consistency theories are the Balance Theory (Heider, 1958) and the Congruence Theory (Osgood and Tannenbaum, 1955), which are similarly based on (in)consistency between two cognitions. Following this theory, a change in behaviour or attitude then takes place as a result of inconsistency between two cognitions.

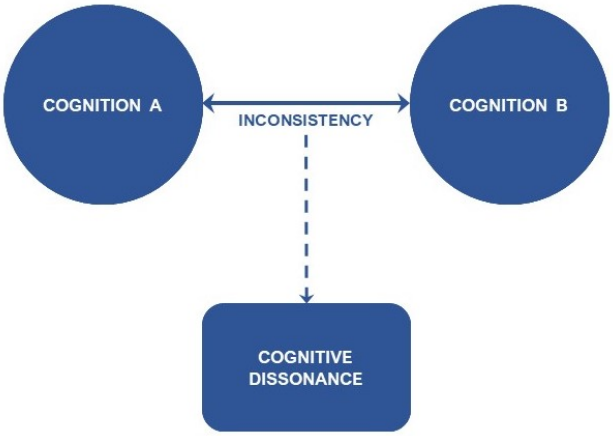


Figure 3.4: Cognitive Dissonance Theory

3.4. Reflection on the theories

This section first reflects on the role of attitude and attitude change in the presented theories, namely to what extent attitudes form a construct. Thereafter, the relation of attitudes with behaviour that these theories establish is reflected upon. Finally, the inclusion of attitude change and its causal relations are considered. This is especially interesting for the purpose of this study.

3.4.1. The role of attitude (change)

In the TPB and CDT, attitudes are included. First the TPB, in which attitudes form a core construct, namely the attitude toward the behaviour is considered an autonomous predictor of people's behaviour. The theory assumes that behavioural beliefs, including the evaluation of the consequences of the intended behaviour, influence the attitudes (Ajzen, 1991). Important to note here is that attitudes are assumed to have "temporal stability" and this influences the ability of attitudes to predict behaviour (Doll and Ajzen, 1992). Therewith, the TPB does not address changes in attitudes (over time), but rather views them as relatively constant.

Second, in the CDT, the attitudes of people could be either of the cognition constructs. The theory assumes that in case the attitude of the individual does not fit with the other cognition, such as behaviour, one of the two will change to reduce the dissonance. Therewith the theory establishes a bidirectional relation between attitude and behaviour, and moreover posits that either behaviour or attitude will change under the influence of the other. Hence, the CDT addresses attitude change and assumes attitudes to be malleable. However, this is only considered as a result of a certain cognitive inconsistency. The theory does not address attitude change in other cases.

In the SCT and TTM, the attitudes are not specifically taken into account, but they could be implicitly related. For the SCT, attitudes could be considered a part of the cognition construct. Based on the reciprocal determinism assumption, behaviour and environment can influence personal factors, therewith attitudes might be influenced as well. This implies that attitudes could change, however, changes in environment or behaviour might not always lead to a change in personal factors, i.e. attitudes.

Finally, in the TTM, attitudes are also not directly incorporated as a construct. The dynamic nature of the TTM emphasises how an individual over time progresses from one stage to another towards behaviour change. Prochaska (2008) emphasises how decision-making is an integral part of this process: in each stage the pros and cons of the behaviour are, often unconsciously, evaluated by the individual. In short, people progress from an initial negative to an eventual positive decisional balance (Prochaska, 2008). Since attitude inherently has an evaluative nature, this evaluation process can be considered as a gradual change in the attitude towards the behaviour, which eventually leads to behaviour change. Namely, the gradually more positive attitude towards the behaviour results in a person moving through the stages of behaviour change. With regard to the role of attitudes, it can be concluded that attitudes are to a greater or lesser extent part of the four theoretical models.

3.4.2. Attitude-behaviour relation

All theories establish a relation between behaviour and attitude, which is more explicitly seen in the TPB, SCT and CDT and more implicitly part of the TTM. In the TPB, attitudes are a determinant for behaviour and reciprocity between them is not presumed, whereas in the CDT and SCT a more bidirectional relation between attitudes and behaviour is assumed. This bidirectionality is most explicit in the CDT: it is the only theory that specifically acknowledges the reverse effects between behaviour and attitude. In the TTM attitudes are not explicitly addressed, however, implicit unidirectional causality between the changing attitudes and gradual behaviour change could be assumed as explained in 2.4.1. However, taking a more critical perspective, the causality might

be bidirectional as well. That is, the TTM posits that a person can relapse, i.e. moving one stage back, which suggests a change in attitude towards a negative evaluation. This might be the result of performing the behaviour for a while. Considering the theories, the attitude-behaviour relation might well be a bidirectional one.

3.4.3. Suggested attitude change mechanisms

The four theories only address up to a certain extent the notions of attitude change and corresponding mechanisms. Firstly the TPB, which at first sight does not include whether and how attitudes change, except that it supposes that behavioural beliefs influence attitudes. Behavioural beliefs entails what the person thinks will happen as a consequence of the intended behaviour, suggesting that some sort of cognition influences attitudes. Then the SCT suggests that attitudes could be influenced by behaviour as well as the environment, but how and why that exactly happens remains unclear. As mentioned earlier, the gradual behaviour change in the TTM suggests a gradual change in attitudes, in which the attitude would be the result of evaluating the pros and cons of the behaviour. Finally, the CDT is the only theory that clearly posits that attitudes can change and this is due to perceived cognitive inconsistency. This inconsistency could in turn be caused by behaviour that is incompatible with a person's attitude.

This reflection and the discussed attitude-behaviour relation bring forward at least one influence on attitudes and attitude change, that is the influence of behaviour. The theories further suggest, more or less explicit, other causes for attitude change. It could be suggested that the environment and cognition can lead to attitude change. However, the exact mechanisms leading to attitude change cannot be derived from the four discussed theories and there might be more mechanisms leading to a change in attitudes that are not considered in these theories. Theory that includes these aspects is not in abundance. Moreover, the theories do not relate to travel behaviour specifically.

3.5. Theoretical model for attitude change

One relatively new contribution to the theory on attitude change was found in the literature and was done by Van Wee, De Vos & Maat (2019). Their newly established conceptual model was found in the literature on attitude change and based on literature from social psychology and travel behaviour. The model captures multiple causal mechanisms leading to attitude change to better understand how these changes occur.

Three clusters of processes that lead to attitude change are distinguished in the model. The first cluster regards the cognitive processes that refer to the individual knowing something. The second cluster comprises the behavioural processes that refer to the individual doing something. The third cluster includes the affective processes that refer to the individual feeling something.

In turn, these processes are suggested to change under the influence of triggers that are divided into three categories. The personal level triggers relate to information and experiences of the individual and the social level triggers regard influences from the individual's social network (e.g. family, friends). Finally, triggers from the environmental context refer to other types of influences. Triggers are "the reasons why people change what they know, do or feel" and initiate the discussed processes (van Wee et al., 2019).

In short, three triggers are assumed to influence the engagement in cognitive, behavioural and affective processes, which then could lead to attitude change. Moreover, the cognitive and behavioural processes can have an effect on each other and the affective processes too, meaning that attitude change can be the (in)direct result of multiple processes. The relations are depicted in the figure below. It should be noted that the dotted arrows, i.e. the influence of affective processes and attitude change on behavioural processes, are not the focus of this study.

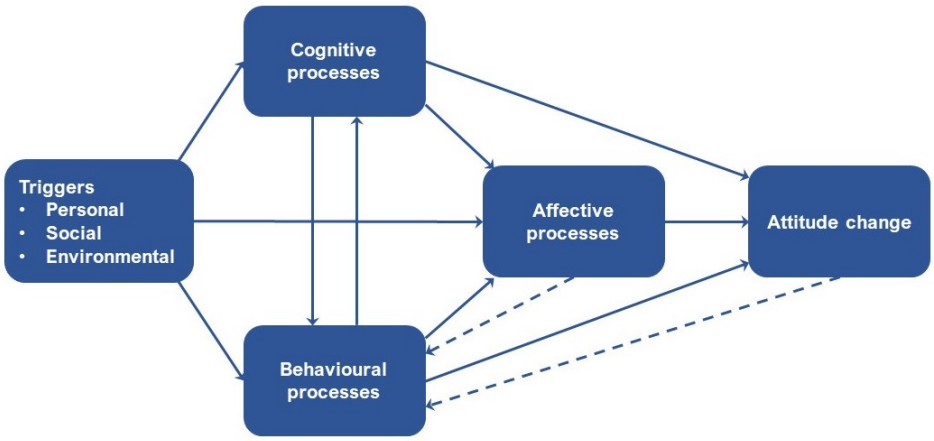


Figure 3.5: Theoretical model on attitude change, adopted from van Wee et al., 2019.

3.5.1. Reflection on model for attitude change

A reflection similar to section 3.4 on the role of attitude (change), the attitude-behaviour relation and the attitude change mechanisms in the model of Van Wee et al. provides the following findings. Firstly, in the conceptual model for attitude change of Van Wee et al. (2019) not attitudes but explicitly *attitude change* forms a clear construct that is affected. Comparing this to the other theories, it clearly assumes attitudes can change and includes attitude change as a theoretical construct, which is unique.

Secondly, regarding the attitude-behaviour relation, the model of Van Wee et al. (2019) also recognises the influence of behaviour on attitudes as discussed in the other theories. However, here behaviour is considered one of multiple constructs influencing attitude change, instead of the sole construct influencing attitudes like in the CDT or the sole construct that is affected by attitudes like in the TPB. Also the influence of cognition (knowledge) and affection (emotions) are acknowledged as influences on attitude change. Similar to the other theories, the model also includes the bidirectional causality from attitude change to behavioural processes, although the relation from attitude to behaviour is not the focus of the authors.

Finally, regarding the inclusion of attitude changes mechanisms, the model of Van Wee et al. (2019) is actually unique. Namely, the causal mechanisms leading to attitude change are more comprehensively addressed in Van Wee et al. (2019) than in the previously discussed theoretical models in section 3.3. This model captures more relations than just the influence of behaviour on attitudes by identifying three types of internal processes leading to attitude change (i.e. the causal mechanisms), as well as that it includes triggers that initiate these processes.

3.6. Conclusion

3.6.1. Main take-aways

In the first part of this chapter, four main theories on attitude and behaviour were discussed, namely the Theory of Planned Behaviour, Social Cognitive Theory, Transtheoretical Model and Cognitive Dissonance Theory (as part of Consistency Theory).

Based on these theories, the first important take-away from this chapter is the assumption that attitudes can change. This is a main assumption in this thesis on changing attitudes to flying.

A second important take-away from theory regards the relation between attitude and behaviour. Differences exist in the direction of causality. According to the TPB, flying behaviour is affected by

attitudes to flying. Assuming those attitudes can change, then our desired behavioural change in the aviation sector could be the result of attitude change. However, other theories such as CDT suggest more flexible, bidirectional causality, meaning that behaviour also influences attitudes. In that case, the desired behavioural change, meaning people actually flying less, could itself also result in changing attitudes. Since this thesis studies what influences attitudes and changes therein (SQ4) as well as its relation to flying behaviour (SQ5), bidirectional causality between attitudes and behaviour is assumed.

The second part of this chapter introduces a relatively new theoretical model on attitude change established by Van Wee et al. (2019). It distinguishes three types of triggers that, through initiating certain behavioural, cognitive and affective processes, lead to attitude change. Hence, a third main take-away is that not only the effect of behaviour on attitudes, but several mechanisms for attitude change are acknowledged.

3.6.2. Theoretical lens

Finally, the model of Van Wee et al. (2019) is taken as a theoretical lens to look at the empirical results. Since this research aims to not only identify people's viewpoints to flying, but also find out what triggers a change in attitude to air travel, this model provides a broad theoretical lens to later on analyse the viewpoints and identify triggers for attitude change in this research.

Namely, the different model constructs offer the possibility to recognise the various motivations or causes for the indicated attitude change and with that it is useful for making sense of and understanding the entire perspectives of people as well. How and why people's attitudes to flying change or have changed, being the focus of this thesis, then becomes comprehensible.

Besides, this model is partially derived from travel behaviour studies, making it fitting to this research into air travel attitudes. In addition, since the model is relatively new, it has to the best of my knowledge not been extensively applied and validated (TU Delft Research Portal, n.d.). This furthermore makes it interesting to take this conceptual model as a theoretical lens to look at the results of this study.

However, it must be noted that entirely validating Van Wee's model is difficult in practice. Whereas in the TPB, SCT and CDT the model constructs are psychological variables with relations between them, in the attitude change model they describe processes. Processes are inherently dynamic, making it complicated to measure them as well as the relations between them. Hence, statistically validating the model entirely is not part of this study.

4

Current attitudes to flying

What are the current attitudes of people towards air travel?

For the study into changes in attitudes to flying, it is of interest to firstly identify the different attitudes and perspectives that currently exist among society. This creates a better understanding of the current discourses on aviation and using that as the context in which changes take place. Possibly some changes in attitudes can be noticed. Doing this furthermore results in a comprehensive insight into what studies into air travel attitudes have been conducted to this day. Therefore, this chapter discusses the scientific literature in the area of people's attitudes towards air travel, in which specific attention is paid to (signs of) changes in attitudes. After the first, more theoretical chapter, this chapter presents mainly empirical studies. First section 4.1 explains the literature review and corresponding analysis. Subsequently section 4.2 presents the scientific research and discusses the findings related to people's (changes in) attitudes to flying. Finally, section 4.3 synthesises the findings.

4.1. Literature review and its analysis

The systematic literature search from subsection 2.2.2 was conducted in December 2021, after which the resulting articles were systematically reviewed. For this, the titles and abstracts of the articles were subsequently scanned to decide on the relevance of the article for this question. An article's relevance and its inclusion was based on several criteria. An article should specifically refer to (changes in) attitudes of people in relation to flying or air travel, in general or as a modality. They should specifically reveal actual observed attitudes to comprehend the variety of attitudes that exist. These topics could be studied in different contexts, such as climate change or COVID-19, or combined with flying behaviour as well. The research should not solely focus on people's climate change attitudes, travel choices and behaviour, their evaluation of aviation policies or their airport and in-flight experience, such as aspects of safety, comfort, health, infection risk or money. The geographical location of the research was not a criterion, since a most comprehensive overview into current attitudes was desired, regardless of where the attitudes were found.

Eventually, twenty articles were selected from the collected literature based on the criteria and were categorized based on their focus. The condensed literature review below starts with discussing the articles related to COVID-19 and climate change. Thereafter the articles focusing on academics are discussed. Academics are especially interesting since they often have more pro-environmental attitudes and travel for work-related purposes. Finally, articles addressing the attitude-behaviour gap and the functions (i.e. purpose) that attitudes serve are discussed. Specifically, the findings that are related to attitudes towards flying are highlighted in the literature review.

Table 4.1: Overview of the literature review

Authors & year	Focus	Method	Location
Graham et al. (2020)	COVID-19	Survey	UK
Budd et al. (2021)	COVID-19	Survey, cluster analysis	Norway
Thomas et al. (2021)	COVID-19	Survey	New Zealand, Australia
Lamb et al. (2020)	COVID-19	Survey	US
Song & Choi (2020)	COVID-19	Survey, SEM	South Korea
Lamb et al. (2021)	COVID-19	Interviews	US
Davison et al. (2014)	Climate change	Survey, cluster analysis	UK
Ryley et al. (2013)	Climate change	Survey	UK, US
Araghi et al. (2016)	Climate change	Discrete-choice latent class model	Netherlands
Kroesen et al. (2013)	Climate change	Q methodology, cluster analysis	Netherlands
Higham et al. (2014)	Climate change	Interviews	Norway, UK, Germany
Valkila & Saari (2012)	Climate change	Consumer panel	Finland
Busche & Sargisson (2020)	Climate change	Survey	Netherlands, Germany, other
Dickinson et al. (2013)	Climate change	Survey, cluster analysis	Poland
Whitmarsh et al. (2020)	Academics	Survey	International
Nursey-Bray et al. (2019)	Academics	Survey, interviews	Australia
Schrems & Upham (2020)	Academics	Case study, interviews	Germany
McDonald et al. (2015)	Attitude-behaviour gap	Interviews	UK
Cocolas et al. (2020a)	Functions of attitudes	Literature review	*na*
Cocolas et al. (2020b)	Functions of attitudes	Interviews	Australia

Table 4.1 presents the articles in order of their discussed *focus*. Furthermore, the table includes the used *research methods*, as this illustrates how attitudes were studies and the scarcity of clustering studies, and the *location of the research*, as this indicates where certain attitudes were found.

4.2. Literature on attitudes to air travel

Attitudes and COVID-19

In several recent studies, the effects of the COVID-19 pandemic on air travel attitudes have been included. Graham et al. (2020) have analysed the attitudes of ageing passengers to air travel in the light of the COVID-19 pandemic. Findings show that a majority of ageing passengers are expecting to take the plane in the next year, indicating a reasonably positive attitude towards air travel. Yet, results do suggest a change in their travel patterns, meaning travelling less, favouring more local trips and choosing other travel modes than the plane in the future. This indicates a changed perspective towards flying.

In the study of Budd et al. (2021), four distinct groups of passengers are distinguished, each sharing different attitudes and preferences towards flying in the same pandemic context. Similar to findings from Graham et al. (2020), the elderly group expressed most concerns about flying and reduced intention to fly in the future. With their outcomes, Budd et al. (2021) aim to contribute to the challenge of increasing consumers' confidence in air travel in the aftermath of the pandemic.

The central question of Thomas et al. (2021) is how people's attitudes towards, and intention to use travel modes have changed due to the coronavirus pandemic. The results indicate that those attitudes were negatively affected by COVID-19. Regarding air travel specifically, attitudes towards both domestic and international air travel remain less positive than prior to COVID-19 travel restrictions.

Specifically consumers' willingness-to-fly during and after the COVID-19 pandemic was studied by Lamb et al. (2020). For both business and pleasure flyers, their willingness to take the plane

decreases when their perceived COVID-19 threat, agreeableness, affect (i.e. emotions) and fear increase. The study focus is not on attitudes specifically, though it can be said that an increase in those factors is a reason for potential passengers to avoid air travel (i.e. less willingness to fly), which likely indicates negative emotions and a more negative attitude towards flying. Thus, fear and worry about safety are important in people's willingness to fly.

In Song & Choi (2020) people's perceptions and behaviours with regard to the resumption of air travel after the COVID-19 pandemic are studied through hypothetical travel situation statements. The factors influencing these perceptions and behaviours are elicited, and among their results they find that a fear of transmission of the disease, similar to Lamb et al. (2020), and a negative social atmosphere related to overseas travel result in a social reluctance to travel by plane. This also indicates a more negative attitude towards flying during a pandemic.

The study of Lamb et al. (2021) builds on previous research (Lamb et al., 2020) by further examining the factors predicting willingness-to-fly, mainly focusing on passengers' emotions and feelings of trust and fear during the pandemic. Distrust of other people is the primary source of the fear and negative affect, which predict their willingness to fly. Due to these trust issues, which all travelers likely experience to some degree, they have safety concerns about flying. Of the participants, 40% indicated no intention to fly soon. Results furthermore showed mainly optimistic expressions regarding flying for leisure after the pandemic, contrary to the more pessimistic views about business travel returning to normal.

Attitudes and climate change

Other studies have incorporated another context, namely that of climate change and environmental awareness with respect to air travel attitudes. First the analysis of Davison, Littleford & Ryley (2014), which measures, among other things, consumers' attitudes towards air travelling and willingness to change behaviour to minimize its environmental impact. It results in four attitude-based segments, varying in level of people's belief that flying behaviour affects climate change and belief that they are dependent on air travel. Comparing each segment with their flying behaviour, it is seen that people who fly most frequently have the most sceptical views regarding the impact of flying on the environment.

Ryley, Burchell & Davison (2013) aim to determine how people value sustainability with respect to flying in two developed countries. By examining public attitudes to air travel and sustainability, they find how the majority of respondents believes air travel is essential to the country's economy. Similar to Davison et al. (2014), they find frequent flyers to be more likely to question the impact of flying. Overall, respondents furthermore tend to acknowledge that flying contributes to climate change, however, they seem unwilling to pay more to offset these effects or fly less to compensate (Ryley et al., 2013).

As part of their study, Araghi et al. (2016) also investigate people's attitudes towards flying and climate change, and complement the previous studies by incorporating stated preferences to passenger-oriented environmental policies. Findings indicate that passengers with more ignorant attitudes to the link between flying and climate change have a higher probability to value ticket price and luggage allowance more. Moreover, passengers who perceive flying as less embedded in their lifestyle have a higher probability to value carbon offsetting and an ecoefficiency label.

The study of Kroesen (2013) reveals, among other results, how people vary in their general liking of air travel and differ in their perceptions on whether flying is for example necessary (for working), pleasant, affordable, polluting or results in feelings of guilt. Based on this, six distinct viewpoints of air passengers towards flying and climate change are identified. The largest group of respondents express a viewpoint in which their attitudes and flying behaviour are well-integrated. They are in general environmentally aware, have an overall critical attitude towards flying and claim to fly little or not at all. However, in the case there is an inconsistency between air travel and climate change attitudes and their flying behaviour, individuals commonly resolve this by claiming to be ignorant of

the effects or emphasizing the necessity of flying.

Also in Higham, Cohen & Cavaliere (2014) the attitudes and behaviour of air passengers to climate change and discretionary flying are explored. More evident than in the above research, widespread climate concerns and awareness of the impact of flying on climate change were found among consumers. Specifically, their attitudes to short haul air travel seem to be hardening and, like in Kroesen (2013), some express feelings of guilt when flying. However, they suppress this to continue flying practises. People tend to stress the convenience and freedom of flying and the mobility it offers them.

The study of Valkila & Saari (2012) explores the readiness of people to adopt pro-environmental behaviours in different aspects in life. One aspect regards mobility, in which consumers' attitudes to giving up flying and driving are discussed. Some results indicate positive attitudes towards flying, such as that flying offers a break from daily life and the pleasure of flying is bigger than the environmental consequences. However, more negative attitudes were dominant, such as that air travel is a problem, individual flying quotas should be policy, business air travel should be limited and flying should be more expensive and mandatory flight taxes. Train and boat transport are perceived as convenient alternatives to flying.

As part of the study of Busche & Sargisson (2020) into how psychological variables from the TPB predict the intention to reduce the environmental impact of flying, the environmental attitudes towards air travel of people are studied. Agreement with statements such as flying contributes to climate change and flying should become more expensive, indicating more negative attitudes to flying, and agreement with statement such as climate change effects are overstated, indicating more ignorant attitudes, are measured. These environmental attitudes toward air travel are demonstrated to highly predict people's intentions to reduce the impact of flying.

While the above studies focus on developed countries, one study focuses on flying attitudes in an emerging economy. Dickinson et al. (2013) assess people's awareness of climate change, attitudes towards aviation and holiday flying behaviour of consumers in Poland, where the share of air travel is relatively low. Results reveal how climate concern is present, although knowledge of the impacts of air travel on climate change is less developed.

Attitudes of academics

In the same climate context, other studies have focused on the attitudes to flying of academics specifically. Such as Whitmarsh et al. (2020), who investigated the flying behaviour and air travel perceptions of researchers. Specifically the climate change experts report greater awareness and concerns about the negative impact of flying on climate change compared to their non-climate colleagues. However, the experts fly more frequently. Despite climate concerns, the participants overall perceived flying as "more convenient, cheaper and faster" than other travel modes and as a boost for their professional network.

Nursey-Bray et al. (2019) report similar findings. Despite the climate concern that academics experience, very few are willing to modify their current flying practices. One of the reasons is they perceive plane travel as a driver for a prosperous career. Therefore not flying remains a barrier to them for more environmentally-friendly behaviour.

The perspectives on flying for academic purposes of sustainability scientists specifically are part of Schrems & Upham (2020). The scientists overall have a flying-critical attitude, due to awareness of the environmental impacts, however, still continue travelling by plane. They for example believe it is necessary for research or have no other option than to fly. They do experience feelings of dissonance related to this.

Attitude-behaviour gap in air travel

In short, many studies indicate inconsistencies between people's attitudes towards flying and their actual air travel behaviour, pointing to the so-called 'attitude-behaviour gap'. McDonald et al. (2015)

examine this gap among self-reported “green consumers”, of whom many continue to fly despite their environmental awareness, through a Cognitive Dissonance theoretical lens. Four main strategies these consumers have for repairing the inconsistency between their attitude and behaviour were elicited. Despite that mainly environmental attitudes are analysed, among the results various attitudes of green consumers towards flying can be reported too. For instance, flying is most practical and cheap, flying offers wisdom and experience, flying is a shame, and not flying is a sacrifice.

The attitude-behaviour gap is also demonstrated in several other studies, such as Cohen, Higham & Reis (2013), Higham, Reis & Cohen (2016) and Reis & Higham (2017). Interestingly, findings show that in tourism contexts, compared to everyday situations, people are less driven by their environmental concerns, seen in reluctance to give up or change their holiday flying behaviour. This indicates less “strict” attitudes of people to flying when in tourism situations. Nevertheless, these articles’ focus is more on the behavioural and environmental side and they do not specifically elicit attitudes to flying.

Influences on attitudes

Finally, some studies focus more on understanding what shapes attitudes to air travel, while less explicitly discussing people’s actual attitudes.

The literature review of Cocolas et al. (2020a) highlights how current attitudes towards air travel are aligned with dominant aviation industry discourses and reflect consumers’ overall unwillingness to fly less. Therefore, based on the theory of Katz (1960), the researchers aim to understand the underlying functions that attitudes serve, i.e. the purpose of a certain attitude, so that a change in those attitudes could be induced.

Katz’ theory is further applied in Cocolas et al. (2020b), in which they explore factors shaping attitudes towards air travel to understand why consumers continue to fly despite growing climate concern. They find how flying is perceived as beneficial and justified as instrumental for the deeply embedded motivations of travel, and these motivations outweigh environmental concerns. Therewith, the results reflect how flying is “entrenched as a social practice”, which corresponds with findings that indicate unwillingness or inability to change behaviour.

4.3. Conclusion

4.3.1. Observed attitudes to air travel

Based on the reviewed studies, the attitudes to flying can be summarised as diverse. Some studies report concerns of people about flying during a pandemic and indicate hesitations to fly. Overall, generally less positive attitudes to flying after the COVID-19 pandemic are seen, such as pessimistic views about the return of flying for business. On the other side, people hold optimistic views about flying for leisure purposes after the pandemic is over.

Moreover, attitudes vary when it comes to the environmental impacts of flying on climate change specifically. Some people hold more critical, hardening views towards flying, some even reporting feelings of shame, and are more aware and concerned about the impacts of flying. People perceiving flying as a problem also represents a negative attitude. In addition, people’s support for discouraging flying through policy options was studied and indicates a more negative attitude to flying. Others are questioning the environmental impact and hold more sceptical or ignorant attitudes on air travel’s climate impact. Some people simply have less developed knowledge on this issue.

Attitudes expressing the necessity of flying and dependency on it are furthermore observed; some people believe air travel is essential for a country’s economy or necessary for their career. A general unwillingness of people to fly less came forward as well.

The generally positive attitudes to flying also come forward, seen in people perceiving flying as

beneficial and more convenient, cheaper and faster than alternatives and stressing the possibilities that flying offers, such as travelling far. Still, positive attitudes addressing the convenience of the alternatives to flying are reported too. Also agreement with certain anti-flying policies can be considered as more negative attitudes to flying.

Finally, reflecting on the different countries in which the attitudes are studied, explicit differences in attitudes were not observed. The only notable thing is that in an emerging economy, attitudes to air travel seem to be less concerned with climate awareness.

4.3.2. Reflection on attitude change, influences and themes

The gathered literature not only informs us about current attitudes, but furthermore provides other useful insights for the next steps in the research. First and foremost, investigating and identifying attitude change specifically has not been the research objective of the reviewed studies nor has it been done in The Netherlands, which underlines the knowledge gap and scientific contributions of this research project. Nevertheless, studies do bring forward some indications of attitude changes. That was sometimes more implicitly observed by the researcher, and in other case more explicitly mentioned in the article. For instance, the less positive attitudes to flying for business purposes or a decreased intention to fly since the COVID-19 pandemic. The first take-away thus is that attitudes are indeed changing, which is consistent with the assumption in section 3.6 based on the theory.

Moreover, besides the insights into attitudes, the literature already suggests several aspects that possibly influence a change in attitude. These include COVID-19, climate awareness, convenient alternatives for flying and perceived necessity of flying. The second take-away thus is to consider these themes during the following research steps, i.e. sub-question 3 and 4.

In addition to just the air travel attitudes, several studies demonstrate the attitude-behaviour gap that is evident among people. The result is that people holding more pessimistic attitudes to air travel are not necessarily flying less. Indeed attitudes are assumed to influence behaviour, as concluded from the theory of chapter 3, of which the study of Busche & Sargisson (2020) is an example demonstrating how air travel attitudes influence behavioural flying intentions. However, the relation between attitudes and behaviour is thus not perfect. Therefore, a final important take-away is that different attitudes will not one on one translate to consistent flying behaviour. Yet, this study does assume some kind of positive effect of attitude change on behaviour change.

5

Changing attitudes to flying

What changes in attitudes towards air travel can currently be identified?

This chapter identifies in what way people's attitudes towards flying have changed or are changing and what trends and discourses in this area can currently be observed. The grey literature was explored and six interviews were conducted to provide insights into the current and changing attitudes to flying among the Dutch population. These insights were in turn used for performing the Q study, namely for first for *concourse development (step 1)* and subsequently *Q set development (step 2)*.

First, section 5.1 explains the execution of the literature exploration and interviews. Next, section 5.2 discusses the procedure of sampling statements for the concourse and Q set. Finally, section 5.3 concludes on the final Q set.

5.1. Grey literature exploration and interviews

The necessary information for this question and corresponding concourse was collected from various written and spoken sources according to the method described in subsection 2.3.1. Namely, 1) a grey literature exploration and 2) conducting six semi-structured interviews with different types of air travellers were conducted. The attitudes, possible changes therein and themes in the air travel discourse identified in chapter 4 were additionally used as information. The final concourse for this study was developed in December 2021 and January 2022.

Time frame for attitude change

Based on the gathered data, a time frame of five years was taken for the attitude change in this study. Five years ago was taken as a reference, since this is considered well before (at least three years) the start of the COVID-19 pandemic in the Netherlands in March 2020 (Rijksoverheid, n.d.-b) as well as before the IPCC climate report of 2021. These are considered two main events that (could) have impacted both flying behaviour and attitudes. At the early stage of concourse development, it was already observed how those events more or less impacted people's attitudes. Also from empirical studies in chapter 4 it has become clear that the environmental awareness and COVID-19 pandemic have been studied in relation to people's attitudes to flying and have an impact on that.

Grey literature

During the literature exploration, a variety of Dutch sources were consulted that related to the "the flow of communicability" surrounding air travel and changing attitudes (Brown, 1993). Sources included surveys, research and reports about air travel in The Netherlands conducted by diverse

actors with some interest in the aviation field and/or sustainability. For example, the research institute Motivaction (e.g. Bos and der Lelij, 2021), the knowledge institute KiM (e.g. KiM, 2018) and consultant Climate Neutral Group (CNG, 2019) and a bank (Couzy, 2020). Furthermore, several media sources were consulted, such as newspapers, websites and forums originating from various organisations, such as news channels, climate organisations, and individuals. Such sources should result in more "informal" references to (changes in) air travel attitudes. Specific attention was paid to those documents that in some way revealed changes in attitudes, but more general attitudes to air travel were considered too. Furthermore, attention was paid to indications of causes for attitude changes.

Generally, reported changes in attitudes said by people themselves were not in abundance in the grey literature. More common was research conducted among a group of people (panel study) of which the results indicated a change in opinion or observed changes in opinion, or documents that implicitly pointed to an attitude change. Therefore, it was not necessary that an attitude change was specifically referred to as a 'change'. In addition to findings from chapter 4, this exploration also gave an idea of prevailing themes in the concourse, such as climate change and awareness, COVID-19, alternatives to flying, flying for business, air travel policies, emotions accompanying flying, and functions and attributes of air travel. These were used as input for the interviews too.

Interviews and interviewees

With the guidance of the discussed sampling dimensions, i.e. flying behaviour and main flying purpose, eventually a group of six interviewees was selected by the researcher. Besides that, the researcher evaluated whether a certain person could provide interesting insights, which was done more intuitively and not strictly and purely based on the two sampling dimensions. Especially, some interviewees were selected who (used to) fly for work or who used to fly a lot in the past, but are now flying less often due to a change in profession or shifting to another preferred transport mode. Moreover, a person that has recently become aware of the climate problem, and lives as environmentally-aware as possible, yet, has made several flights for holidays. This is for the reason that, as seen in chapter 4, pro-environmental attitudes are often linked to a more negative stance towards air travel. Furthermore, a variety in age was also considered. Altogether, these were characteristics that the researcher expected to play a role in their attitude to flying as well as a possible change therein, thus resulting in a variety of insights for the concourse. The interviewees can be characterised as the following types of travellers, including their flying behaviour and main purpose:

- A person who mainly flies for business purposes, such as lectures or congresses, and occasionally for leisure too. This person is an academic too, which is one of the themes discussed in chapter 4.
- A former business traveller, who used to make dozens return flights per year, and who currently regularly enjoys flying for holiday purposes only.
- A person who generally flies regularly, with the largest share being for leisure purposes and occasionally for business purposes. This person has started to travel a lot with the train as an alternative too.
- A person who aims to fly as less as possible, and accordingly, has recently travelled to a European destination by train on principle, instead of the plane like their travel company.
- A person who used to fly once a year on average for leisure purposes before the pandemic, but has recently started to make sustainable (travel) decisions based on environmental principles.
- A person who rarely flies at all, and the last made flight was only for a leisure purpose.

Regarding the flying behaviour of the interviewees, a distinction can be made, namely that the first three interviewees travelled more than the Dutch average of 1.3 flights per year, whereas the latter three interviewees took the plane less than the average number per year in the period before the pandemic (KiM, 2018). For main flying purpose, only one interviewee primarily flies for business purposes. The youngest interviewee was 25 years old and the oldest interviewee was 67 years old. Of course, interviewing more people could have given additional unmentioned insights, yet, after the six interviews it certain findings started to be repetitive. Time restrictions also played a role in the decisions to not interview more people. With the grey literature as complementing, it was considered to yield a diverse concourse.

The interviews were done according to the outlined approach in subsection 2.2.2; a conversation consisting of three parts and with the guidance of the prepared questions from Appendix A. To complement the findings from grey literature, the interviewer explicitly asked about changes in attitude, so that they actually started talking about that. The interviews therewith provided useful actual quotes and citations about attitude change for the concourse. However, the opinions might be biased towards the interviewees, but this was partly resolved due to the consultation of the grey literature that added different insights.

Five interviews were conducted online and recorded in MS Teams due to COVID-19 restrictions as well as practical considerations. One interview was done in real life and voice-recorded. Each interview approximately lasted 30 minutes to one hour. The first interview resulted in experience and feedback that was taken into account for the following interviews.

5.2. Analysis: statement sampling procedure

There is no one best practice to develop a concourse; its limited guidance on constructing a systematic concourse has even been criticised (Fontein-Kuipers, 2016). Hence, the concourse development is usually a rather non-scientific process; in this study it was quite an intuitive and iterative process. Nevertheless, there were some systematics involved, as it roughly consisted of two sensible iterations. This is visualised in Figure 5.1.

The starting point for concourse development was gathering a mix of both static and dynamic statements (as discussed in item 2.1) from the grey literature and interviews. This entails taking statements referring to:

- *changes in attitudes to flying*, specifically how people think their attitudes have changed or indications of changes in attitudes; and
- *current attitudes to flying*, which entails more general statements on relating to the positive and negative aspects of air travel on which people (mostly) did not change.

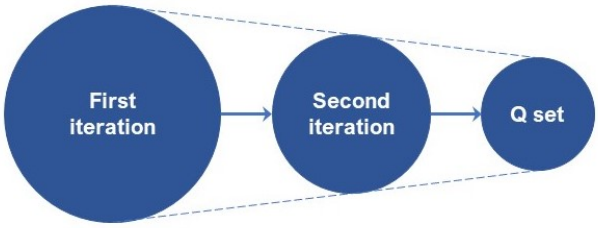


Figure 5.1: From concourse to Q set

First iteration

The grey literature was scanned and quotations, phrases, pieces of text were marked and sampled for the concourse. Regarding the interviews, these were transcribed first and analysed in an impressionistic manner by the researcher. This entailed looking for both static and dynamic statements and evaluating intuitively the relevance or interest of a person's statement based on added diversity or nuance to the concourse (and minimise repetition of opinions). Consequently, these quotations were also sampled. This concourse development was organised in Excel, the first column including the sampled concourse and their original source and data in two separate columns. This resulted in an extensive list of quotes, citations, anecdotes and statements that were either representing more implicitly observed attitude changes by the researcher, or more explicitly mentioned attitude changes. The list also included static statements about air travel in general.
The necessary reformulation of the sampled items in the list was done. First of all, it was ensured the statements were all normative, subjective in nature. This reformulation was the case for most sampled texts originating from the grey literature that were not directly subjective, but rather factual or descriptive. For example, in case of two panel studies from two different years, and a difference in attitude could be concluded, then this was formulated into one normative statement about a change in attitude. Secondly, specifically for the interviews, the sampled items were reformulated or shortened in case they were too vague or long, ensuring the statement still captured its initial meaning. For the dynamic attitude change statements, the formulation should capture the observed direction of that attitude change in the concourse. Preferably the statement included a cause or motivation for that change as they were of interest in this research too. Furthermore, the dynamic statements were formulated more in a reflective way, meaning stimulating the respondent to reflect on their attitude as desired, and therefore usually included words like "my", "I", "to me".

After this iteration, the total concourse list included more than 70 statements originating from the grey literature and more than 80 statements originating from the interviews.

Second iteration

In the following iteration, this large list was reduced into a "smaller and manageable set" (Cuppen et al., 2016). This entailed inductively identifying several main themes from the first iteration and chapter 4. The identified themes are:

- *General and emotions*. This regards more general perceptions and feelings about flying.
- *The necessity of flying*. This regards the stance towards the necessity for both leisure and business flying.
- *The self-evidence of flying*. This regards to what extent people perceive flying as normal.
- *Airplane or alternatives*. This regards the stance towards the efficiency of flying and availability of alternatives.
- *The climate and environment*. This regards perceptions of the environmental and climate impacts of flying.
- *The pandemic*. This regards the impact of COVID-19 specifically.
- *Flying behaviour*. This regards whether people are willing to fly less.
- *Opportunities*. This regards the perception on the opportunities that flying offers.
- *Social environment*. This regards the influence of people's friends and family.
- *Taking responsibility*. This regards whether people perceive a certain responsibility.

- *Policies and measures*. This regards the stance towards certain policy measures.

The financial aspect to air travel was not identified as a separate theme. Nevertheless, it was included in several statements, for example in people being more positive about higher flight taxes, more willingness to compensate flights or how tickets are perceived as affordable or too cheap on the other hand. Altogether, this aspect was incorporated more in the way of measuring people's perceptions towards certain cost-related aspects to flying, but it did not come forward as an influence on a change in attitudes by itself.

Consequently, the statements could be grouped into the eleven themes and organised based on their either dynamic or static nature, to separate the attitude changes from current attitudes. To reduce the number of statements, not every statement from the large list was sampled into a category, but they were strategically reduced through the following procedure. First and foremost, two or multiple statements from the concourse that were similar, were combined and included as one overall statement on the issue at hand. Consequently, that statement was categorised according to the themes and its static or dynamic nature. For the static statements, it was aimed to include both more positive and more negative formulations of the attitude, since chapter 4 also highlights the existence of both more flying-critical and more pro-flying attitudes and bias in the concourse towards one of these sides was undesired. This moreover ensured that both ends of the spectrum could relate to the statement set. Moreover, more extreme and "bold" statements were also purposively included, although they appeared to be more rare in this concourse. The observed directions of attitude changes or pro-climate opinions might have been over-represented in the concourse, but not every individual might experience that. Especially since polarisation can be observed in the public debate on different topics, such as climate change, these attitudes were given a place in the concourse too. This was furthermore interesting for finding topics where people hold different opinions about and highlighting controversy. In addition, several statements were deductively formulated by the researcher for the 'policies and measures' theme. Namely, one interviewee mentioned the absence of the flight tax and several interviewees mentioned carbon offsetting, however, these were reformulated into a policy measure statement. This could inform the making of policy recommendations afterwards. Overall, it was aimed to have a variety of static and dynamic statements as well as a variety in possible viewpoints.

After this, statements that were still too long were shortened and simplified, making them better understandable without losing the initial meaning. Subsequently, it was intended to separate possible causes or motivations from the attitude change, if possible. Next, it was ensured the resulting statements were "single argument" to enable either agreeing or disagreeing to one argument of the statement.

After this iteration the concourse was reduced to a well-organised set of 80 statements covering various themes surrounding air travel, i.e. static statements, and attitude changes and causes for that, i.e. dynamic statements.

5.3. The Q set

In the final step, the statements for the final Q set were selected through an iterative, semi-structured, partly intuitive process, which is "more an art than science" (Brown, 1980, p.186; Kroesen, personal communication, January 18, 2022). While selecting from the concourse, the potential viewpoints that the researcher expected to find were considered. It was aimed to have a Q set that is different types of people can relate to; people holding opposite, extreme or more nuanced views, or who did not experience a change in attitude. The final concourse was therewith reduced to a desirable subset of 50 statements which was ensured to represent the "breadth and depth of opinions" (Paige and Morin, 2016). Final reformulations were done to ensure statements could be included in the final Q set. Brown (1993) noted that in principle the Q set consists solely of things that people have actually said. However, due to the previously explained strategic sampling procedures, not

all statements in the Q set are literally said by people. The final Q set can be found in Appendix C, including the origin of the statement and corresponding theme, which is summarised in Table 5.1.

The developed Q set was consequently input for the next steps in the Q study, discussed in the following chapter 6, which will empirically study the attitudes and changes.

Table 5.1: Q set statement origin

Source/origin	# statements	%
Interview	18	36
Report/article	8	16
Forum/opinion	4	8
Combination	20	40

6

Viewpoints to air travel and changing attitudes to flying

What are people's viewpoints on air travel and changes in their air travel attitudes and what causes the attitude change?
What relations can be observed between the identified viewpoints and people's actual flying behaviour?

This chapter discusses the perspectives of people on air travel and changes in their air travel attitudes and identifies potential causes for that. This corresponds with performing the final three steps of the Q study as outlined in chapter 2. For this, a Q survey was set out that enabled the *Q sorting (step 4)* of the Q study. Consequently, *factor analysis (step 5)* was performed to result in three viewpoints. Finally, the viewpoints were interpreted, i.e. *factor interpretation (step 6)*.

First, section 6.1 describes the operationalisation and execution of the Q survey as well as the respondents that were sampled and participated in this study. Secondly, section 6.2 describes the procedure of analysing the gathered Q sorts and third in section 6.3 the identified viewpoints are described, followed by the attitude changes in section 6.4. Next, section 6.5 discusses factors contributing to that change are discussed. Finally, section 6.6 concludes and reflects on the findings.

6.1. Execution of Q survey

A Q study is often conducted in person, however, for the sake of time and practicalities and the uncertainty around COVID-19, this study's survey was executed online. The Q sorting survey consisting of four separate steps as described in subsection 2.3.2 was set up with the EasyHTMLQ software developed by Shawn Banasick and a corresponding guide (Banasick, 2019). Continuing to the next step was only possible if the current step was completed, if not, the Q survey was not completed as a whole. The survey was published in February 2022 using Netlify.app as a website host and Firebase as a database. The respondents were provided the website link (https://vliegattitudes.netlify.app) to participate. The entire Q survey, including the sorting steps, specific post-sorting questions and screenshots of the web application, is presented in Appendix B.

In the P set sampling, it was aimed to have at least ten respondents per sampling dimension. On top of that, when a person was expected to hold a different or interesting view, they were especially included (Cuppen et al., 2016). Still, a certain level of bias towards the researcher's network was inevitable. Consequently, a group of 60 potential participants were personally approached to participate in the Q survey through an online invitation by the researcher. The approached group of

potential respondents was bigger than the aimed P sample size of approximately 40 respondents, to incorporate a margin for people that would eventually not complete the survey or not respond despite their initial confirmation to participate. The survey was sent digitally to these participants. The researcher kept track of the responses through sending reminders and asking the respondents directly whether they had completed the survey. Since participating was anonymous, the researcher could never be 100% sure who had completed it. The names and contact details of the approached P set are known by the researcher only, stored according to HREC guidelines of the TU Delft, and deleted after the thesis project is completed.

Eventually, in March 2022, 46 respondents completed the online sorting procedure. The sociodemographics of the P set are visualised in Figure 6.1. The age of respondents is quite evenly distributed over ages between 20 and 70 years old, yet, there are only two respondents older than 70. Slightly more females than males participated, but this was not considered a problem as gender was not expected to cause significant differences in perspectives (see chapter 2). Regarding flying purpose, a person was considered a business traveler if they at least made 1 flight for business purposes per year before the pandemic (Zijlstra et al., 2021). For the sampling dimensions of education level and flying purpose, the distributions are more skewed towards hbo/wo and leisure travellers. Finally, the average flying behaviour is given for the years before the pandemic only, with a distinction between 0-1 flights per year (non- or occasional flyers), which is below the average of 1.3 flights per year in The Netherlands, and 2 or more flights per year (frequent flyers), which is above the Dutch average (KiM, 2018). This is evenly distributed, however, for The Netherlands in fact more people (70%) would make 0 or 1 flights per year. The flying behaviour is discussed in more detail per viewpoint. Since the goal of Q is uncovering perspectives at all, rather than their "numerical distribution among the larger population" (Valenta and Wigger, 1997), a P set that is not representative is not an issue here.

Figure 6.1: Descriptive statistics of the P set

6.2. Analysis: by-person factor analysis

Since Q sorts (individual rankings) can be transformed into arrays of numerical data, they are amendable to quantitative analysis (Valenta and Wigger, 1997). Data analysis in Q entails applying *by-person* factor analysis, meaning that participants, represented through their Q sorts, are the variables in the analysis instead of the statements (Brown, 1993; Valenta and Wigger, 1997). Basically, the factor analysis aims "to account for as much study variance as possible" through identifying patterns of similarity in the Q sorts and forming segments of shared meaning, i.e. factors (Watts and Stenner, 2012). The derived factors in turn determine and represent the amount of distinct viewpoints on air travel that exist among the respondents (Desing and Kajfez, 2020).
The steps of a typical Q factor analysis are:

1. *Correlation*: intercorrelating all Q sorts
2. *Factor extraction*: extracting segments of similar Q sorts

3. *Factor retention*: choosing the amount of final factors
4. *Factor rotation*: rotating the factors for simple structure
5. *Factor interpretation*: interpreting the final factors

The steps and their execution are explained in the following sections.

The result from the Q survey was a dataset of 46 Q sorts in the form of numerical arrays, which were subject to factor analysis. The factor analysis was performed in the Ken-Q Analysis Desktop Edition (KADE) since this is the corresponding and recommended data analysis software for the EasyHTMLQ output (Banasick, 2019). The Ken-Q Analysis required the Q sorts (JSON-file) and the Q set (text-file) as input.

6.2.1. Correlation

In this step, each respondent's Q sort is correlated with the Q sorts of all other respondents (Valenta and Wigger, 1997). The correlations between the Q sorts of each respondent indicate how similar their rankings of statements were, hence, the extent to which these persons have similar viewpoints. The higher a positive correlation, the more alike are two Q sorts (Brown, 1993; Desing and Kajfez, 2020).

Two common measures for correlations are Pearson's and Spearman's correlation. Pearson's correlation measures a linear correlation between the actual values two variables. Spearman's correlation does the same, however, on the ranked values of the variables. Consequently, Pearson's is usually recommended for normally distributed, continuous data and Spearman's is usually recommended for ordinal data, typically seen in a Q study (Alberts and Ankenmann, 2001). Yet, Brown (1980, p.204) considers the commonly used Pearson correlation as most suitable. According to Alberts & Ankenmann (2001), Pearson's correlation can indeed be used as a substitute for the more complex Spearman's correlation. Moreover, it is appropriate for a larger number of Q statements as well, as the case in this study (Danielson, 2009). The equation (6.1) of the Pearson correlation coefficient calculates the correlation between two Q sorts (Brown, 1980):

$$r_{a,b} = 1 - \frac{\sum d^2}{2Ns^2} \tag{6.1}$$

and

- $r_{a,b}$: correlation between Q sorts a and b
- d: the difference in scores for the statements in Q sorts a and b
- N: total number of Q sorts
- s^2: the variance of the forced distributions

The correlation range is $r = \pm 1$. Positive correlations indicate agreement between two respondents, whereas negative correlations indicate opposites and disagreement. When two Q sorts are identical, this results in a perfect correlation of $r = +1$. In case of two exact opposite Q sorts, this logically results in a perfect negative correlation of $r = -1$. A correlation is considered as statistically significant if the correlation is 2 to 2.5 times the standard error (Brown, 1993; Brown, 1980). The standard error is calculated according to (6.2) and for this study with the number of statements N = 50 is:

$$SE = \frac{1}{\sqrt{50}} = 0.14 \tag{6.2}$$

However, the correlations by themselves are of less interest, since they are just the necessary raw data to calculate and reveal the factors in the next steps (Brown, 1993).

Results

All Q sorts were intercorrelated with all other Q sorts, producing a 46 by 46 correlation matrix as provided in Appendix D. The correlations in this matrix range from $-0.48 \leq r \leq 0.78$. Overall, there are both positive and negative correlations, and correlations of zero, which together indicate heterogeneity in opinions on air travel and attitude changes and at first sight no clear consensus among the respondents. However, it can be said are more positive than negative correlations, reflecting in general more agreement than disagreement on the topic. None of the correlations are greater than 0.80, meaning that none of the respondents are too similar. The correlations were used for *Factor extraction*.

6.2.2. Factor extraction

The next step, factor extraction, searches for segments of Q sorts that, based on their correlations, go together. Hence, Q sorts that are highly correlated are grouped to result in a number of factors that each represent a group of respondents that hold similar views about air travel (Brown, 1980, p.207; Akhtar-Danesh, 2017).

Several factor extraction techniques exist. The KADE provided Principal Components Analysis (PCA) and Centroid Analysis as options. A commonly used factor extraction method in Q is PCA, which extracts combinations of Q sorts to create new variables (the principal components) that are uncorrelated with each other and in turn maximise variance (Akhtar-Danesh, 2017; Jolliffe and Cadima, 2016). It extracts a first factor, which explains the most variance, and then extracts a second factor, that explains the second most variance, and continues this extraction until 100% of the total variance is explained (Akhtar-Danesh, 2017).

Whereas centroid extraction is preferred for judgmental rotation and exploring the possible solutions in a more theoretically informed or investigatory manner, PCA results at once in a single, mathematically optimal and preferable solution that should be accepted. In the context of this study, that is the main advantage of PCA over centroid extraction, and therefore PCA was applied (Watts and Stenner, 2012).

Brown (1980) suggests extracting seven factors as a starting point, and initially extracting one factor for every six to eight respondents is suggested too (Watts and Stenner, 2012). Factor extraction results in a table that shows, per respondent, their factor loading for each extracted factor. The factor loading is the extent to which the respondent's Q sort reflects the perspective of that factor. The higher the factor loading, the more that respondent characterises/embodies the factor. Logically, people who share the same views, share the same factor (Coogan and Herrington, 2011; van Exel and de Graaf, 2005).

Results

KADE by default extracts eight factors in the initial factor extraction, which for this study is also in line with Brown's suggestions. The Table D.5 in Appendix D shows the unrotated factor matrix for eight factors. This table is consequently subject to evaluation in the next step, *Factor retention*.

6.2.3. Factor retention

Factor retention is the step of deciding the appropriate amount of factors to retain for factor rotation and interpretation in the study. Deciding how many factors to extract and keep can be complex, yet, there are no strict rules for this evaluation (Watts and Stenner, 2012; Coogan and Herrington, 2011). Several criteria and considerations can be made for deciding on the number of factors to retain. Based on Brown (1980) and Watts & Stenner (2012) the following, most commonly used criteria were evaluated in this study:

- **Kaiser-Guttman rule**: The most common rule of thumb is the Kaiser-Guttman criterion, which retains only the factors with an eigenvalue (EV) greater than 1. The EV of a factor is the sum of the squared loadings $f_{i,A}^2$ (of the unrotated factor matrix) of all the Q sorts (i = 1, ..., 46) on a factor A, given by the following equation:

$$EV_A = \sum f_{i,A}^2 = f_{1,A}^2 + f_{2,A}^2 + ... + f_{46,A}^2 \tag{6.3}$$

  Another way to calculate the EV is multiplying its variance (s^2) and the number of respondents (N = 46) and dividing this by 100, namely $EV = \frac{s^2 \times N}{100}$ (Coogan and Herrington, 2011). This criterion's downside is overestimation, especially in larger data sets; it frequently lead to extracting too many factors (Watts and Stenner, 2012). Therefore, the following criteria were considered too.

- **Two significant loadings**: This criterion only retains the factors with two or more significantly loading Q sorts following the extraction. Aiming at a 99% confidence, thus a significance level of $p = 0.01$ and corresponding critical value of 2.58 (Ibe, 2014), and with a number of statements N = 50, a significant loading in this study is:

$$= 2.58 \times \frac{1}{\sqrt{50}} = 0.36 \tag{6.4}$$

- **Humphrey's rule**: This rule states that "a factor is significant if the cross-product of its two highest loadings (ignoring the sign) exceeds twice the standard error" (Brown, 1980, p.223). Simply multiply the two highest loadings and check whether this is greater than $2 \times 0.14 = 0.28$.

- **Scree test**: The scree test is a visual check based on the explained variance and eigenvalues of the factors. It looks at the plot of the eigenvalues, identifies the point where the scree plot changes its "slope", and takes that as the number of factors to retain. On the downside, this is a more subjective and ambiguous test compared to the others. Therefore, it was considered as additional test.

Results

These criteria were evaluated for the unrotated factor matrix from table Table D.5. First, the Kaiser-criterion resulted in the retention of all eight factors, since each EV was greater than 1. Furthermore, all eight factors had at least two significant factor loadings ($\geq$ 0.36), thus, keeping all factors. Still, factors 6, 7 and 8 have just two significant loadings, so they are borderline cases. Third, applying Humphrey's rule resulted in retaining only factors 1, 2 and 5. The final Scree test confirms that extracting three factors is indeed desired, since the bend of the plot is at factor 3. This procedure is discussed in detail in Appendix D. A total of three factors were subsequently rotated in the next step, *Factor rotation*.

6.2.4. Factor rotation

Consequently, factor rotation was applied to arrive at a final set of three factors. Rotation is done to achieve a simple structure and maximise factor loadings, meaning that every respondent loads significantly on at least one factor, which simplifies the factor interpretation (van Exel and de Graaf, 2005; Valenta and Wigger, 1997).

Rotation can generally be done in two ways, either objectively, following a statistical principle, or theoretically, according to theoretical considerations or researcher's own knowledge (van Exel and de Graaf, 2005). For Q, commonly used techniques are either Varimax rotation or judgmental rotation. The latter is done by hand and uses visualisations of the vectors and rotation effects

(Brown, 1996). This study applied the more conventional Varimax (variance maximisation) rotation. Varimax is an orthogonal rotation technique that minimises the amount of Q sorts that load highly on each factor by making high loadings higher and low loadings lower, i.e. maximizing variance of each loading (Valenta and Wigger, 1997).

After rotation, it is still possible that Q sorts load significantly on more than one factor, so the factor loadings were assessed on significance (≥ 0.36). Attention was paid to "confounded factor loadings", that is, when a Q sort loads significantly onto more than one factor (Akhtar-Danesh, 2017), and non-significant loadings.

Finally, the quality of the solution was judged by considering the composite factor reliability of the extracted factors, presented by the following equation, in which p presents the number of associated Q sorts with the factor (Brown, 1980, p.244):

$$r_{pp} = \frac{0.80p}{1 + (p-1)0.80} \tag{6.5}$$

Brown (1980, p.245) states that the more persons loading on a factor, the higher the reliability of that factor, the greater confidence can be put in its scores (Ward, 2009). It is even suggested by Brown to preferably have at least five persons ($p = 5$) defining the factor, making the composite reliability 95%, to enable a clear interpretation of the viewpoint by the researcher (Nazariadli et al., 2019).

Results

Eventually, based on subsection 6.2.3, three factors were rotated to result in the final set of factors. The corresponding factor loading table is presented in Table D.9. After evaluating the criteria again, all three factors could still be retained.

Next, the factor loadings of each Q sort were assessed and flagged in case their load was significant (≥ 0.36). A 100% of the Q sorts loaded significantly on at least one factor. However, still there were 14 confounded loadings. These were assessed carefully to decide whether or not to associate them with any factor. This procedure is extensively described in Appendix D.

Eventually, 7 sorts were not associated with any factor, hence not represented in the final solution, and 85% of the Q sorts (39 respondents) were associated with one of the three factors. Finally, for all three factors, the composite reliability was well above 95%.

Nevertheless, for the sake of completeness, the retention and rotation of both four and five factors were also briefly explored. However, these solutions were not chosen by the researcher based on several considerations, mainly being the resulting composite reliability and additional explained variance, combined with more subjectively considering whether an entirely different perspective was added to the already existing three factors. In the end, the three-factor solution was chosen to have the most confidence during interpretation. This is more elaborately discussed in Appendix D.

6.2.5. Factor interpretation

For the final factor interpretation, the factors scores and difference scores were calculated. The factor score of a statement is "the normalised weighted average statement score (Z-score)" that respondents within the factor have given that particular statement. Based on this, the statements can be returned into corresponding Q sort values, in which the statement with the highest score is assigned +5 and the lowest score is assigned -5, and so on. Eventually, for each factor a unique factor array was identified, which is the typical Q sort of the factor. It reflects the rank-ordering of a hypothetical respondent with a 100% association with that factor (van Exel and de Graaf, 2005; Cuppen et al., 2016; Brown, 1993). The difference score consequently is the degree of difference in a statement's score between two factors, showing the degree of distinction between two factors and pointing to distinguishing statements (van Exel and de Graaf, 2005).

Results

The resulting factor scores (Z-scores) and corresponding Q-sort value per identified factor are presented in Table 6.1. The entire interpretation is elaborated upon in section 6.3.

6.2.6. Flying behaviour

A final step in this research phase regards investigating the flying behaviour per identified viewpoint. The flying statistics of the respondents were split according to the viewpoint they belonged to get an overview per viewpoint. Since the flying behaviour of respondents was given per two years, this number was converted to average number of flights per year for the period before the pandemic and the period during the pandemic. Consequently, corresponding box-plots were made to incorporate not only the mean flying behaviour, but also the minimum and maximum number of flights, the modus and median per viewpoint. Furthermore, the share of business travellers compared to leisure travellers was calculated per viewpoint, also based on the presence of at least one business flight as discussed in section 6.1. These analyses were executed in Excel and its results are discussed for each viewpoint.

6.3. The identified viewpoints

The interpretation of each factor is done through highlighting their distinctive characteristics, linking them to one another and including comments of respondents in that factor. Specific attention was paid to the *distinguishing statements*. These are the statements that were significantly differently ranked (i.e. significant difference in Z-score) in one factor compared to all other factors and therewith they make the three perspectives distinctive from one another (Webler and Danielson, 2009). Since each factor had at least twenty distinguishing statements, mostly those statements with a factor score of approximately $\pm$ 1 are discussed. Namely, when the Z-score (i.e. factor score) of a statement is greater than 1 or smaller than -1, it characterises that factor (van Exel and de Graaf, 2005). Per viewpoint, the distinguishing statements are discussed, including their number and factor score between brackets. Altogether, this reveals the general outline of the way of thinking of respondents associated with each factor, which was turned into a typical narrative of that viewpoint. Comments of respondents on specific statements are included for clarification and indicated by the statement number between brackets.

6.3.1. Viewpoint 1: Acting more environmentally-aware is our responsibility as flying is harmful

General attitude

The subjects in this perspective (48% of total sample) are generally negative towards flying. They do not agree with that flying is a convenient way to travel (1, -2) nor that flying is efficient compared to its alternatives (7, -1). In line with that, they do not have a preference for flying above available alternatives (8, -3) and certainly do not believe that it is nice that flying is so easily done and affordable (16, -2). Yet, to a certain extent they do think flying can be practical to get somewhere far away (15, +1).

Characterising positions

This first of all regards their highly positive attitude towards climate and aviation policies. They express the most agreement with the introduction of obligatory carbon offsetting and the flight tax (22, +5). These higher taxes on flight tickets is actually something they have become more positive towards in the last five years. On the other side, they disagree strongly with statements that find

Table 6.1: Factor scores with corresponding Q-sort value

No.	Statement	Factor 1		Factor 2		Factor 3	
		Z-score	Q-SV	Z-score	Q-SV	Z-score	Q-SV
1	Flying is a convenient way of travelling.	-0,6	-2	0,7	1	0,5	1
2	Flight shame is exaggerated, there are other things we could be ashamed of.	-1,1	-3	1,6	4	0,5	2
3	Flying is a necessary evil.	-0,9	-2	-0,4	-1	-0,5	-1
4	Flying is necessary for business purposes.	-0,5	-2	-0,8	-2	2,1	5
5	Flying is necessary for going on holiday.	-1,7	-4	-1,6	-4	-2,3	-5
6	For me, flying is part of the holiday experience.	-1,6	-3	-0,7	-1	-1,3	-3
7	Flying is an efficient means of transport compared to the alternatives.	-0,4	-1	1,1	3	-0,1	-1
8	My preference is to fly, even though there are alternatives to the plane trip.	-1,6	-3	0,0	0	-0,8	-2
9	Flying is justified when I realistically cannot arrive at my destination in another way.	0,6	1	1,1	2	1,9	4
10	The CO2 emissions of flying are not problematic.	-1,9	-4	-0,8	-1	-1,5	-4
11	I see no reason nor need to fly less, after all, I only live once.	-1,9	-5	0,1	0	0,0	0
12	As long as we think carefully about the choice to fly, we should always be able to fly.	0,0	0	1,0	2	1,4	3
13	Quit flying, I don't see myself doing that in the near future.	-0,6	-2	1,5	4	1,9	4
14	Flying allows me to broaden my view of the world.	0,0	0	0,7	1	0,3	1
15	Flying is primarily practical for reaching a faraway destination.	0,8	2	1,6	5	1,8	4
16	It is nice that flying is so easily done and affordable.	-0,7	-2	0,7	2	-0,1	0
17	It is important for the economy and society that good air connections exist.	0,1	0	1,6	4	2,1	5
18	As consumers, we must take responsibility for changing our own flying behaviour.	0,9	3	0,1	0	0,4	1
19	Employers should discourage flying and promote sustainable travelling with their travel policies.	1,2	4	0,6	1	0,1	1
20	Schiphol should primarily have a network role for business flights to international destinations, instead of holiday flights.	-0,3	-1	-1,1	-3	-0,1	-1
21	The aviation sector needs to innovate more.	1,0	3	1,2	3	0,3	1
22	The government should introduce the flight tax or mandatory carbon offsetting.	1,6	5	1,2	3	-1,1	-3
23	For short trips within Europe, flying is unnecessary, the train should become the standard here.	1,8	5	1,1	2	-0,5	-1
24	It is unjustified that making aviation more sustainable is a is a key theme within climate policy.	-1,6	-4	-1,3	-3	-0,7	-2
25	It is unnecessary to put the growth of Dutch aviation to a halt.	-1,3	-3	0,1	1	0,2	1
26	Five years ago, I stepped into the plane with an uninhibited mind, now I experience more unpleasant feelings when I fly.	0,1	0	-1,3	-4	-1,6	-4
27	I now look more critically at whether it is necessary for me to fly than I did five years ago.	1,2	3	-1,6	-5	0,4	1
28	Flying for business purposes is less normal now than it was five years ago.	0,1	0	1,5	3	-0,1	-1
29	Flying for leisure purposes is less normal now than it was five years ago.	0,0	-1	-0,1	0	0,9	3
30	Traveling longer or paying more for an alternative to flying is less of a problem for me than it was five years ago.	0,7	1	-0,3	-1	-1,4	-4
31	My flights are becoming more and more difficult to justify compared to five years ago.	0,1	0	-1,3	-4	-1,2	-3
32	I now consider the different options better before I book a flight compared to five years ago.	1,5	4	-0,9	-2	0,5	2
33	My concerns about the environmental impact of flying are greater than five years ago.	1,0	3	-0,9	-2	0,0	0
34	My willingness to fly less is greater than five years ago.	0,7	1	-0,7	-1	0,0	0
35	If my travel companion chooses to fly, I am now more likely to make a different choice than five years ago.	0,2	1	-1,1	-3	-0,6	-1
36	I am now more positive about a higher tax on air tickets than I was five years ago.	0,9	2	0,4	1	-0,7	-2
37	Now I am more willing to offset the CO2 emissions of a flight compared to five years ago.	0,8	2	-0,2	0	-0,8	-2
38	Flying has taken on a different role in my life.	0,3	1	-1,0	-2	-0,3	-1
39	Due to the corona pandemic, travelling by plane is now more of a hassle than it was five years ago.	-0,3	-1	0,5	1	0,7	2
40	The corona pandemic has taught us that we can also communicate well online.	0,8	2	1,9	5	0,6	2
41	Due to the corona pandemic, I know that a leisure activity without flying is also fun.	0,1	0	0,0	0	0,0	0
42	The alternatives to flying have become more attractive.	0,2	0	-0,7	-1	-0,8	-3
43	I have gained pleasant experience using the train or car as an alternative for the plane.	0,7	1	-0,4	-1	0,8	3
44	Due to the corona pandemic, I am now more aware of the health risks of air travel than I was five years ago.	-0,3	-1	-1,6	-5	0,0	0
45	Air travel has considerable tourism significance.	-0,3	-1	0,8	2	0,5	2
46	Because I increasingly see and hear the consequences around me, I am more aware of the climate problem than I was five years ago.	0,9	2	0,1	1	0,0	0
47	The negative consequences of everyone flying so easily around the world, I can now see more than I did five years ago.	0,7	1	-1,0	-3	0,8	3
48	The fact that people (e.g. family, role model) have started flying less or have stopped, has got me thinking.	-0,2	-1	-0,9	-2	-1,6	-5
49	I am now more aware of my choices and responsibilities as a as a consumer compared to five years ago.	1,3	4	-0,1	0	0,0	0
50	After recent years' developments, I have had enough of the climate posturing.	-2,1	-5	-0,3	0	-0,7	-2

discouraging air travel policies unnecessary or redundant. This shows their support for more sustainable aviation as a head theme in climate policy (24, -4) and the need to put a stop to the growth of the Dutch aviation (25, -3). They are furthermore supportive of more decentralised policies; they believe that employers should discourage flying and stimulate more sustainable travelling through their travel policy (19, +4).

> It is important that the government plays an important role when it comes to our environment. They should lead by example. (22)

> The polluter pays. The tax revenues can be used for climate purposes. (22)

> Whoever is going to fly anyway chooses this consciously and is willing to pay for it. (22)

Secondly, this perspective can be characterised by a positive attitude towards alternatives to flying and a flying-critical attitude. Subjects heavily support that flying is unnecessary for short-haul travel within Europe and the train should become the standard in this (23, +5). However, they address that the train network and ticket prices could be improved, seen in how they do not necessarily agree with that alternatives have improved (42, 0). Some respondents suggest policy measures for doing this, in line with the pro-policy attitude. They also clearly do not have a preference for flying above the available alternatives (8, -3). These findings are in line with their claim of an increased consideration of the different alternatives before booking a flight (32, +4) and a more critical look at whether it is really necessary to fly (27, +3) compared to five years ago. These people do not believe flight shame is an exaggerated phenomenon, which goes hand in hand with their evaluative attitude towards the necessity of their flying. Yet, this viewpoint does not express to feel more negative feelings when flying, which could be flight shame, compared to five years ago.

> For short distances, the train is an excellent and comfortable alternative to flying. The CO2 emissions no longer outweigh the difference in travel time. (23)

> I see expanding the train network, better subsidizing on a European scale and better promotion of the train as solutions to make this the standard. (23)

This evaluative attitude corresponds with their responsible attitude. This perspective namely is distinctive in acknowledging their own role as a consumer in this topic; they believe that consumers have to take responsibility in changing their own flying behaviour (18, +3). This is consistent with their strong claim that their awareness of their choices and responsibility as a consumer has grown in the last five years (49, +4).

Finally, the subjects in this perspective stand out in their environmental awareness regarding air travel. That is, they strongly disagree with having enough of the “climate posturing” of the last years (50, -5) and not seeing the urgent need to fly less (11, -5), being the statements receiving the highest score of all. On the contrary, the respondents express increased concerns about the environmental impact of flying compared to five years ago (33, +3).

> If there’s one thing that needs to be clear, it’s that the ’posturing’ doesn’t sound loud enough. All other problems will disappear once the climate changes. (50)

> This is very selfish! That is an attitude that does not fit in this time when we all have to do our part to tackle climate change. (11)

Flying behaviour

In this viewpoint, before the pandemic respondents made 1.7 flights per year on average, which is above the average of 1.3 in The Netherlands, and during the pandemic this was 0.7 flights per year,

which is below the average (KiM, 2018). The latter was expected due to the flight restrictions during the pandemic. From the box-plot in Figure 6.2 it is seen that some respondents did not take the plane at all in the past four years (minimum of 0) and a few respondents took the plane relatively often (maximum of 5 before the pandemic) compared to the group, with an outlier of 8.5 flights per year. Consequently, the average of this group is higher due to a few respondents being relative frequent flyers. This could be related to the fact that about 27% of the people in this viewpoint also travel for business purposes, and business travellers on average fly more (Zijlstra et al., 2021).

Therefore, a more interesting result is the fact that an average of 0 flights per year occurs the most among the respondents (i.e. mode), both before and during the pandemic, showing that not flying at all is actually the most common characteristic of this viewpoint. This is in line with the finding that respondents in this viewpoint do not rule out the possibility that they will stop flying in the near future (13, -2). What is more, several people indicated to have quit flying for environmental reasons. It can be concluded that these people have an attitude consistent with their behaviour. However, some respondents in this group, despite their generally critical attitude to flying, have definitely not stopped flying, pointing to the discussed attitude-behaviour gap. One respondent comments on this:

> My view on flying has changed, but now that I add it up, I have actually flown a lot. ... So my behaviour has not necessarily changed, but the way I look at flying has.

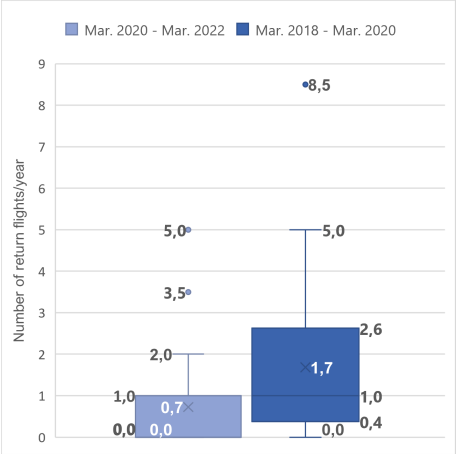


Figure 6.2: Box-plot of flying behaviour viewpoint one

6.3.2. Viewpoint 2: Flying is important, although for business less normal and discouraging it never harms

General attitude

The subjects in this perspective (20% of total sample) are generally positive about flying. They think flying is practical to get somewhere far away (15, +5), efficient compared to its alternatives (7, +3) and a convenient way of travelling (1, +1). Yet, they are not outspoken about a preference for flying above alternatives (8, 0). People in this viewpoint furthermore believe flying offers them the possibility to broaden their worldview (14, +1) and find it nice how it is easily done and comfortable nowadays (16, +2).

Characterising positions

First and foremost, this group strongly believes that people have improved in online communication because of the COVID-19 pandemic (40, +5) and in line with that consider flying for business purposes as less normal that five years ago (28, +3).

> Within my company, Zoom calls have exploded. The company has made it possible to work well from home with good webcams and laptops, so that flying is no longer necessary for a meeting.

This increased critical attitude towards business air travel furthermore comes forward in their disagreement with the statement that Schiphol should only have a hub function for business flights, and less for holiday flights (20, -3). On the contrary, respondents in this perspective strongly agree with the importance of good air connections for the economy and society (17, +4), in their case not only for business, but likely for leisure purposes too. For them, the possibilities that air travel offers for leisure travelling are important, such as visiting foreign friends or being able to arrive at faraway destinations. They furthermore do not see the negative consequences of these worldwide connections more than five years ago (47, -3) and cannot relate to an increased awareness of the health risks of flying because of the pandemic (44, -5).

People in this perspective express that flying is efficient compared to the alternatives (7, +3) and how flying is justified when it is realistically not possible to arrive at their destination otherwise (9, +2). Despite that flying can be practical and efficient, they do definitely not believe it is needed for going on holiday (5, -4).

> It is attractive to be able to fly to Southern Europe outside summer holidays. You don't do that so quickly with a car. ... It is not necessary to fly, but sometimes it is practical.

> I can't think of any other means of transport for visiting, for example, family in other parts of the world!

Despite their positive attitude towards flying for leisure, these people are not ignorant of its environmental impact and the CO2 emissions and find discouraging flying not a bad idea. This is seen in their support for the statement that the train should become the standard alternative on short-distance travels (23, +2), the introduction of a mandatory flight tax or carbon offsetting by the government (22, +3) and believe that sustainable air travel is an important theme in climate policy (24, -3). This is similar to perspective one, but people in this perspective are more moderate on these issues. The respondents comment on the necessary improvements on these issues as well.

> The climate has come to play a greater role. ... However, this need not be a decisive factor for now.

> (on train as standard) Only for short journeys up to 750 kilometers, provided a high-speed train and good infrastructure.

Although this groups seems aware of the climate impact of flying, they do not feel more worried about the climate impact of flying than five years ago (33, -2), as opposed to perspective one. An actual critical view to air travel and flight shame is certainly not what characterises them. On the contrary, this group believes flight shame an exaggerated phenomenon (2, +4), totally opposite to perspective one. They do no feel more negative feelings when flying compared to five years ago (26, -4). The fact that they strongly claim not having a more critical view towards the necessity of their flights compared to five years ago (27, -5) adds to this. They cannot relate to these changes in attitudes. This entire view can actually be summarised by the following answer of one respondent in within this perspective:

> I have no flight shame. It's a beautiful way to travel. I do think that business travel can, and has become, less in recent years.

This group believes in the importance of flying, especially since it is still the most practical and efficient to arrive at their destination. However, they do realise that CO2 emissions are an issue. They believe flying should be possible anyway, and therefore put trust in more sustainable alternatives (e.g. electric flying) and offsetting the CO2 emission of their flights.

Flying behaviour

In this viewpoint, respondents made 1.6 return flights per year on average before the pandemic, being above average of 1.3 in The Netherlands, and during the pandemic 0.7 return flights per year, being below average (KiM, 2018). The latter was again expected due to the pandemic flight restrictions. The box-plot in Figure 6.3 shows that the distribution of number of flights is quite dense, with a minimum of 0 flights per year and a maximum of 2 flights per year (before the pandemic), and an outlier of 5 flights per year compared to the flying behaviour rest of the respondents in the group.

Despite that the averages of this viewpoint are similar to that of viewpoint one, there is a slight difference in their flying behaviour. Namely, in this viewpoint, an average of 0.5 flight per year during the pandemic and 1 flight per year before the pandemic are the most common among the respondents (i.e. mode). Therefore, this viewpoint can be characterised more as people who fly rather regularly than not at all. What is more, 89% of this group flies solely for leisure purposes, which indicates that they play a relatively larger part in this mean flying behaviour. This finding corresponds with the respondents indicating that they definitely do not see themselves quitting flying in the near future (13, +4) and matches with the overall travel-minded and positive view on air travel of this group. Therefore, it can also be concluded that the attitude-behaviour gap is not evident among the respondents; their attitude is generally rather consistent with their behaviour.

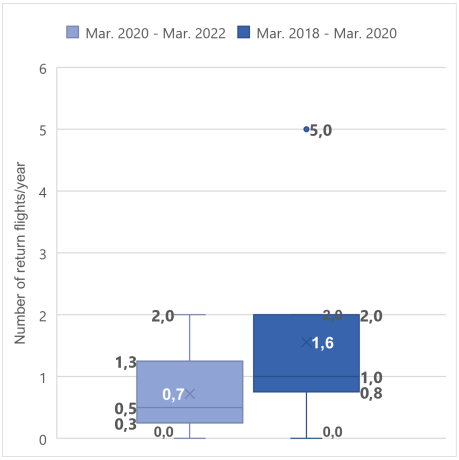


Figure 6.3: Box-plot of flying behaviour viewpoint two

6.3.3. Viewpoint 3: Certain aspects of flying have changed, yet, it remains necessary for business

General attitude

The respondents in this perspective (17% of total sample) have mixed attitudes towards flying; some aspects are very positive to them, whereas others are moderately negative. Respondents

primarily perceive flying as a practical means to arrive at a faraway destination (15, +4), being a strong positive attitude. Yet, they only moderately find it a convenient way of travelling (1, +1) and do generally not think flying is efficient compared to its alternatives (7, -1). This is in line with that they do not have a preference for flying above the alternatives (8, -2), but tend to have a more practical mindset.

Characterising positions

Most importantly, this group agrees strongly with the necessity of flying for business purposes (4, +5), in big contrast to perspective two. They also strongly underline the importance of good international air connections for the economy and society (17, +5), briefly captured by the quote below. Consistent with this view, they also find flying justified when it is realistically not possible to travel to the destination otherwise (9, +4). This likely relates to the respondents considering flight shame as somewhat exaggerating (2, +2) and certainly not having more negative feelings when flying compared to five years ago (26,-4). The latter three perceptions they share with perspective two. They also strongly claim that other people who quit flying do not affect their thinking (48, -5), which has likely to do with their perceived importance of business flights that is solid as a rock.

> Building and maintaining business relationships is still much better in the direct presence of colleagues and business associates. (4)

> My job makes me dependent on international flight connections. (17)

> Some destinations cannot be reached by other means of transport or it takes far too long. (9)

On the other side, they strongly disagree with the statement that flying is necessary for going on holiday (5, -5) and find that flying for leisure purposes is nowadays less normal compared to five years ago (29, +3). Contrary to perspective two, subjects do not stress the possibilities for vacationing that flying offers. Respondents actually show the opposite, namely the availability of other means for going on holiday.

> Absolutely not! As soon as I get into my motor-home, my holiday has started! (5)

> Car, bicycle, train, boat, motorcycle... (5)

Despite their somewhat flight-dependent attitude for business, they moderately express having more critical consideration in deciding whether their flight is necessary compared to five years ago (27, +1) and to better consider the various options before actually booking a flight than they did before (32, +2). These perceptions are similar to that of perspective one. Nonetheless, respondents of this perspective do not come across as very environmentally-minded in their considerations.

This is seen in other perceptions too. Whereas the other two perspectives are more pro-policy, the respondents in this group are not supportive of obligatory carbon offsetting or the flight tax (22, -3). They even express, although moderately, that they are not more willing to compensate their flight now than five years ago (37, -2). Furthermore, this perspective overall disagrees with the statement that travelling longer or paying more for an alternative to flying is less problematic than five years ago (30, -4). In short, instead of environmentally-minded, this perspective could be considered more business- and money-minded. One respondent is clear about this.

> The government is very inefficient with the income earned from taxes. (22)

Flying behaviour

The respondents in this viewpoint on average made 7.6 flights on a yearly basis before the pandemic, whereas they made 2.1 flights per year during the pandemic. Both numbers are clearly higher than the 1.3 average flying behaviour in The Netherlands; despite pandemic flight restrictions this group continued to fly. In the box-plot in Figure 6.4, the maximum number of flights was 20 flights per year before the start of the pandemic and the minimum was 0 flights during the pandemic. Yet, there are no outliers. The flying behaviour of the respondents shows a great variety.

Compared to the two other viewpoints, this group can be characterised as the more frequent flyers due to the relatively high number of flights that respondents made. Moreover, even during the pandemic, an average of 1 flight per year during the pandemic was the most common among the respondents. This viewpoint furthermore shows the biggest decline in their average flying behaviour compared to the other viewpoints. This could be linked to the share of business travellers in this viewpoint, that is, 63% of the respondents fly mainly for business purposes. As mentioned, such travellers fly more than the average person on a yearly basis, yet, this was put to a sudden halt due to the pandemic (Zijlstra et al., 2021). Consequently, the respondent's flying behaviour is considered consistent with their business-minded and somewhat flying-dependent attitude. In line with this, they definitely do not see themselves stopping flying in the near future (13, +4). The attitude-behaviour gap is not evident from these findings.

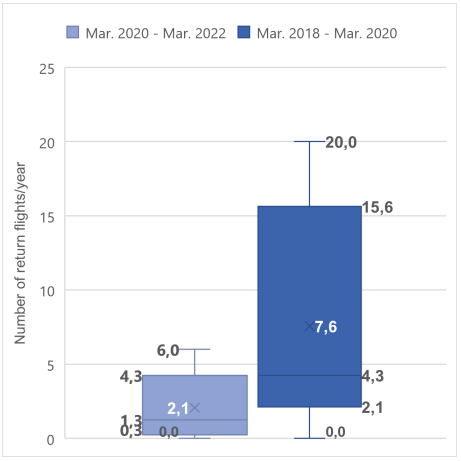


Figure 6.4: Box-plot of flying behaviour viewpoint three

6.3.4. Consensus among the viewpoints

On the other side, the consensus statements were important results, which are the statements that do not distinguish between any pair of factors (Webler and Danielson, 2009). Although the three identified viewpoints have distinctive characteristics, there are two statements on which there is consensus among all viewpoints. Firstly, all respondents are neutral about knowing that leisure activities without flying are also nice because of the pandemic (40, 0). This indicates that this specific issue is relatively unimportant to them in relation to other aspects that determine their overall position more. Still, it does not mean that they do not have any opinion on it. When asking a respondent to only reflect on that statement in isolation, chances are high they have something to say about it. However, the set-up of this Q study forces them to make choices within an entire set of statements.

Secondly, all respondents moderately disagree with the statement that flying is a "necessary evil" (3, -1 or -2). One respondents from perspective one notes the following on this statement.

> It's not that black and white as far as I'm concerned. There really are many alternative

> ways to travel. Except of course the locations where you can't get to in other ways. (3)

Linking this to other perceptions of viewpoint one, this is likely reasoned from an environmentally-aware and pro-alternative attitude. Since it is harmful for the environment and alternatives are available, flying is simply not necessary, only in very exceptional situations. Another respondent from perspective one makes a critical note that the alternatives however need improvement.

> There need to be more investments in alternatives (to flying).

One respondent from viewpoint two argues the disagreement with the necessary evil of flying not from the alternative-narrative, but from the practical-narrative. In any case, in his viewpoint flying for leisure and business is generally not *necessary*. Nevertheless, from his comment it can be concluded that he does not exclude that flying is *efficient*. These perceptions are characteristic for viewpoint two. Still, he argues that flying should be discouraged through higher prices, which is in line with viewpoint two that flight tax and carbon offsetting should be introduced.

> Flying will remain important to get from place A to B quickly. ... It would be better if airline tickets became more expensive to discourage the choice of flying.

Regarding this consensus statement it can thus be concluded that "evil" and "necessary" are notions can be interpreted in various ways by respondents. This is typically a statement that gets meaning within the entire narrative of statements.

6.4. Changes in attitudes

Several changes in attitudes already came forward from the identified viewpoints. This section specifically highlights and elaborates on the perceived *attitude changes* by analysing the dynamic statements and additional comments by respondents from the post-sorting questionnaire. Specifically those statements that received positive (+) rankings in the viewpoints are important indicators, as they suggest the attitude change is applicable to the respondents. The attitude change statements and corresponding Q sort values and Z-scores are shown in Table 6.2. The discussion follows this order; it starts with the attitude changes that have disagreement among the viewpoints and ends with more consensus among viewpoints.

First, the statements about having a more critical look on whether it is personally necessary to fly (27) and better considering the different alternatives before booking a flight (32) compared to five years ago. Respondents in viewpoint one (+3, +4) can certainly relate to these changes in attitude, meaning they believe they have become more critical in their considerations to fly or not. This is consistent with their overall pro-environment and pro-alternatives attitude. For people in viewpoint three (+1, +2) the same is true, however to a lesser extent. From their perspective, this is likely more related to them better considering whether it is necessary to fly at all, as some of the business trips can be replaced.

Second, the statement about an increased realisation of the negative consequences of everybody flying over the world so easily (47) compared to five years ago. Respondents in viewpoint one (+1) claim that this attitude change is to a lesser extent applicable to them. They likely relate this to the negative environmental effects and this attitude change fits their environmentally-aware profile. Viewpoint three (+3) agrees even more with this attitude change. However, as they are not characterised by their environmental mindset, the attitude change is possibly linked to an overall increased awareness that flying for them is nowadays not so obvious as it used to be and more of a hassle, due to the pandemic (39, +2).

The following two attitude changes only people in viewpoint one can relate to. Namely, travelling longer or paying more for an alternative to flying is less problematic (30) and increased concerns about the climate impact of air travel (33) compared to five years ago. They claim these attitude

Table 6.2: Attitude changes and corresponding scores, sorted by consensus (top) to disagreement (bottom)

No.	Statement	Factor 1		Factor 2		Factor 3	
		Q-SV	Z-score	Q-SV	Z-score	Q-SV	Z-score
46	Doordat ik de gevolgen nu meer zie en hoor om me heen, ben ik me bewuster van het klimaatprobleem dan vijf jaar geleden.	2	0,9	1	0,1	0	
29	Vliegen voor vrijetijdsdoeleinden is nu minder normaal dan vijf jaar geleden.	-1		0		3	0,9
39	Door de coronapandemie is een vliegreis maken nu meer gedoe dan vijf jaar geleden.	-1		1	0,5	2	0,7
35	Als mijn reisgezelschap kiest voor vliegen, zal ik nu sneller een andere keuze maken dan vijf jaar geleden.	1	0,2	-3		-1	
38	Vliegen is een andere rol gaan spelen in mijn leven.	1	0,3	-2		-1	
34	Mijn bereidheid om minder vaak te vliegen is groter dan vijf jaar geleden.	1	0,7	-1		0	
49	Ik ben me nu bewuster van mijn keuzes en verantwoordelijkheid als consument dan vijf jaar geleden.	4	1,3	0		0	
31	Mijn vliegreizen zijn steeds moeilijker te verantwoorden vergeleken met vijf jaar geleden.	0		-4		-3	
36	Ik ben nu positiever over een hogere belasting op vliegtickets dan vijf jaar geleden.	2	0,9	1	0,4	-2	
37	Nu ben ik eerder bereid om de CO2-uitstoot van een vlucht te compenseren dan vijf jaar geleden.	2	0,8	0		-2	
28	Vliegen voor zakelijke doeleinden is nu minder normaal dan vijf jaar geleden.	0		3	1,5	-1	
44	Door de coronapandemie ben ik me nu bewuster van de gezondheidsrisico's van vliegreizen dan vijf jaar geleden.	-1		-5		0	
26	Vijf jaar geleden stapte ik onbevangen het vliegtuig in, nu ervaar ik meer vervelende gevoelens als ik vlieg.	0		-4		-4	
33	Mijn zorgen over de milieu-impact van vliegen zijn groter dan vijf jaar geleden.	3	1,0	-2		0	
30	Langer reizen of meer betalen voor een alternatief voor vliegen is voor mij minder problematisch dan vijf jaar geleden.	1	0,7	-1		-4	
47	De negatieve gevolgen van dat iedereen zo makkelijk over de wereld vliegt, zie ik nu meer dan vijf jaar geleden.	1	0,7	-3		3	0,8
32	Ik overweeg nu beter de verschillende opties voordat ik een vlucht boek vergeleken met vijf jaar geleden.	4	1,5	-2		2	0,5
27	Ik kijk nu kritischer naar of het nodig is dat ik ga vliegen dan vijf jaar geleden.	3	1,2	-5		1	0,4
No.	*Attitude changes*	*12*		*4*		*5*	

changes are respectively to a lesser (+1) and greater (+3) extent applicable to them. It matches their climate-awareness and positive stance towards alternatives to flying. Still, as mentioned, they stress the necessary improvements in alternatives, for instance train infrastructure. Altogether, viewpoint one likely only moderately agrees to this statement (30) since the alternatives are not completely ideal, yet, their increased climate concerns have made that downside less problematic.

The statement about perceiving flying for business purposes nowadays as less normal than five years ago (28) is only applicable to viewpoint two (+3). This could be linked to their belief that due to the pandemic, people's online communication skills have improved (40, +5). This same pandemic namely put business air travel to a halt, making online communication the rule rather than exception. These perceptions are furthermore consistent with their general belief that flying for business purposes is not necessary. Despite they perceive business flying as less normal and not necessary, they do indicate how flying remains important in many ways.

Next, some people express a greater willingness to offset the carbon emissions of flying (37) and a more positive stance towards higher taxes on flight tickets (36) compared to five years ago. Namely, for people in viewpoint one (+2, +2) these attitude changes are applicable, indicating they are now more willing to pay a price for the climate impact of flying. This is again consistent with their environmental narrative. People in viewpoint two (+1) are only moderately positive about the higher taxes, consistent with their view that discouraging flying can do no harm.

Being more environmentally aware of the choices and responsibility as a consumer (49) and a greater willingness to fly less (34) compared to five years ago are two attitude changes that respondents in viewpoint one either strongly (+4) or moderately (+1) express. Not only are these attitude changes clearly linked, since it regards self-reflection and a willingness to act accordingly, they also fit into the entire viewpoint. Furthermore, the same viewpoint moderately claim that flying has taken on a different role in their life (38, +1) and that they will nowadays sooner make an alternative choice

when their travel companion chooses to fly (35, +1). This highlights their relative independence of flying.

The perception that air travel today currently is more of a hassle compared to five years ago, because of the recent pandemic (39) is what people in viewpoint two (+1) and three (+2) can relate to. This attitude change is not particularly characteristic of those viewpoints. Yet, it points to the influence of the pandemic on how people perceive flying.

Furthermore, it is seen that flying for leisure purposes nowadays is perceived as less normal than five years ago (29). Respondents in viewpoint three (+3) certainly agree with this, pointing to a clear change in their attitude to flying for holidays, which is not as normal as it was to them. Yet, they typically find that flying for business remains necessary.

Finally, people express an increased awareness of the climate problem, because the consequences are currently widely seen and heard around them (46). This perception has the highest level of consensus among the viewpoints: none of them *disagree* with it. Viewpoint one (+2) claim this change in attitude is applicable to them, again typical for people who are very environmentally aware. Viewpoint two (+1) agrees to a lesser extent, which is consistent with their acknowledgement of the problematic CO2 emissions of air travel. Yet, considering the general pro-flying attitude of the respondents, this does not immediately make them such environmentalists.

In short, the suggested attitude changes are various, as they are more or less related to air travel specifically, and they are not equally distributed among the viewpoints. People in viewpoint one indicate having experienced the most attitude changes over the last five years, mainly in the area of overall awareness, responsibility and decisions surrounding flying. Changes can clearly be linked to their general environmentally-aware attitude with regard to flying. Less attitude changes are observed in viewpoint three. The expressed changes are more related to the decreased self-evidence and ease of flying. Finally, people in viewpoint two have expressed the least attitude change towards flying, mainly in the aspect of business flying, a finding overall in line with their generally positive air travel attitudes.

6.5. Factors contributing to attitude change

The previous section discussed various attitude changes related to different aspects of air travel. From that, the contours of several causes of the attitude changes already came forward. This section specifically reflects on the factors that contribute to attitude change by analysing them through the theoretical model on attitude change of Van Wee et al. (2019) (Figure 3.5). This entails linking the attitude changes within viewpoints 1) to each other and other statements suggesting a cause and 2) to explicit motivations and reasons indicated by the respondents in the post-sorting questionnaire.

Next, the resulting suggested reasons for attitude change are systematically discussed based on the constructs of the theoretical model. This proposes cognitive, behavioural, and affective *internal* processes as leading to attitude change, and in turn, these processes are initiated by *external* personal, social or environmental triggers (van Wee et al., 2019). Figure 6.5 visualises the causal mechanisms of the model that were to a more or lesser extent seen in the empirical findings of this study.

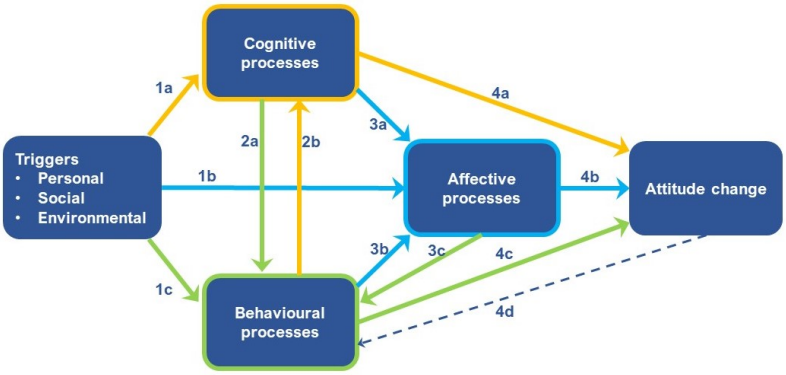


Figure 6.5: Observed causal mechanisms from Van Wee et al. (2019).
The figure shows each process in a separate colour. The process' incoming arrows and its outgoing arrow to attitude change are shown in the same colour.

Personal, social and environmental triggers

Certain triggers or processes causing change were explicitly named by the respondents, indicated with (R), whereas others were observed by the researcher through linking several statements and their rankings, indicated with (statement number). Since the respondents in viewpoint one expressed the most attitude changes, many of the suggested causes were named by them.

First of all, personal level triggers were observed, namely how own information and experiences of the respondents themselves seem to play a role in initiating the internal processes.

- Expansion of the family, such as the birth of children, or another change in family composition. (R)
- Encountering (i.e. seeing, hearing, reading) of information about climate change as well as the impact of flying on that. For instance, reading about it in the (social) media. (R) (46)
- Increased loyalty to own travel principles, instead of going along with the travel choices that other people make. (35)
- Experience with an alternative to flying such as the train or car. (43)
- Experience with online communication and the "worldwide changed way of working", especially forced during the pandemic. (R) (40)

Secondly, several social level triggers were identified, that is, social influences from other people in the respondents' network seem to initiate certain processes.

- Choices of family members, friends or colleagues, such as them following a vegan diet for climate reasons. (R)
- Conversations about the topic with friends or family, including their opinions and information about the topic (e.g. the impact of flying) and taking that seriously. (R)

Third, certain environmental triggers came forward, which are all other types of factors in a person's surroundings that are of influence on the internal processes.

- Widespread availability of and attention to information about climate change as well as the impact of flying on that. For instance, climate documentaries and reports, attention in the news. (R) (46)

- Actual observable consequences of climate change, in line with the previous trigger. (R) (46)
- The (recent) presence of climate change on the agendas of political parties. (R)
- Increased availability, efficiency and affordability of alternatives to flying. For example, the availability of a car in a person's surrounding or cheaper train tickets. (R)
- Change in income, meaning that money is to a lesser extent or no longer a limitation in travel mode choice, or it especially is a limitation. For instance, a person being able to afford a more expensive train ticket. (R) (30)
- The COVID-19 pandemic in general. This includes both the trend and acceptance of online communication, new travel procedures of filling in forms and testing when making a trip by plane, or the perceived damage done to the air travel industry. (R) (39)

Subsequently, these triggers form "the reasons why people change what they know, feel or do", being the three internal processes (van Wee et al., 2019). Hence, these processes as mentioned and observed among the viewpoints are discussed. These in turn change attitudes.

Cognitive processes

Firstly, the discussed triggers seem to have initiated several cognitive processes (arrow 1a), which is also seen in the statements to which respondents agree.

In this case, the cognitive processes entail people gaining increased knowledge of and awareness about climate change, its related problems and the environmental impact of flying on that. People have started to realise that climate change is worsening and have become aware of the relative impact of flying on this bigger picture (10). This also relates to the growing realisation how vulnerable people on earth are. Other cognitive processes entail people's increased awareness of their own role, behaviour and responsibilities when it comes to climate change and travelling (18, 49) and knowing they make an impact. Consequently, people are looking with a more critical mind towards the necessity of their own flying (27). The main suggested, overarching trigger is more information about climate change within and surrounding a person (trigger).

Another cognitive process entails people gaining knowledge of an alternative to flying, triggered by for instance a new experience with the train (trigger). The same trigger can lead for instance to travelling more often with an alternative to flying, entirely changing transport mode or not flying at all (seen among respondents), which in turn could also strengthen these cognitive processes (arrow 2b, behavioural processes).

Finally, learning how to conduct meetings online or knowing that physical attendance is not always required and consequently making other travel considerations, being a clearly cognitive process. This is for example triggered by the pandemic and forced online communication experience (trigger), and in some cases the result of online communication becoming recurring or standard behaviour (arrow 2b, behavioural process). Based on these processes, it is suggested that people in turn change their attitude to flying (arrow 4a).

Behavioural processes

Secondly, despite that analysing behaviour was not the focus of this study, some behavioural processes were identified (arrow 1c). Behavioural processes are that people are generally considering the alternatives to flying more than before in their travel decisions (32) or people are choosing to travel with alternatives to flying. These processes could for instance be due to an increase in income (trigger) that makes actually travelling with an alternative possible. It could furthermore be due to family composition (trigger), a general preference for not flying, or a preference for more sustainable alternatives instead of flying (arrow 3c, affective processes).

Another behavioural process is that some people only fly in extraordinary situations or emergencies only and are not dependent on it anymore. What is more, it is seen that some people have in principle quit flying. These processes are generally considered the result of increased knowledge of and awareness about climate change (arrow 2a, cognitive process), the availability of alternatives or an increase in income, making other travel choices possible, or a family member's sustainable way of living (triggers). Other people have simply not travelled recently (by plane), for example due to the COVID-19 pandemic (trigger). Especially due to people aiming for consistency between their behaviour and attitude (CDT, (chapter 3), it is assumed such behavioural processes influence and change people's attitude to flying (arrow 4c).

In turn, this attitude change could influence people's behaviour (arrow 4d), however, empirically investigating and identifying this was outside the scope of this research.

Affective processes

Finally, certain affective processes were initiated, not only by triggers (arrow 1b), but cognitive or behavioural processes are of influence as well (arrow 3a and 3b). A first process entails that people have started to perceive climate change as a problem and crisis (50). They personally feel the importance of these problems more and how the environmental impact of travelling matters more nowadays, whereas earlier they were not aware of the impact of flying on the climate at all (arrow 3a, cognitive process). On top of that, people have personally become more worried about these climate problems (33) and are feeling their offspring deserves a life on earth, an emotion likely caused by their own family composition (trigger).

Furthermore, people feel that their CO2 emissions from flying are not justifiable anymore when there are more sustainable alternatives available. It is also seen that some people have started feeling an aversion to flying for short trips, flying to European destinations or flying often. Acknowledging flight shame as a feeling indicates that some people might relate to this as well, although people do not necessarily express to feel more negative emotions when flying compared to five years ago. In line with what the model (van Wee et al., 2019) proposes, these affective processes suggest that besides triggers, the cognitive process of having more knowledge results in evoking feelings about that knowledge (arrow 3a, cognitive processes).

Another affective process of certain people developing positive emotions or affection towards a certain transport mode was for example initiated by a pleasant experience with the train for a business trip or an unpleasant experience of air travel during the pandemic (39) (trigger) or was the result of going on holidays with the motor-home or regularly travelling with alternative transport modes (arrow 3b, behavioural process).

A final process entails a decreased importance of efficiency when travelling, such as total travel time being less important, which could be due to more knowledge of travel mode emissions on the other side (arrow 3a, cognitive process) (30). Such causal relations are described by the model of Van Wee et al. (2019) and can result in changing attitudes to flying (arrow 4b).

Examples of causal mechanisms

In conclusion, multiple triggers and resulting internal processes are suggested to lead to diverse changes in people's air travel attitudes. Several examples given by respondents provide more concrete insight into the mechanisms of attitude change.

> My view of flying has certainly changed in the last five years. This is because I read more about it, for example in the (social) media, and talked about it with friends. This has made me more aware of the negative effects of flying.

In this, reading about the topic at hand and friends talking about it can be considered as respectively personal and social triggers that led to a cognitive process of becoming more aware of the impact of flying (arrow 1a, cognitive process). Another example is the following.

> Because of the arrival of children, we have started to fly less. In the knowledge that has now been gained about environmental pollution (of air travel), this will play a role in the future. Especially since there are good alternatives.

Here, the composition of the family is the personal trigger to have influenced the flying behaviour of the person (arrow 1c, behavioural process). Furthermore, the person mentions that good alternatives are available, being an environmental trigger, and expresses to have gained more information about air travel emissions (arrow 1a, cognitive process). Altogether, the person explains this has contributed to a changed attitude to flying.

6.6. Conclusion and reflection

This section reflects on the results from the study. It starts with a reflection on the substantive results of this research and how they can be placed in the context of other studies from chapter 4 and findings from chapter 5. Despite that the interviews were mainly used for concourse input, the reflection shortly addresses that too. Next, the executed mixed-statement Q study and its suitability for studying attitude change is reflected upon.

6.6.1. Conclusion and reflection on results

Viewpoints

To summarise, three viewpoints on air travel and changes in air travel attitudes were identified. They can all be characterised by a variety in attitudes, from more positive to negative, as seen in earlier studies (chapter 4). The attitude changes within the viewpoints are discussed in the next section.

The first viewpoint (subsection 6.3.1), being the largest group in this study, can be characterised by the label *"Acting more environmentally-aware is our responsibility as flying is harmful"*. In this, people generally are critical to flying and have widespread concerns about its impact, as seen in Higham et al. (2014), and are supportive of alternatives to flying as well as policies discouraging flying. Overall, these negative attitudes and pro-policy views are similar to findings of Valkila & Saari (2012). The people in this perspective are characterised by their environmental awareness. Yet, this is the only group where there is an indication of the attitude-behaviour gap, since a few people in this group fly relatively often despite their "green" and critical attitude, similar to what McDonald et al. (2015) found. In Kroesen (2013), an actual separate inconsistent viewpoint was found for this. On the other side, in the same study especially the environmentally aware and flying critical viewpoint, also comprising the largest group, integrated their attitudes and behaviour well (Kroesen, 2013), like most respondents in this viewpoint.

Considering this, it could be the case that the environmental viewpoint in this study actually includes people from both groups as found in Kroesen (2013), being people who are consistent and people who are not or to a lesser extent. Since climate concerns are increasing and have never been so widespread as nowadays among the Dutch population (Couzy, 2020), it could mean that some people in this viewpoint have only recently become more environmentally aware, as expressed by their increased climate concerns in recent years, but are not yet integrating this with their flying behaviour. The other people might already be more principled in that respect. Altogether, this identified viewpoint stresses again that attitudes and behaviour are not necessarily aligned.

The second viewpoint (subsection 6.3.2) can be characterised by the label *"Flying is important, although for business less normal and discouraging it never harms"*. In this viewpoint people generally have positive attitudes towards flying, the opportunities it offers for travelling, and how it remains important for economy and society. The latter corresponds with the study of Ryley et al. (2013) in which respondents believe air travel is essential to a country's economy. Nevertheless, this viewpoint does not believe flying is necessary for going on holiday and they do realise its environmental

impact and are supportive of policies stimulating alternatives to flying. This is in line with what Cocolas et al. (2020b) point out: people perceive flying as beneficial and instrumental for their desires to travel, thus continue flying, despite their growing climate concerns. For this viewpoint, the flying experience currently often still 'wins' from the alternative.

The third viewpoint (subsection 6.3.3) can be characterised by the label *"Certain aspects of flying have changed, yet, it remains necessary for business"*. In this viewpoint people generally believe flying is necessary for business purposes and important for the economy and society. They are not supportive of carbon offsetting and flight tax and fly the most often of the three viewpoints. Yet, they do believe that the environmental impact of flying is a problem. This is in contrast to the finding of Davison et al. (2014) and Ryley et al. (2013) where the frequent flyers are actually the most sceptical about air travel's climate impact. However, since these studies were done almost ten years ago, this difference could also be related to the spirit of the age and changing attitudes themselves. Especially since the COVID-19 pandemic, Dutch people are more aware than ever about the consequences of climate change and the importance of this theme (82% is worried about the climate) (Couzy, 2020).

Furthermore, whereas in the study of Ryley et al. (2013) people seemed unwilling to pay for carbon offsetting or fly less, this study finds a willingness to compensate flying among the first and second viewpoint, and a willingness to fly less among the first viewpoint. Indeed, a greater willingness to fly less was actually recently found among the Dutch population (Couzy, 2020).

However, the second and third viewpoints do not clearly express more willingness to fly less and furthermore definitely not see themselves quitting flying. Such air travel attitudes indeed reflect an overall unwillingness to fly less as stipulated in Cocolas et al. (2020a). However, this finding might in fact be more nuanced. For instance, it could be the case that respondents were already flying less than before, or, respondents generally fly relatively little, and an increased willingness would mean that they would give up flying entirely. Stopping flying is however not something these viewpoints express.

Finally, this study did not uncover one viewpoint characterised by an ignorance of the environmental impact of flying, whereas Araghi et al. (2016) and Kroesen (2013) do find this. On the contrary, all viewpoints acknowledge emissions of air travel as more or less problematic.

Attitude changes

The viewpoints overall point to more or less strong attitude changes in the direction of flying-critical perspective. This section reflects specifically on seven of the identified attitude changes that were relatively most strong in each viewpoint.

People express they are better considering the different options before booking a flight, looking more critical towards the necessity of their flights and, consistent with that, overall being more aware of their own role and responsibility as consumers compared to five years ago. Moreover, people have also become more worried about the climate impact of flying in the recent years. These attitude changes were strongly seen in the first viewpoint, as expected, and definitely observed among the interviewees.

Furthermore, a strong change, seen in the second viewpoint, regards that people find flying for business purposes nowadays less normal than five years ago. In the study of Lamb et al. (2021), people had more pessimistic attitudes towards flying for business returning to the old way, corresponding with results in this study. Moreover, in the interviews this attitude change was mentioned multiple times.

On the other side, there is a strong change, seen in the third viewpoint, that people find flying for leisure purposes, for example for going on holiday, now less normal than five years ago. This attitude change was less explicitly mentioned, yet identified in the interviews as well. However, it is contrary to the findings in Lamb et al. (2021) in which people were mostly optimistic about leisure air travel returning to normal.

Finally, seeing the negative consequences that the ease of flying over the world brings more than five years ago is a strong change identified in this study. This is uniquely seen among the third viewpoint, i.e. business-minded people, and only one interviewee explicitly addressed this, relating to the impact of globalisation.

Despite that these attitude changes were observed, most respondents in viewpoint two and three interestingly did not think their attitudes had changed, or not that much, which is not completely the case in the results, although these are indeed the viewpoints from which the least attitude changes come forward. Furthermore, the attitudes from the interviewees were seen in the characteristics of all three viewpoints, but mostly in the first viewpoint. Hence, typical persons with more travel-minded or business-minded perspectives from viewpoint two and three were in retrospect not interviewed.

> My view toward flying has not changed, but I do realize that through flying I am contributing to CO_2 emissions. But, if I have to travel two days by car or two hours by plane to a holiday destination, then the choice is clear to me.

> My attitude has not changed, because I think that with, for example, carbon offsetting it is perfectly fine to fly.

Factors for change

The theoretical lens of Van Wee et al. (2019) enabled systematically analysing the attitude changes and, in turn, these findings have indicated the presence of the model's theoretical causal mechanisms. Based on this, numerous personal, social and environmental triggers were suggested to initiate cognitive, behavioural and affective processes. This section briefly reflects on the findings.

It is concluded that the increased awareness of the environmental impact of flying is considered as a definite factor contributing to changing air travel attitudes. Furthermore, results suggest that people know better the alternatives they have for flying, for example through experiencing the train or because their work meetings are online during the pandemic. Next, certain behavioural processes, such as actually travelling with alternatives, or not travelling at all, are suggested to have an effect on people's attitude too. Yet, this study did not reflect on the actual behavioural processes of people, so this internal process remains more difficult to check. The process of people feeling the importance and being worried about climate change is also evident. Despite the scarcity of studies into factors influencing air travel attitudes, the findings correspond with the initial suggested influences in chapter 4, namely COVID-19, climate awareness, convenient alternatives for flying and perceived necessity of flying. Furthermore, in Van Wee et al. (2019) similar internal processes and triggers leading to attitude change are discussed.

However, it must be noted that it is not possible to link one cause specifically to one change. Besides, these factors are difficult to analyse isolated from other processes or triggers, which is well incorporated by the relations in the model of Van Wee et al. (2019). Thus, an important note to make accompanying the findings from this research is the fact that both attitude changes and the mechanisms leading to that are not easily observed, as they take place inside people's minds. Furthermore, the results do not highlight the extent to which the factors contribute to changing attitudes. Therefore, based on this study alone, these findings remain rather suggestive than conclusive.

Reflecting separately on the influence of COVID-19, it only moderately came forward as an environmental trigger. For example, its effect on the perceived ease of flying, as it nowadays is found to be more of a hassle. This is consistent to what was seen in earlier studies, such as Thomas et al. (2021), in which the pandemic decreased the ease of flying and the willingness to fly. Especially the decreased ease was observed multiple times among the interviewees and grey literature. However, the impact of the pandemic on people's attitudes was only explicitly mentioned by one respondent. Contrary to Song Choi (2020) and Lamb et al. (2020), the health-risk aspects of the pandemic were not found to be of great influence among these study respondents, whereas it was mentioned by one interviewee. The influence of the pandemic hence is considered moderate.

6.6.2. Reflection on mixed-statement Q method

This research experimented with the application of Q methodology to investigate changes in people's attitudes towards air travel. In doing so, several dynamic statements (see item 2.1) were included in the set of statements. These statements enabled, up to a certain extent, revealing various attitude changes among the identified viewpoints, therewith pointing to attitude changes in the society at large. This section provides a reflection on the application of the Q method that includes both the classic static statements and dynamic statements, thereby making it a 'mixed-statement' application of Q.

A first point of reflection regards the interpretation of the dynamic statement itself. Such a statement described an attitude change in a specific direction that was observed among interviewees or in the grey literature, or that was considered the most likely direction. This resulted in the assumption that agreeing to the dynamic statement points to a perceived attitude change by the respondent. However, disagreeing on the other side could mean multiple things. Taking the statement "I am more worried about the climate impact of flying compared to five years ago" as an example, then disagreeing could either mean that a person was as worried five years ago as they are now about the climate, thus has not changed recently, but in the past. It could also mean the person is still not worried about the climate, hence, cannot relate to this and has not changed either. As a result of its retrospective nature, another downside of the dynamic statement is that it required more words as well as its meaning might have been more difficult to comprehend for the respondents. A way to account for this is by not including a specific time frame for the attitude change, but leave it unspecified.

The results following from including such dynamic statements are consequently interesting to reflect on. Taking the example statement, two persons who are both critical to flying, yet one has recently become worried about the climate impact, whereas the other was already and still is worried, might intuitively be clustered based on a currently concerned attitude, but not be clustered based on their attitude change. The result could be that an attitude change that is actually taking place among some people, only moderately comes forward within a viewpoint. Another case could be that one person who is just not worried and another person who was already worried, both cannot relate to the attitude change and are clustered based on that. Yet, one likes flying and the other does not, showing a different current view to air travel. Another result could be that people might simply find it more relevant to express their opinion about static statements, making the dynamic statements less outspoken in the viewpoints. Whether it is problematic could be argued, but in any case it could be accommodated by splitting static and dynamic statements, however, this in turn also has its drawbacks (see item 2.1).

A following interesting point of reflection regards whether the findings from this dynamic Q study could have been found in a conventional Q study with only static statements. On a critical note, with respect to people's current views to air travel, the three identified perspectives were intuitively expected, showing similar cluster characteristics as in Kroesen (2013), and were likely found in a static approach to Q as well. Nevertheless, without the dynamic statements, people would not have been stimulated to engage in a comparison of their attitudes now and years ago. Hence, the resulting viewpoints would not have included people's narratives about attitude change. Subsequently, recent attitude changes would have been more difficult to elicit, however, this could be done by directly asking respondents questions about attitude changes separately from the sorting statements.

Another point of reflection regards the Q set that is finite and should be understandable. However, it was not possible to include as many statements as desired in the Q set, especially since a certain balance between both static and dynamic statements was aimed for, and dynamic statements were often longer or more complex in nature. This resulted in the fact that not every attitude change, nor nuance to the attitude changes nor all possible causes for attitude change could be incorporated in the statements of the Q set. The result of less nuance is that some statements and

notions could be interpreted in multiple ways by the respondents, or that statements were more bold or black-and-white. On the positive side, such statements remains open to subjective interpretation and addition of nuance, hence, respondents could freely give them meaning within their perspective. This is typically done in Q. On the downside, statements that were too vague or simplistic might have been a reason for respondents to disagree at all or be neutral about it, as they felt it was not completely representative of their view, while it might to some extent have been applicable to them. Consequently, some attitude changes might have been under- or overestimated or overlooked. The possible solution is conducting two separate Q sorting procedures, however, is not always desired (see item 2.1).

The forced distribution for sorting the statements is also a point of reflection. Despite that it was aimed to have a balance between static and dynamic statements, it could still be possible that the respondent could not sort any more statements at their desired side of the grid. For instance, there were more statements the person agreed to, but no places left at the agree-side of the grid. This is something that two respondents have indicated during the sorting. Still, the resulting Q sort provided interesting insights into a person's agreement to one statement more than another, i.e. the relative rank ordering, and revealed their most agreed or disagreed statements, being the most characteristic information.

A final point of reflection regards the identifying and understanding of the causal mechanisms for attitude change in the viewpoints. Due to the holistic nature of the Q methodology, it was not possible to one-on-one link every specific attitude change to a corresponding cause for change, but rather it explored the various existing attitude changes, causes and possible relations between them. A downside is that, of the suggested causal relations, it is not known whether and to what extent one trigger initiates exactly one internal process, or a chain of processes. Even if a respondent mentioned clearly what they perceive as the cause for their changed attitude, it might still be the case that other triggers and processes played a role too. The three internal processes namely influence each other as well, and attitude change in turn can influence the behavioural process. It is even suggested by Van Wee et al. (2019) that an attitude change in turn not only has an impact on the person's behaviour, but may also impact the exposure to triggers again, being a feedback mechanism. In short, the chain of 'events' leading to attitude change is complex and therefore somewhat difficult to demonstrate from the viewpoints. Hence, the identified causal mechanisms from such a Q study are not conclusive nor comprehensive, but remain suggestive or speculative in nature. Still, they yield interesting initial insights that can be used as input in further research.

This reflection does not conclude with advising against this mixed-statement type of Q study for studying attitude change. On the contrary, it is suitable for yielding interesting, initial insights into attitude changes and is perfectly suitable for exploratory research that can be followed up with confirmatory research, such as survey studies. Yet, the reflection does point to the need for the researcher to pay extra attention during interpretation of the results as well as to carefully reflect on the discussed aspects and decisions to be made. On top of this, besides that this methodological approach can reveal the contours of attitude change, it also highlights the complexity surrounding the mechanisms that lead to attitude changes. Therefore, when the objective is to investigate this complexity in more detail, a more in-depth study is advised. Recommendations for future research are discussed in chapter 7.

7

Conclusion

Flying less (far) or not at all are considered promising for reducing CO2-emissions from aviation (Berveling et al., 2020), pointing to a need for a behavioural change in the aviation sector. In this, attitudes are assumed to play a role in this flying behaviour change. Hence, the research objective of this thesis was to empirically explore whether and how people have changed their attitudes towards air travel, more specifically what viewpoints can be distinguished in that respect, and to identify what factors can be indicated to explain a change in attitude. First, section 7.1 presents the summarised conclusions to the research questions. Next, section 7.2 outlines the policy recommendations following from the research results. Finally, section 7.3 discusses the limitations to the research as well as corresponding directions for future research.

7.1. Conclusion and answers to research questions

SQ1: What is the main theory on behaviour and attitude, the relation between attitude and behaviour, and what mechanisms for attitude change can be found?

This sub-question resulted in the necessary theoretical framework for the research. From the theory exploration, the Theory of Planned Behaviour (Ajzen, 1991), Social Cognitive Theory (Bandura, 1989), Transtheoretical Model (Diclemente and Prochaska, 1982) and Cognitive Dissonance Theory (Festinger, 1957) are found to be common attitude and behaviour theories. It resulted in several insights into attitude change and causal mechanisms. In the TBP, attitudes influence behaviour, but not the other way around, and are assumed to be relatively constant. Yet, it suggests certain beliefs to influence attitudes. Based on the SCT and CDT, attitudes and behaviour can influence each other, more or less explicitly implying that attitudes can change. Besides the influence of behaviour and environment, these theories do not elicit causalities leading to attitude change. The TTM does not explicitly incorporate attitudes, yet, it also implies attitudes can gradually change over time and behaviour can influence this too.

Based on the theories, this study assumed attitudes can change as well as a bidirectional causality between attitudes and behaviour. Hence, changed air travel attitudes could lead to the desired behavioural change in the aviation sector. Furthermore, besides the influence of behaviour, and some form of cognitive of environmental factors to influence attitude change, the exact mechanisms are not captured. Here, the attitude change model of Van Wee et al. (2019) offers a more complete theoretical understanding of attitude change; it not only incorporates cognition and environmental factors, but uniquely captures the mechanisms leading to attitude change. In short, people's changing attitudes can be explained by a change in their knowledge, behaviour or feeling (i.e. internal processes) surrounding a topic at hand. The processes in turn are initiated by people's

exposure to personal, social or environmental factors (i.e. triggers). This comprehensive model is taken as a lens to analyse and explain the changes in air travel attitudes in this study.

SQ2: What are the current attitudes of people towards air travel?

The systematic review of scientific research, mostly empirical in nature and conducted in different countries, show how attitudes to flying certainly vary between different people from more positive towards more negative, but cannot conclude that one attitude is specifically prevailing. During the COVID-19 pandemic, more negative views towards flying were observed, seen in little intention or willingness to fly. Overall critical and negative attitudes are also seen in the context of climate change. Among several people, more environmentally-aware attitudes to the impact of flying, even resulting in feelings of guilt, are seen. Yet, some inconsistencies between these "green" attitudes and people's flying behaviour come forward, in short, the attitude-behaviour gap. This is related to the prevailing perceptions that flying is a pleasure, convenient, practical, necessary, and how flying is an deeply-embedded practice. This results in the reservation that changed air travel attitudes do not necessarily lead to perfectly consistent flying behaviour, i.e. a desired change. Although attitude changes are not subject to this scientific research, studies give indications that those attitudes are changing and the COVID-19 pandemic, climate awareness, availability of alternatives and perceived necessity of flying possibly play a role.

SQ3: What changes in attitudes towards air travel can currently be identified?

The grey literature exploration and six preliminary interviews with individuals make the initial contours of attitude changes from the previous question more evident. Despite that Dutch people are generally positive about air travel, especially its efficiency and possibilities, a transition towards more negative attitudes seems to take place among various people and in various themes relating to air travel. For example, the realisation of the climate impact of flying has increased. Support for certain policy measures to discourage flying and make alternatives more attractive has increased and people are more hesitant about the growth of the aviation in The Netherlands. It is seen that the pandemic is often related to people's changed views on how normal flying is and its perceived necessity, especially business travel. People indicate to have become more critical towards air travel, their flying behaviour and responsibility as consumers. In this, influence of information, through the media and people's social environment, about the climate impact of flying and involvement with climate change are often identified as an explanation for the attitude change. Yet, other attitudes, such as the societal and economic importance of air travel, seem to remain rather constant among the Dutch population. What is more, not everyone has changed their views.

SQ4: What are people's viewpoints on air travel and changes in their air travel attitudes and what causes the attitude change?

Through a mixed-statement Q study, several of the identified changes from sub-question 3 were empirically investigated among a purposively selected sample of the Dutch population, consisting of 46 respondents, to identify main perspectives that people hold. Three viewpoints were identified that each reveal different changes in attitudes.

In the first viewpoint, labeled *"Acting more environmentally-aware is our responsibility as flying is harmful"*, people generally hold negative and critical attitudes to flying. They are very aware of climate change and the impact of flying, and express to be more concerned about that compared to five years ago. They are supportive of alternatives to flying and policies to discourage flying, and in line with that they have become more critical towards their own flying behaviour and they are more seriously considering the alternatives to flying. Altogether, show quite an independence from flying. This group strongly shows a more self-aware attitude regarding their role as consumers. The results show this viewpoint has changed the most in their air travel attitude, and this attitude change is unanimously perceived by the respondents as well.

In the second viewpoint, labeled *"Flying is important, although for business less normal and discouraging it never harms"*, people are generally positive about the opportunities that flying offers and how it is a convenient and practical means and efficient compared to alternatives. They do acknowledge the climate impact of flying, and have become somewhat more aware of the climate problem, yet, they do not see themselves stopping flying in the near future. They see the need for the aviation sector to innovate and the government to implement taxes on flying, so that flying remains possible for the occasional flyer. Especially taxes is something they have become more positive about. Interestingly, this viewpoint did not believe their attitude to flying had changed that much, but results indicate they do perceive flying for business as less evident than five years ago.

In the third viewpoint, labeled *"Certain aspects of flying have changed, yet, it remains necessary for business"*, people have a more practical and efficient mindset towards flying, and not necessarily think of it as convenient travel means. They definitely not prefer the plane above available alternatives. Still, they do underline the necessity of good air connections and strongly perceive flying for business as necessary. Their view to leisure air travel has changed; for them that has become less normal compared with five years ago. They also have become more aware of the negative consequences due to ease at which everybody flies over the world (i.e. globalisation). For them, flying nowadays is more of a hassle compared to five years ago. Overall, some of their attitudes have changed too.

The model of Van Wee et al. (2019) provided the lens to explain and analyse attitude changes and causes specifically. In doing so, the model was validated to some extent. As expected, it is seen that increased environmental awareness and knowledge of the impact of flying play a role in the changed attitudes. Also more knowledge of alternative ways of travelling and online communication are contributing (cognitive processes). Secondly, people have started to perceive climate change as problem or crisis, and personally feel the importance of it and have worries about it. They attach less importance to efficiency when travelling as well. Feeling flight shame did however not specifically come forward as a definite cause for change (affective processes). Third, certain changes in people's behaviour, such as considering the alternatives to flying better, flying only when no other option is possible, or quitting flying at all, are assumed to have affected the identified attitude changes (behavioural processes).

The initiators of these processes seem to be diverse. This can vary from a positive train experience to a change in family composition and from a change in income to encountering more climate change information. Certainly, the pandemic is an external trigger that led to new experiences with working and going on holiday, which caused people to learn and know these possibilities. That has likely led to a changed attitude to flying for business and leisure purposes. Yet, the results do not necessarily suggest the pandemic as an initiator of growing environmental awareness nor as a cause for changing views.

SQ5: What relations can be observed between the identified viewpoints and people's actual flying behaviour?

The flying behaviours per viewpoint, both before and during the pandemic, were analysed to establish rough relations between attitudes and behaviour. Viewpoints one and two both had a similar average flying behaviour, slightly above the Dutch average of 1.3 return flights per year (KiM, 2018). When looking closer at the descriptive statistics of their flights, it is seen that viewpoint one had typically many people who did not fly at all in the years before the pandemic, as claimed by several respondents too. Nevertheless, the few outliers in flying behaviour among the most changed, environmentally-aware people of viewpoint one do point to the presence of the attitude-behaviour gap among some of them. Consequently, it was suggested this viewpoint might include two groups; people who are more principled and consistent in their pro-environmental attitudes and flying behaviour, and people who are not (yet), as they might just recently have taken these attitudes.

Regarding the second viewpoint, these people typically travel by plane at least once a year

and mostly for leisure purposes. Furthermore, people have typically continued to fly during the pandemic, although it was less than before, but they are not necessarily the frequent-flyers. This corresponds to their overall positive views on air travel that they do not make a secret.

In the third viewpoint, although a great variety in flying behaviour is seen, people typically travel by plane more often than the Dutch average. This is expected since the large share of business travellers in this viewpoint and matches the perception that business air travel is necessary, i.e. their flying-dependent attitude.

Considering the flying behaviour of the latter two viewpoints, it can be concluded the attitude-behaviour gap is probably the least present among those people. There are rather consistent relations between people's positive attitudes and their occasional or frequent flying.

Main research question: Whether and how have people's attitudes towards air travel changed and what factors contribute to that change?

The findings from this research enabled the final answering of the main research question. First, regarding whether people's attitudes to flying have changed. The results of this research indeed show that people in The Netherlands have changed their attitudes in the recent years. Secondly, and more interestingly, regarding how people's attitudes have changed, it is clear that those attitude changes take place in a direction towards an overall more negative attitude. These attitude changes take place within an individual to a more or lesser extent. The attitude changes can be synthesised into three main directions:

- People expressing a *more environmentally-aware view* on air travel, meaning that people also see the environmental impacts when they think about air travel.
- People expressing a *more independent view* on air travel, meaning that people are more open to the alternatives when they think about flying. This does however not necessarily mean they have become more positive about the alternatives.
- People expressing a *less self-evident view* on air travel, meaning that people perceive flying, for both leisure and business purposes, as less normal and are more critical to the necessity of flying at all.

This study emphasises that the causal mechanisms leading to attitude change are complex and explaining them is therefore not straightforward. The results show how a variety of triggers from the social, personal or environmental sphere cause people to engage in certain processes. Three observed processes of people knowing, feeling or doing something more or less contribute to changing the views people hold about flying. These triggers and processes are also related to each other. The factors contributing to attitude change can be summarised as follows:

- People learning more about the environmental impacts of flying and becoming more aware of their responsibility. Furthermore, people learning about alternative ways of travelling. Finally, people learning about online communication.
- People feeling more concerns about climate change, perceiving it as a problem and wanting to preserve their legacy.
- People considering the alternatives to flying and choosing to travel with an alternative. Furthermore, people only flying in extraordinary situations or not flying at all.

7.2. Policy recommendations

As this research is a first exploratory study into attitude changes and was done among a non-representative sample, it does not easily result in ready-made recommendations for policymakers.

Especially since the attitude-behaviour gap exists, it is furthermore not certain that measures focused on attitudes will necessarily affect people's flying behaviour too. In addition, to set up more targeted policies, more statistical knowledge of the viewpoints (e.g. age, gender, education) and how they are distributed among the population is necessary. That will require additional research first (see section 7.3).

Nevertheless, the identified viewpoints gave insights into people's narratives about attitude changes and what has contributed to their attitude change, informing a first reflection on what these findings could imply for policy aimed at creating broader attitude and behaviour change among society. The policy recommendations are aimed at the individual and the attitudes they hold, trusting this could result in a change in their flying behaviour too. The results namely suggest that, despite the indication of the attitude-behaviour gap among them, people who overall hold more flying-critical attitudes and who have changed their attitudes the most, seem to also fly less. Yet, the results show that there is still a group of people who show some preference, importance or dependency with respect to flying, and who could change these attitudes.

Taking this into account, the following policy recommendations were developed, in which the three internal processes of Van Wee et al. (van Wee et al., 2019) provided inspiration.

- **Policy measures focused on knowledge and awareness**
  In the Netherlands, it is not the case that people in do not think of the climate as unimportant, on the contrary, the majority of the Dutch believe the climate is changing and find climate policies important (CBS, 2021). The viewpoints in this study also make clear that the CO2 impact of air travel is widely acknowledged. Yet, not everyone seems to have the most critical attitude to flying and its environmental impact specifically. People who are characterised as more environmentally-aware are generally more critical towards flying, and because of that might even fly less or not at all. In this, several people have indicated that especially knowing the impact of flying only has made them realise more. This recommendation is based on these findings and aims at creating a more environmentally-aware view on flying among people, maybe influencing a less self-evident view as well.

  From the people who are still rather positive towards flying, despite their acknowledgement of its climate impact, there might be people who do not know how the impact of flying relates to the environmental impacts of other aspects in daily life, in short, what share flying has in their carbon footprint. It might be that this information does not reach everybody sufficiently, because it is not easily available to them, they do not understand it, have no internal motivation to look it up, or are simply ignorant of it.

  Therefore, it is recommended to create more widespread knowledge among the population through an intensive information campaign about "responsible daily decisions", in which the climate impact of travelling, and flying specifically, is put in perspective of other impacts of daily life decisions. This could include the information from the IPCC report (2021), in which the emissions from certain activities were put into a larger perspective, which made their impact more evident. For example, the emissions of making one intercontinental flight are the same as driving a car for an entire year. Such information provides people with manageable and concrete knowledge that makes their travel and flying decisions part of their daily life decisions, instead of something separate. It makes them aware that their behaviour indeed has an impact.

- **Policy measures focused on emotions**
  Among the first environmental viewpoint, people indicated that they are thinking about their legacy that is currently on the line. In other words, they are aware that the choice they make today, have an impact for their children and grandchildren and the future earth at large. This is something they wish to preserve. Other emotional processes seen are the increased worries and perceiving the climate change as a real problem or threat. This recommendation is based

on these findings and aims a more environmentally-aware view, likely influencing a less self-evident view as well.

Therefore, accompanying the above information about the impact of flying, it is recommended to include more personal and emotional aspects in the recommended campaign. Central should be the different emotions and feelings that people have about climate change as well as the motivation for people to make those responsible daily life decisions, including whether or not to fly. It should include personal anecdotes of different types of people making daily decisions, from a business traveller with a family to someone who has quit flying to personally make a positive impact. Altogether, it should be relatable to different types of people as well as create a feeling of solidarity; we tackle climate change together for the sake of our legacy. The Dutch national COVID-19 vaccination campaign could provide inspiration.

- **Policy measures focused on behaviour**
  Overall, it is seen that people are supportive of the train becoming the standard alternative for short-haul trips within Europe and that none of the viewpoints indicate a preference for the airplane when an alternatives is available. However, people do not widely believe the alternatives have improved. Only the environmentally-minded people strongly express to really consider the alternative more and strongly express a willingness to fly less. Despite that the exact influences of attitudes and behaviour on each other could not be observed from this study, there is no harm in actually stimulating the engagement in desired travel behaviour, as it could result in an attitude change too. Moreover, a behaviour change is often associated with attitude change (B. Van Wee, March 30, 2022). This recommendation is based on these findings and aims at creating the more independent and self-evident view on flying.

  Therefore, it is recommended to invest in a campaign that stimulates alternative travel behaviour, of which the recent “public transport is okay” campaign stimulating the use of public transport is an example (OV-NL, 2021). The aim is not directly to make air travel look bad, but to make the alternatives look more positive in the eyes of consumers. The campaign could stimulate different holiday behaviour, for example going on holiday in Europe to a destination that is already easily accessible by other transport means. In turn, a positive experience with the alternative could lead to an attitude that is more open to the alternatives and thinks twice about taking the plane for holidays.

Although the recommendations seem to be targeting people who are not yet as aware and critical towards flying, seen in viewpoint two and three, they can certainly work for people in viewpoint one as well. Especially the behavioural policy measures could win over people experiencing the attitude-behaviour gap to change their flying behaviour and behave more consistent with their pro-environmental attitudes.

These policy recommendations can together form a comprehensive campaign that should be spread through several channels, such as television, online (social) media and physically on the streets, which were also mentioned as influential by the environmentally-aware people in viewpoint one. The campaign should initiate Dutch people knowing, feeling and doing more regarding responsible daily life decisions that could in turn stimulate the changing views to air travel, as identified, making it overall more psychological and attitude-oriented.

The Dutch national government is the suggested stakeholder to take the lead. Air travel attitudes form an intangible, psychological phenomenon inside every individual’s head in a society. Hence, they are not owned by a specific stakeholder nor are they a visible technology to implement by actors. Yet, air travel attitudes are of importance and interest to two actors specifically, namely a national government and the aviation industry. Since this research entails studying attitude change that might lead to people flying less, this is intuitively not something the aviation industry would stimulate. Therefore, the Dutch government is suggested as the actor to gather further necessary information and elaborate and implement the policy recommendations. This is not only because

the policy recommendations are in line with their aimed reduction of the CO2 emissions of the aviation sector (Rijksoverheid, n.d.-a), but also for the simple reason that they have the means to set this up on a large scale. What is more, it does not assign a prominent role to government out of the blue; 80% of the Dutch adults believe in the importance of the government interfering in and focusing on climate policies (CBS, 2021). On a more local level, employers could take on a role as well. From this study, it is clear there is support for employers stimulating sustainable (business) travelling, hence, they could also improve climate awareness and sustainable behaviour among their employees.

Other recommendations

However, attitude changes do not take place isolated from the larger society in which technologies, infrastructures and money play a role too. Therefore, several more tangible policy measures that relate to these aspects are suggested as well. This research shows an increase in (although not unanimously) support for monetary policy measures targeting aviation, such as carbon offsetting, the flight tax and generally higher taxes on flight tickets. The flight tax in the Netherlands was already introduced in 2021 (Rijksoverheid, n.d.-c), but this does not immediately exclude the possibility of higher or different taxes. This could be supported by monetary measures that make alternative travel behaviour more affordable, especially to people who are susceptible to cheap flight tickets to European destinations. As the Netherlands is a relatively small country, they rely on the infrastructure of other countries too for travelling to such destination. Therefore, it is also obviously suggested to continue to the intended improvements of the European railway infrastructure (Rijksoverheid, 2021).

Critical remarks for policy

Nonetheless, a more critical note should be placed with regard to the policy recommendations. The set course for current as well as the suggested policy measures assumes that as long as people are knowledgeable and aware of the effects of their consumer behaviour, they will adjust their behaviour towards more sustainable consumption, also with respect to flying. It is assumed this attitude change could result in, for instance, people flying less or purchasing flight tickets that offset carbon emissions. Indeed, some sort of attitude change is a precondition for an eventual behavioural change (G.P. Van Wee, personal communication, 30 March 2022). Yet, this research again shows the presence of the attitude-behaviour gap among society, meaning that people remain inconsistent between their attitudes to flying and their flying behaviour. Chances are high they will continue their flying practises, even when they have changed their attitudes towards a more negative side.

Moreover, the policy focus in the Dutch aviation sector is also on sustainable innovation, such as electrical flying, and internalising the external costs for the environmental effects into the ticket prices, such as through the flight tax, carbon offsetting and possible trading schemes (Rijksoverheid, n.d.-a). This should make air travel more sustainable and responsible, assuming flying practises continue. However, aviation experts stress such innovations are taking long to develop and implement (Trouw, 2022) and as long as people are willing to pay the price for flying, they will probably continue to do so.

These two critical notes combined stress that soft policies might not be as fruitful and that more harsh and strong policies are required to actually make a behavioural change in the aviation sector, i.e. people flying less, possible rather sooner than later. This is especially important during this time of increased climate urgency and recent alarming reports from the IPCC and climate experts, stressing the importance of immediate action and fundamental changes in the coming years to prevent climate disasters (PBL, 2022).

7.3. Discussion and future research

This study has made three clear scientific contributions. First of all, it has contributed to the currently scarce empirical knowledge base on changing air travel attitudes through conducting a first exploratory and empirical study into how attitudes to flying are changing among a group of Dutch people. Secondly, this study contributed to the theory, as it successfully applied and therewith partly validated the model on attitude change of Van Wee et al. (2019). Third, this study made a methodological contribution, as it incorporated a dynamic approach in the Q methodology and thereby addressed its suitability for studying attitude change.

Still, the limitations of this research should be addressed. Namely, while conducting this research, several decisions were made for the sake of feasibility (e.g. section 1.5) and inherent to conducting this Q method research are several limitations.

- A first limitation regards the sample of the study (i.e. interviewees and P set) that does not reflect larger Dutch population. Firstly, the interviewee and P set selection were done within the researcher's own social network, and the networks of friends and family. This might well have resulted in a certain bias. It is seen that most of the sampled respondents and interviewees shared an overall pro-environmental view and are mostly well-educated. Secondly, the sampling dimensions that were chosen might not have resulted in the most diversity in opinions as possible. For the dimensions of age and education level, the differences in attaching importance to the climate are found to be relatively small, yet, there are of course more nuanced views on the climate and climate change (CBS, 2021; Witt and Schmeets, 2018). Despite purposively sampling to include different viewpoints, this is always biased towards the research presuming a person holds a certain viewpoint. Hence, there is always a chance the researcher fails to include a certain viewpoint. That is related to the sample simply not being a representation of society at large, which however is not a goal of a Q study. Therefore, an opportunity for future research lies in doing a Q study that uses more nuanced sampling dimensions and a a future study is suggested that investigates the attitude changes from this study among a representative sample to aim for generalisation of the results.

- The second main limitation regards that not all possible attitude changes and causes and corresponding statements have been included. First, it is impossible to entirely know the concourse, especially since there is not one best method to develop it (Fontein-Kuipers, 2016), meaning that from the beginning certain statements might have been overlooked, thus, specific perspectives left out. Furthermore, the gathered concourse was larger than could have been incorporated in the Q set, resulting in disregarding some nuances in attitude (changes). These decisions were based on the researcher's own insight, which could be biased. Consequently, certain attitude (changes) or causes that are part of the discourse on aviation were not included and could have been missed by respondents. There was no feedback question included that asked them about missed statements, so the insights into that remain limited. This, however, offers the opportunity to further study air travel attitude changes, including different or more changes compared to this study.

- A third limitation lies in the dynamic nature of the Q study itself, as reflected upon in subsection 6.6.2. The dynamic statements included a time frame of attitude change that was predefined and chosen to be five years for valid reasons. However, for the respondents this could have been restrictive during the retrospective reflection on their attitudes. In case they could relate to the attitude change, but not to the time frame, this likely forced them to disagree with the statement. This points to the overall limitation of the dynamic statement itself, being that disagreement to it does not necessarily mean the person has not changed, therewith posing flaws for the interpretation of the viewpoints. Following from this, another limitation is that attitude change to reflect upon should apply to the last five years, whereas people might have

changed ten years ago. These limitations emphasise to further develop and apply this mixed-statement Q method in other studies into attitude change to reflect on, learn and improve this type of Q application. A future study that applies the mixed-statement approach could for example adapt the dynamic statements, by keeping the time frame open to interpretation or making them more easy to interpret.

- A fourth limitation lies in the execution of the Q survey. Due to the sorting procedure being online, there was no possibility for the respondents to get familiar with all the statements before they started the sorting. Furthermore, the respondents were forced to sort statements into a given distribution, while they might have (dis)agreed with more statements than practically possible. Hence, this results in a less accurate representation of their view, that they could not deliberate on. Moreover, it might have been that some respondents did not fully understand the sorting, despite the explanations, resulting in Q sorts that are in fact not a person's viewpoint. A future study could for example conduct this Q study in person.

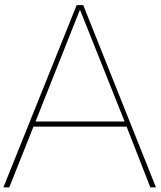
  The second, third and fourth limitations furthermore offer interesting directions for future research, namely investigating air travel attitude changes more comprehensively or in-depth, rather than exploring them. An generally interesting suggestion is doing a study similar to Kroesen (2013) that uses separate scales per statement, giving people room to freely agree and disagree with the statements, instead of a more holistic approach as in Q. For the researcher it gives room to include more attitude change statements and causes for change, possibly even asking respondents per attitude change why they have changed.

- A fifth limitation regards the analysis of the viewpoints. First, according to Brown (Brown, 1993) the number of factors depends fully on how the respondents perform, hence, the factor analysis is from the beginning already subject to flaws. Consequently, another factor extraction method could have led to different factors. Furthermore, the number of factors is subjective. The researcher in the end decided on the number of factors, which in this study was mainly based on strict criteria, whereas another researcher might make different considerations. Hence, possibly other viewpoints could have been the result. Second, the exact proportions of each viewpoint in the entire population remain unknown as well as whether or not more viewpoints exist. Nonetheless, we can trust that the identified perspectives at least exist (Brown, 1993) and bring forward interesting insights into attitude changes. Based on this, interesting directions for future research are applying other factor extraction criteria and studying the identified viewpoints among a representative sample of the Dutch population to examine the exact presence of certain viewpoints.

- A sixth limitation entails the interpretation of the viewpoints. This study into viewpoints did not enable exactly linking a specific attitude change to a specific cause or factor. The model of Van Wee et al. (2019) provided guidance in this, while at the same time, it also emphasised the more complex nature of attitude change. The distinction between a trigger or a process, especially when it entails experiences and behaviour, was not always easy to observe or black-and-white. Yet, this was not the sole objective. The study did enable revealing attitude changes and suggesting factors contributing to that. However, it it cannot be said how strong these changes or factors are nor is known to what extent certain factors influence a change in attitude. What is more, and was outside the scope, it remains unknown what the actual effects of the identified attitude changes on people's flying behaviour are. These limitation offer excellent opportunities for investigating to what extent people can relate to certain causes for attitude change, enabling measuring their effect to some extent. Another future study could also possibly link the attitude changes to certain flying behaviour more specifically and empirically verify the relations, for example by measuring both over a period of time in a panel study.

- The final limitation lies in the overall psychological and exploratory nature of this research. Attitudes are inherently intangible, making it impossible to exactly know what people feel or think, and the same counts for attitude changes. This difficulty is for instance seen in the fact that people themselves did not think they had changed, whereas the results show they have. Considering this and the chosen methodology, the results are suggestive rather than conclusive or confirmatory. They cannot be generalised at this moment, but the limitations give room to interesting directions for future research.

Altogether, the limitations point to interesting directions for future research, namely investigating air travel attitude changes and corresponding complex causal mechanisms more comprehensively or in-depth, using this exploratory research as input.



Interview questions

Interview

Checklist

- Informed Consent Form
- Opname starten
- Gegevens invullen
- Vlieggedrag

Socio-demografische gegevens

Naam:
Leeftijd:
Geslacht:
Hoogst genoten opleiding:

Vlieggedrag

Aantal retourvluchten sinds start COVID-19 (maart 2020) in Nederland[1]: 0

- Primair reisdoel:
- Binnen EU / net buiten EU (Noord Afrika, Turkije) / medium afstand (US, Kenia, India) / lange afstand (Thailand, Cariben, Zuid-Afrika / zeer lange afstand (Indonesië, Australië, Chili)

Aantal retourvluchten in de 24 maanden vóór COVID-19 pandemie:

- Primair reisdoel:
- Binnen EU / net buiten EU (Noord Afrika, Turkije) / medium afstand (US, Kenia, India) / lange afstand (Thailand, Cariben, Zuid-Afrika / zeer lange afstand (Indonesië, Australië, Chili)

Type reiziger ("*wat voor rol speelt vliegen in jouw leven naar eigen inzicht?*"):

[1] Rijksoverheid. (n.d.). *Maart 2020: Maatregelen tegen verspreiding coronavirus, intelligente lockdown.* https://www.rijksoverheid.nl/onderwerpen/coronavirus-tijdlijn/maart-2020-maatregelen-tegen-verspreiding-coronavirus

Figure A.1: Interview I

Opening – beeld bij het gesprek
We gaan het hebben over vliegen en luchtvaart. Ik zal het woord *vliegen* voornamelijk gebruiken, maar daarmee bedoel ik ook "luchtvaart" en "vliegreizen".
Vragen naar jouw attitude, mening, perspectief, kijk, houding t.o.v. vliegen. Er zijn dus geen goede of foute antwoorden.
Ik ben vooral heel benieuwd naar jouw inzichten over dit onderwerp. Het is allemaal in de brede zin.
Ik zal je vooral aan het woord laten, dus praat er vooral op los.

Algemene vragen – huidige attitude

1. Wat zijn je eerste associaties bij vliegen en luchtvaart?
    a. Waarom?
2. Wat is op dit moment jouw mening over vliegen?
    a. Waarom?
    b. Wat zijn voor jou de positieve aspecten aan vliegen?
    c. Wat zijn voor jou de negatieve aspecten van vliegen?
3. Wat voor emoties roept vliegen bij je op? (e.g. schaamte?)
    a. Waarom?
4. Samenvattend: hoe kijk je over het algemeen aan tegenover vliegen?
    a. Zeer negatief – zeer positief
    b. Welke dingen spelen een rol in/bepalen die houding t.o.v. vliegen?

Veranderingsvragen – attitudeverandering

5. Als we het vergelijken met 5 jaar geleden; zou je zeggen dat je houding/attitude/mening over vliegen is veranderd vergeleken met nu?
    a. Op welke manier? Welke richting?
6. Hoe keek je 5 jaar geleden tegen vliegen aan?
7. Waarom is jouw mening veranderd?
    a. Wat heeft daarin een rol gespeeld? (omgeving/partner?/informatie)
    b. Welke aspecten aan vliegen spelen mee in jouw veranderde blik op vliegen?
    c. Wat was de belangrijkste reden?
8. Denk je dat deze verandering blijvend is? Gaat het nog meer veranderen?
9. Anderen in omgeving die verandering doormaken? (familie/vrienden)

Indien geen verandering:

10. Waarom is je mening onveranderd?
11. Is je mening ooit veranderd? Bijvoorbeeld 10 jaar geleden.

Thema's:

12. Hoe kijk je aan tegen het **milieuaspect** (klimaat, CO2-uitstoot) van vliegen?
    a. Is die mening veranderd t.o.v. 5 jaar geleden?
13. Hoe kijk je aan tegen het **gezondheidsaspect** van vliegen (fijnstof, overlast, virusoverdracht, luchtkwaliteit)?
    a. Is die mening veranderd t.o.v. 5 jaar geleden?
14. Hoe kijk je aan tegen het **veiligheidsaspect** van vliegen? (explosies, controles, etc.)
    a. Is die mening veranderd t.o.v. 5 jaar geleden?
15. Hoe kijk je aan tegen het **economische aspect** van vliegen?
    a. Is die mening veranderd t.o.v. 5 jaar geleden?
    b. Persoonlijk financieel/prijs van ticket
    c. Economisch belang; groei van luchtvaart
16. Hoe kijk je aan tegen de **noodzakelijkheid** van vliegen?
    a. Is die mening veranderd t.o.v. 5 jaar geleden?
    b. Voor de maatschappij/Nederland

Figure A.2: Interview II

    c. Voor jou persoonlijk (vakantie/zakenreizen)
        i. Geneigdheid om vliegtuig te pakken, het gemak?
17. Hoe kijk je aan tegen **het gemak van vliegen**?
    a. Is die mening veranderd t.o.v. 5 jaar geleden?
18. Hoe kijk je aan tegen jouw **bereidheid om minder te vliegen**?
    a. Is die mening veranderd t.o.v. 5 jaar geleden?
19. Hoe kijk je aan tegen **alternatieve vervoersmiddelen** voor vliegen?
    a. Is die mening veranderd t.o.v. 5 jaar geleden?
20. Hoe kijk je aan tegen het **sociaal-culturele aspect** van vliegen?
    a. Is die mening veranderd t.o.v. 5 jaar geleden?
    b. Omgeving
    c. Reizen, bestemming
21. Covid-19 en vakantievliegreizen?

Figure A.3: Interview III

B

The Q survey

The following pages show the online Q survey that can be accessed on https://vliegattitudes.netlify.app.

Figure B.1: Q survey I

Figure B.2: Q survey II

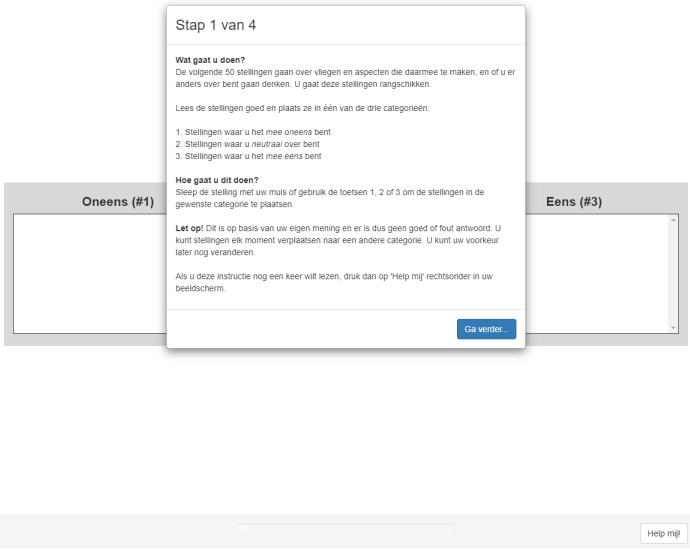


Figure B.3: Q survey III

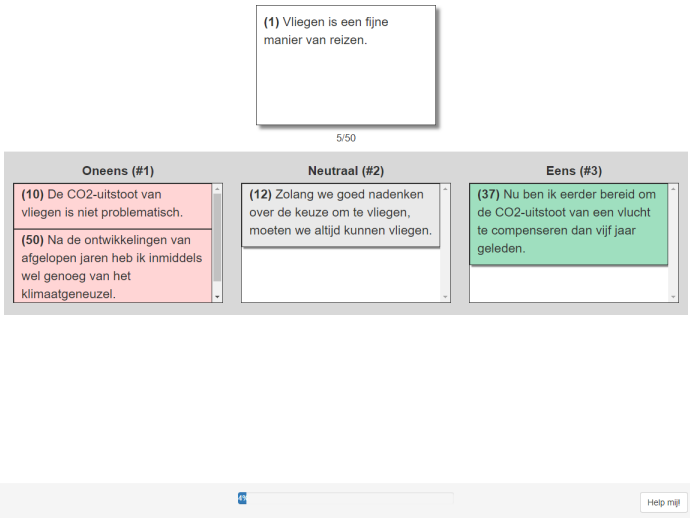


Figure B.4: Q survey IV

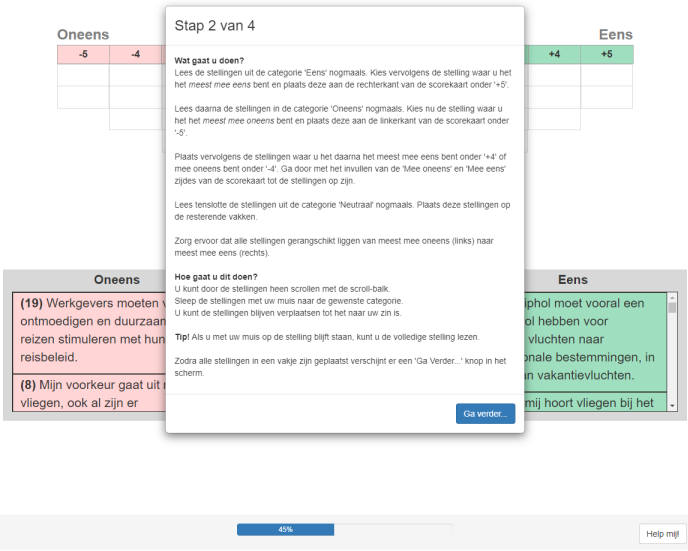


Figure B.5: Q survey V

Figure B.6: Q survey VI

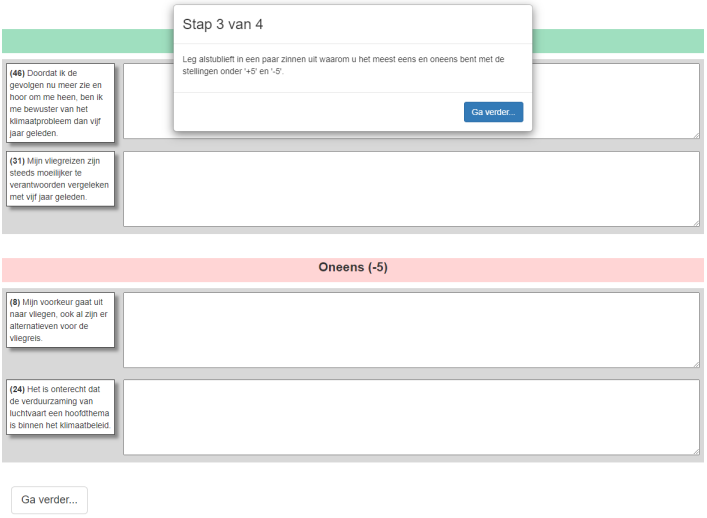


Figure B.7: Q survey VII

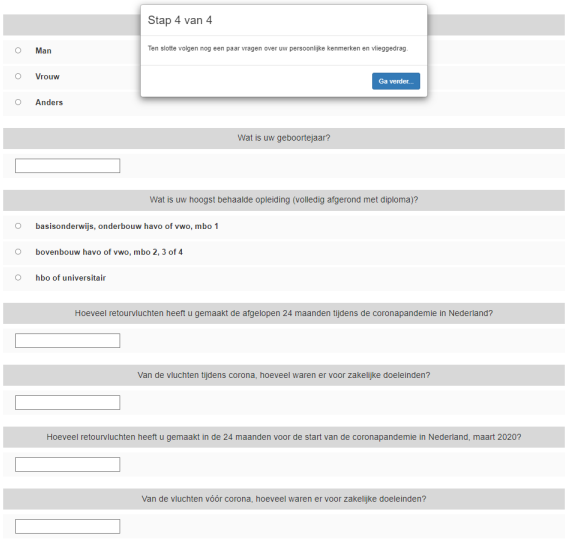


Figure B.8: Q survey VIII

C

Q set

The Table C.1 presents an overview of the statements in the Q set. It indicates their static (S) or dynamic (D) nature. Some statements are not strictly dynamic in nature based on item 2.1, since they do not entail a comparison with five years ago, yet, they are not entirely static in nature too. The next column presents the corresponding theme of the statement. The final column indicates the source in which the statement has its origin and from which it was adapted.

Table C.1: Q set: statement type, theme and source

Statement		Statisch/ dynamisch	Thema	Afgeleid uit		
1	Vliegen is een fijne manier van reizen.	S	Algemeen/emoties	Interview	Rapport/artikel	
2	Vliegschaamte vind ik overdreven, er zijn wel andere dingen waarvoor we ons kunnen schamen.	S	Algemeen/emoties	Forum/opinie		
3	Vliegen is noodzakelijk kwaad.	S	Noodzakelijkheid	Interview		
4	Vliegen is noodzakelijk voor zakelijke doeleinden.	S	Noodzakelijkheid	Interview	Rapport/artikel	
5	Vliegen is noodzakelijk om op vakantie te kunnen gaan.	S	Noodzakelijkheid	Interview		
6	Voor mij hoort vliegen bij het vakantiegevoel.	S	Vanzelfsprekendheid	Interview		
7	Vliegen is een efficiënte vervoerswijze ten opzichte van de alternatieven.	S	Alternatieven/keuze voor vliegen	Interview	Forum/opinie	
8	Mijn voorkeur gaat uit naar vliegen, ook al zijn er alternatieven voor de vliegreis.	S	Alternatieven/keuze voor vliegen	Rapport/artikel		
9	Vliegen is te verantwoorden als ik reëel gezien niet op een andere manier op mijn bestemming kan komen.	S	Alternatieven/keuze voor vliegen	Interview		
10	De CO2-uitstoot van vliegen is niet problematisch.	S	Klimaat/milieu	Interview		
11	Ik zie geen aanleiding en noodzaak om minder te vliegen, ik leef tenslotte maar één keer.	S	Vlieggedrag/minder vliegen	Interview	Forum/opinie	
12	Zolang we goed nadenken over de keuze om te vliegen, moeten we altijd kunnen vliegen.	S	Vlieggedrag/minder vliegen	Interview		
13	Stoppen met vliegen, dat zie ik mezelf niet doen in de nabije toekomst.	S	Vlieggedrag/minder vliegen	Interview		
14	Door te vliegen is het mogelijk mijn blik op de wereld verbreden.	S	Mogelijkheden/gemak	Interview	Forum/opinie	
15	Vliegen is vooral praktisch om op een verre bestemming te komen.	S	Mogelijkheden/gemak	Interview		
16	Het is fijn dat vliegen zo makkelijk en betaalbaar kan.	S	Mogelijkheden/gemak	Forum/opinie		
17	Het is belangrijk voor de economie en maatschappij dat er goede luchtverbindingen zijn.	S	Mogelijkheden/gemak	Interview		
18	Als consument moeten we verantwoordelijkheid nemen in het aanpassen van ons eigen vlieggedrag.	S	Verantwoordelijkheid	Interview		
19	Werkgevers moeten vliegen ontmoedigen en duurzaam reizen stimuleren met hun reisbeleid.	S	Beleid/maatregelen	Rapport/artikel		
20	Schiphol moet vooral een netwerkrol hebben voor zakelijke vluchten naar internationale bestemmingen, in plaats van vakantievluchten.	S	Beleid/maatregelen	Rapport/artikel		
21	De luchtvaartsector moet meer innoveren.	S	Beleid/maatregelen	Rapport/artikel	*Inductief*	
22	De overheid moet de vliegtaks of verplichte CO2-compensatie invoeren.	S	Beleid/maatregelen	Rapport/artikel		
23	Voor korte reizen binnen Europa is vliegen onnodig, de trein moet hier de standaard worden.	S	Beleid/maatregelen	Interview	Rapport/artikel	
24	Het is onterecht dat de verduurzaming van luchtvaart een hoofdthema is binnen het klimaatbeleid.	S	Anti-beleid	Forum/opinion		
25	Het is onnodig om de groei van de Nederlandse luchtvaart tot een halt te roepen.	S	Anti-beleid	Rapport/artikel		
26	Vijf jaar geleden stapte ik onbevangen het vliegtuig in, nu ervaar ik meer vervelende gevoelens als ik vlieg.	D	Algemeen/emoties	Interview	Forum/opinion	
27	Ik kijk nu kritischer naar of het nodig is dat ik ga vliegen dan vijf jaar geleden.	D	Noodzakelijkheid	Interview	Rapport/artikel	
28	Vliegen voor zakelijke doeleinden is nu minder normaal dan vijf jaar geleden.	D	Vanzelfsprekendheid	Interview	Rapport/artikel	
29	Vliegen voor vrijetijdsdoeleinden is nu minder normaal dan vijf jaar geleden.	D	Vanzelfsprekendheid	Rapport/artikel		
30	Langer reizen of meer betalen voor een alternatief voor vliegen is voor mij minder problematisch dan vijf jaar geleden.	D	Alternatieven/keuze voor vliegen	Interview		
31	Mijn vliegreizen zijn steeds moeilijker te verantwoorden vergeleken met vijf jaar geleden.	D	Alternatieven/keuze voor vliegen	Forum/opinie	Rapport/artikel	
32	Ik overweeg nu beter de verschillende opties voordat ik een vlucht boek vergeleken met vijf jaar geleden.	D	Alternatieven/keuze voor vliegen	Interview		
33	Mijn zorgen over de milieu-impact van vliegen zijn groter dan vijf jaar geleden.	D	Klimaat/milieu	Rapport/artikel		
34	Mijn bereidheid om minder vaak te vliegen is groter dan vijf jaar geleden.	D	Vlieggedrag/minder vliegen	Interview	Rapport/artikel	
35	Als mijn reisgezelschap kiest voor vliegen, zal ik nu sneller een andere keuze maken dan vijf jaar geleden.	D	Omgeving	Interview	Forum/opinie	
36	Ik ben nu positiever over een hogere belasting op vliegtickets dan vijf jaar geleden.	D	Beleid/maatregelen	Interview	Rapport/artikel	
37	Nu ben ik eerder bereid om de CO2-uitstoot van een vlucht te compenseren dan vijf jaar geleden.	D	Vlieggedrag/minder vliegen	Interview		
38	Vliegen is een andere rol gaan spelen in mijn leven.	S/D	Algemeen/emoties	Interview		
39	Door de coronapandemie is een vliegreis maken nu meer gedoe dan vijf jaar geleden.	D	Pandemie	Interview	Rapport/artikel	
40	Door de coronapandemie weten we dat we ook goed online kunnen communiceren.	S/D	Pandemie	Interview	Rapport/artikel	
41	Door de coronapandemie weet ik dat een vrijetijdsbesteding zonder te vliegen ook leuk is.	S/D	Vanzelfsprekendheid	Interview		
42	De alternatieven voor vliegen zijn aantrekkelijker geworden.	S/D	Alternatieven/keuze voor vliegen	Interview		
43	Ik heb fijne ervaring opgedaan met de trein of auto als alternatief voor het vliegtuig.	S/D	Alternatieven/keuze voor vliegen	Interview		
44	Door de coronapandemie ben ik me nu bewuster van de gezondheidsrisico's van vliegreizen dan vijf jaar geleden.	D	Pandemie	Interview	Rapport/artikel	
45	Vliegreizen maken heeft een aanzienlijk toeristisch belang.	S	Mogelijkheden/gemak	Interview	Forum/opinie	
46	Doordat ik de gevolgen nu meer zie en hoor om me heen, ben ik me bewuster van het klimaatprobleem dan vijf jaar geleden.	D	Klimaat/milieu	Interview	Forum/opinie	
47	De negatieve gevolgen van dat iedereen zo makkelijk over de wereld vliegt, zie ik nu meer dan vijf jaar geleden.	D	Klimaat/milieu	Interview		
48	Dat mensen (bijv. familie, rolmodel) minder zijn gaan vliegen of zijn gestopt, heeft mij aan het denken gezet.	S/D	Omgeving	Interview	Rapport/artikel	
49	Ik ben me nu bewuster van mijn keuzes en verantwoordelijkheid als consument dan vijf jaar geleden.	D	Verantwoordelijkheid	Forum/opinie	Rapport/artikel	Interview
50	Na de ontwikkelingen van afgelopen jaren heb ik inmiddels wel genoeg van het klimaatgeneuzel.	S/D	Anti-beleid	Forum/opinie	*Inductief*	

D

Factor analysis

D.1. Correlation matrix

The 46x46 correlation matrix is presented in Table D.1. Each of the Q sorts was correlated with all other Q sorts pairwise, resulting in a total of $\frac{(m)\times(m-1)}{2} = \frac{(46)\times(45)}{2} = 1035$ correlations (Watts and Stenner, 2012). From the correlation matrix it can be observed that there is an overall heterogeneity among the participants with regard to their attitudes to flying and changes therein, since there are both positive and negative correlations and some are even (close to) zero. The correlations in this matrix range from $-0.48 \leq r \leq 0.78$. There is no clear consensus on the topic at hand.

- **Positive correlations:** It can be seen that there are more positive than negative correlations, in general indicating more agreement between the respondents than disagreement on the topic. Several positive correlations are relatively high, of which the Q sorts 25 and 30 have the highest level of agreement between them ($r = 0.78$).
- **Correlations of zero:** There are a few correlations that are exactly 0, meaning that these respondents have no association between them at all; they are nor very similar nor clearly opposites in their rankings, just holding different views (Watts and Stenner, 2012). Some examples are the pairs 17 and 7, 23 and 6, and 37 and 3.
- **Negative correlations:** There is a total of 125 negative correlations. These indicate a certain level of disagreement between several respondents, such as Q sort 5 and 9 and 36 and 45. Clearly, Q sorts 5 and 17 have the highest negative correlation ($r = -0.48$). Moreover, it can be observed that Q sorts 17 and 24 overall have more negative than positive correlations with most other Q sorts, showing a general disagreement with their fellow respondents.
- **Close-to-zero correlations:** On the other side, some correlations are quite close to zero, indicating hardly any association between them. For example, some negative correlations are not extremely negative, such as the pair 14 and 14 ($r = 0.01$), tending more towards no association than disagreement between them. The same counts for the small positive correlations, such as the pair 4 and 9 ($r = 0.01$).

Correlations of at least 2 times the standard error are considered significant. Based on the standard error (6.2) of 0.14, a significant correlation is greater than 0.28 (irrespective of the sign). This means that there are several insignificant correlations in the correlation matrix in Table D.1. However, this not problematic; the matrix is simply necessary for revealing the factors (Brown, 1993).

Table D.1: Correlation Matrix

P	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46
1	100																																													
2	24	100																																													
3	34	27	100																																											
4	47	16	36	100																																										
5	53	6	8	34	100																																									
6	17	16	52	27	-5	100																																									
7	31	28	25	42	36	21	100																																								
8	27	9	35	25	12	38	37	100																																							
9	9	11	37	1	-29	21	8	20	100																																						
10	55	29	39	65	49	18	66	33	1	100																																					
11	23	3	52	26	2	27	15	20	33	20	100																																				
12	30	10	4	40	63	-16	43	18	-25	49	-11	100																																			
13	43	43	55	24	4	30	21	24	40	33	18	14	100																																		
14	47	23	24	35	14	27	41	40	14	32	14	16	26	100																																	
15	59	20	37	37	54	-11	29	9	16	57	21	38	35	13	100																																
16	20	-9	6	27	62	-10	31	8	-29	43	-7	64	-9	-1	44	100																															
17	-5	25	42	-3	-48	37	0	22	36	-14	41	-37	34	39	-19	-58	100																														
18	28	25	55	20	7	39	23	43	14	18	23	2	39	31	16	-14	37	100																													
19	43	33	5	40	65	-7	27	12	-16	43	1	49	2	19	54	43	-36	9	100																												
20	30	20	9	47	61	-3	47	23	-17	60	4	62	19	18	43	60	-28	8	52	100																											
21	40	29	17	30	51	2	53	20	-18	59	-4	51	19	8	67	48	-28	14	55	34	100																										
22	39	9	39	43	52	21	57	48	-1	61	13	58	29	38	39	50	1	22	35	53	49	100																									
23	27	9	16	35	60	0	47	16	-13	60	11	53	-7	7	56	64	-41	-6	56	51	62	46	100																								
24	-7	-6	8	-7	-36	-1	-23	19	12	-21	-7	-24	5	13	-14	-34	32	22	-25	-20	-18	2	-32	100																					
25	43	10	16	42	62	3	44	15	-31	73	0	57	9	16	46	63	-37	11	47	54	61	53	66	-20	100																				
26	27	51	37	26	33	16	34	12	19	50	21	20	18	8	36	23	2	23	50	35	43	32	40	-10	35	100																			
27	42	39	42	8	4	42	12	39	35	19	11	-8	55	35	20	-20	48	57	11	8	7	22	-3	28	7	27	100																		
28	28	0	-1	16	51	-13	25	14	-8	34	-6	45	15	22	29	46	-30	-12	40	51	30	46	49	-23	41	14	-3	100																	
29	31	37	27	21	30	26	52	10	2	49	14	39	25	27	20	25	6	24	18	42	31	49	28	-9	33	39	17	14	100																
30	39	7	18	39	61	2	55	27	-29	74	12	57	7	19	47	62	-32	9	48	66	57	60	66	-27	78	40	3	51	37	100															
31	47	18	34	41	20	16	24	44	15	25	17	18	42	50	18	-10	30	35	7	23	0	35	-9	30	5	7	40	4	29	10	100														
32	52	2	55	57	60	38	43	40	-1	64	26	43	33	31	45	43	-2	35	38	46	37	69	50	2	61	27	34	34	32	57	36	100													
33	57	17	42	36	51	17	41	40	-1	55	11	46	48	37	45	25	6	53	38	48	43	67	31	11	49	36	40	29	35	53	38	59	100												
34	43	11	10	33	67	-24	46	16	-28	63	-7	73	9	11	50	68	-47	3	50	64	57	60	58	-22	76	21	-7	51	36	73	9	47	56	100											
35	33	27	39	39	48	17	35	28	-4	64	19	41	28	18	52	52	-19	27	49	43	61	54	48	-2	69	53	21	32	35	59	20	50	43	52	100										
36	24	13	21	23	-10	41	30	26	39	25	40	-14	23	48	12	-13	41	14	3	1	0	16	4	-3	-2	15	33	2	21	10	30	18	-5	-23	14	100									
37	28	26	0	14	17	23	23	10	18	31	-5	8	14	25	21	2	3	9	41	29	18	12	20	-25	14	34	16	26	39	23	2	10	27	13	20	21	100								
38	34	-23	13	38	56	2	33	15	-2	52	5	52	14	8	45	54	-32	11	43	56	28	43	51	-30	52	4	11	46	20	48	14	58	38	50	34	11	20	100							
39	38	15	21	29	52	13	50	21	-15	64	3	57	20	13	41	43	-20	13	36	39	53	55	60	-30	65	31	3	35	48	70	6	44	56	68	45	14	34	39	100						
40	34	20	-2	30	50	-3	41	19	-13	46	-15	53	7	30	28	46	-19	4	35	52	33	58	52	-15	46	17	11	57	41	49	12	41	35	60	30	6	31	37	49	100					
41	31	20	8	30	41	6	29	9	-3	47	-2	42	2	9	39	59	-31	8	47	37	46	48	55	-17	57	34	19	36	28	54	-10	38	30	57	56	9	24	35	52	59	100				
42	52	20	47	37	19	46	34	42	37	34	37	16	45	63	28	1	39	27	33	17	20	41	23	-7	16	33	43	31	16	21	30	46	48	7	13	43	34	25	18	27	11	100			
43	52	23	21	37	35	20	39	22	10	61	19	29	30	42	42	19	-2	29	39	39	31	52	41	-22	44	32	28	33	51	47	18	48	43	33	37	39	44	37	48	41	51	37	100		
44	53	9	35	26	25	20	7	38	6	21	6	14	45	44	25	-6	16	35	20	3	23	28	-11	11	5	10	38	20	-2	16	42	31	41	12	34	4	18	5	4	14	7	40	16	100	
45	14	13	11	32	57	-8	38	12	-28	51	10	64	0	-4	45	62	-42	14	55	68	53	47	59	-26	62	26	-9	43	35	62	2	41	41	69	55	-12	15	53	45	44	48	3	36	-10	100	
46	34	8	30	48	59	16	51	34	2	63	18	52	19	10	43	57	-31	16	47	58	46	56	62	-18	57	47	9	42	32	51	19	66	42	54	58	4	20	52	40	51	46	29	35	15	58	100

D.2. Factor extraction and rotation

The factor analysis took place in several steps.

- Step 1: Initial factor extraction (PCA)
- Step 2: Check evaluation criteria
- Step 3: Factor rotation (Varimax)
- Step 4: Check factor loadings

Step 1: Initial factor extraction

Eight factors were initially extracted in KADE through PCA. The resulting unrotated factor matrix is presented in Table D.5. For each of the eight factors, it shows the factor loadings of the Q sorts for that factor.

Step 2: Check evaluation criteria

The evaluation criteria were applied to decide on how many factors to retain. First, based on the eigenvalues of the factors presented in Table D.2, all factors were retained. It must be noted that the eigenvalues of factor 1 and 2 are relatively large compared to the smaller eigenvalues of the other factors. Factors 3, 4, 5 and 6 have an eigenvalue of more or less 2, whereas the eigenvalues of factor 7 and 8 lie closer to 1.

Table D.2: Eigenvalues of the factors

	F1	F2	F3	F4	F5	F6	F7	F8
Eigenvalues	15,2897	6,5001	2,3053	1,9651	1,9447	1,7183	1,2664	1,1990
% Explained Variance	33	14	5	4	4	4	3	3

Secondly, checking the presence of two or more significant loadings in the correlation matrix of Table D.1. Every factor has at least two significant loadings of ≥ 0.36 at the 1% confidence level. Factors 6, 7 and 8 have only two significant loadings, so are borderline cases. This criterion also keeps eight factors.

Thirdly, the Humphrey rule, which keeps factors that have a cross-product of its two highest factors that is ≥ 0.28. This gives the following results as presented in Table D.3. Only factor 1, 2 and 5 suffice, so this criterion keeps three factors.

Table D.3: Cross-products of the factors

	F1	F2	F3	F4	F5	F6	F7	F8
Cross-product	**0,6875**	**0,5464**	0,2094	0,1833	**0,2833**	0,2207	0,1609	0,1697

Fourth, the Scree test, which looks at the Scree plot as presented in Figure D.1. According to this, a clear bend in the slope occurs at three factors, as indicated by the blue circle. Hence, this criterion also keeps three factors for the final extraction and rotation.

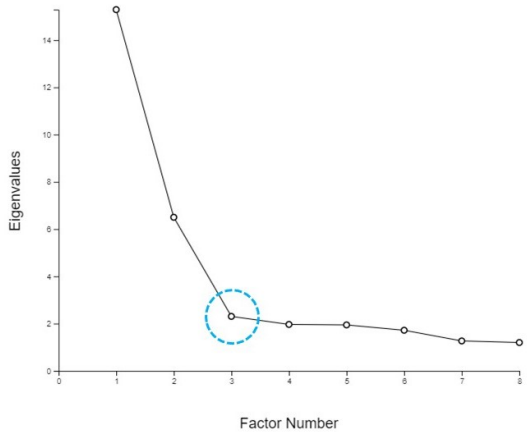


Figure D.1: Scree plot of the factors' eigenvalues

The number of factors retained per criterion is presented in the table Table D.4 below. Eventually three factors were retained and immediately proceeded to factor rotation (since KADE does not allow for changing the number of factors to extract; only the number of factors for rotation).

Table D.4: Number of retained factors per criterion

Criterion	Factor kept if…	# of retained factors
Kaiser-Guttman rule	EV >1	8
Two significant loadings	At least two significant loadings (≥0.36)	8
Humphrey's rule	Product two highest loadings exceeds twice SE (≥0.28)	3
Scree test	Scree plot slope changes	3

Table D.5: Unrotated factor matrix

P	F1	F2	F3	F4	F5	F6	F7	F8
1	0,6278	0,3262	-0,1342	0,0974	-0,2249	0,3409	0,1142	-0,1627
2	0,2712	0,3182	0,3944	-0,2956	-0,5129	-0,1658	0,2281	0,0012
3	0,3854	0,6126	-0,0282	-0,3845	0,3190	0,0599	0,0171	0,1140
4	0,5903	0,1885	-0,0790	0,0646	0,2138	0,0876	0,2991	-0,2646
5	0,7517	-0,2909	-0,1716	0,0288	-0,0667	0,2071	0,0683	-0,0574
6	0,1695	0,5857	0,1827	0,0132	0,2926	-0,1547	-0,3235	-0,1650
7	0,6473	0,1227	0,1740	0,1420	0,1067	-0,3271	0,2084	-0,0874
8	0,3825	0,4452	-0,2695	0,0903	0,1482	-0,1748	-0,2170	-0,1059
9	-0,0653	0,5641	0,2927	0,0290	0,1377	0,2802	-0,0221	0,4466
10	0,8466	0,0781	0,1312	-0,0353	0,0948	-0,0676	0,1419	-0,0998
11	0,1663	0,4273	0,2055	-0,1170	0,5523	0,1887	0,2342	-0,0455
12	0,7042	-0,3244	-0,2154	0,0756	-0,0725	-0,1198	0,2001	0,1079
13	0,3328	0,5962	-0,0824	-0,1462	-0,1786	0,1225	0,1409	0,3800
14	0,3662	0,5328	-0,1061	0,4672	-0,1735	-0,0821	0,0749	-0,2826
15	0,6633	0,0110	0,0469	-0,2518	-0,0670	0,4536	0,1475	0,0836
16	0,6457	-0,5219	-0,0665	-0,0308	0,1997	0,0249	-0,0845	0,0456
17	-0,2356	0,8001	0,0701	0,0316	0,0405	-0,2027	0,0487	0,0353
18	0,2802	0,5755	-0,1828	-0,3061	-0,0398	-0,1748	-0,1555	0,0377
19	0,6594	-0,1768	0,1349	-0,0528	-0,2737	0,3345	0,0120	-0,1822
20	0,7296	-0,1957	-0,0452	0,1029	-0,0126	-0,0915	0,2382	0,2268
21	0,6881	-0,1550	0,0897	-0,3170	-0,1646	0,0449	-0,0311	-0,2349
22	0,7771	0,1265	-0,2036	0,1050	0,1051	-0,2530	-0,0893	0,0814
23	0,7289	-0,3320	0,2224	-0,0179	0,1881	0,0822	-0,1135	-0,0436
24	-0,2369	0,3478	-0,4527	-0,1992	-0,0985	-0,2463	-0,1397	0,0324
25	0,7902	-0,2711	-0,0432	-0,1287	0,0692	-0,0961	-0,0995	-0,1602
26	0,5118	0,1632	0,4373	-0,3924	-0,1336	0,0348	0,0121	-0,0518
27	0,2487	0,6829	-0,0552	-0,1323	-0,2315	0,0183	-0,2898	0,1849
28	0,5550	-0,2340	-0,0793	0,3783	-0,1096	0,1918	-0,1378	0,2229
29	0,5303	0,1511	0,2871	0,0432	-0,1026	-0,4866	0,2186	0,1643
30	0,8121	-0,2250	0,0070	0,0125	0,0848	-0,1139	-0,0383	-0,1616
31	0,2961	0,5357	-0,4168	0,1269	-0,0785	-0,0876	0,3936	-0,0161
32	0,7518	0,2155	-0,2534	-0,0089	0,3161	0,0379	-0,1247	-0,0021
33	0,6997	0,2673	-0,3155	-0,1176	-0,1687	-0,0770	-0,0475	0,1182
34	0,7771	-0,3928	-0,1996	-0,0494	-0,1077	-0,1016	0,0719	0,0798
35	0,7191	0,0210	0,0292	-0,3838	0,0185	-0,0056	-0,1339	-0,1288
36	0,1689	0,5319	0,3933	0,3682	0,2288	0,0215	0,0165	-0,1530
37	0,3544	0,1393	0,4625	0,2875	-0,3745	0,0835	-0,1460	0,0620
38	0,6277	-0,1813	-0,1422	0,2358	0,2785	0,2362	-0,0321	0,2902
39	0,7140	-0,1323	0,1479	0,0299	-0,0187	-0,2302	-0,0824	-0,0221
40	0,6382	-0,1619	-0,0103	0,3625	-0,2148	-0,1989	-0,1638	0,1616
41	0,6342	-0,2062	0,2044	-0,0516	-0,0785	-0,0393	-0,4089	0,0267
42	0,4488	0,5802	0,0690	0,3086	0,0286	0,2802	-0,0823	-0,0354
43	0,6351	0,1997	0,2770	0,2329	-0,0798	-0,0209	-0,0709	0,0202
44	0,2972	0,4460	-0,4277	0,0043	-0,3154	0,3140	-0,1182	-0,2346
45	0,6894	-0,3827	0,0078	-0,1580	0,1049	-0,1107	0,0874	0,1494
46	0,7467	-0,0829	-0,0137	-0,0750	0,2470	0,0510	-0,0464	0,1060

Step 3: Factor rotation

After Varimax rotation, the 3-factor solution with factors loadings presented in Table D.8 was the result. All significant factor loadings ≥ 0.36 (for $p = 0.01$) are highlighted in green. The KADE program automatically flagged the highest significant loading in case a Q sort loaded onto two factors. This loading is indicated in bold. In short, all respondents loaded significantly on at least one factor. It can furthermore be observed that factor 1 is a bipolar factor, as it has one negative correlation. Since the corresponding Q sort 17 loaded significantly onto more than one factor, even after the procedure described below, this factor was however not split. Moreover, it would result in a factor that had only one significant loading, so it would not be included anyway.

Step 4: Check factor loadings

The factor loadings matrix was then checked in more detail on two aspects, namely 1) non-significant factor loadings, when a Q sort does not load onto any factors, and 2) confounded loadings, when a Q sort loads onto two or more factors. The procedure is described below and its findings are summarised in Table D.6.

First, zero non-significant loadings were observed. Second, multiple confounded loadings were observed. The factors loadings of each Q sort were analysed, by hand, on whether they loaded significantly onto another factor as well. In total, 14 Q sorts loaded onto more than one factor at the significance threshold of 0.36. By deselecting them, those Q sorts are not represented in the final factor array and interpretation, but the highest possible number of Q sorts is desired for this. On the other side, keeping those Q sorts can cause unnecessary high correlations between the three factors, which is undesired. The solution often is increasing the significance threshold to decrease confounded loadings, however, making it too high results in more non-significant factor loadings, which is also undesired. Hence, an optimum in this was searched for by increasing the significance threshold step by step.

Step-by-step procedure

1. First the significance threshold was set at 0.37. Hence, Q sort 10 had only one significant loading instead of two. This resulted in 13 confounded factor loadings and still all factors loaded onto one factor, so no insignificant loadings.

2. Then, the significance threshold was set at 0.38. Q sort 3 and 7 now only loaded significantly onto one factor. There were 11 confounded factor loadings remaining. Still, there were no insignificant loadings resulting from this.

3. The threshold was then increased to 0.39. Q sorts 4 and 26 were then only significantly loading onto one factor. Besides, Q sort 17 now has two instead of three significant loadings. After this, there were 9 confounded factor loadings left. Still, there are no insignificant loadings.

4. Increasing the threshold to 0.40 and 0.41 did not result in any improvement, but one final increase to a threshold of 0.42 was done. This resulted in Q sort 29 and 6 to load onto one factor only. However, it must be noted that their only significant factor loading is close to their second highest, insignificant factor loading. The result now was 7 Q sorts loading onto more than one factor.

5. Finally, the threshold was increased to 0.43. However, this was the turning point, since this caused no improvement in confounded loadings and it resulted in one insignificant factor loading, for Q sort 11. This was undesired and therefore the final optimal significance threshold was set at 0.42.

Table D.6: Factor loading evaluation procedure

Significance value	Confounded loadings	Non-significant loadings
0.36	14	0
0.37	13	0
0.38	11	0
0.39	9	0
0.40	9	0
0.41	9	0
0.42	**7**	**0**
0.43	7	1

At the threshold of 0.42, all sorts loaded significantly onto one or more factors and there were 7 confounded loadings, which was considered the optimum. The final 3-factor solution for a significance thresheld of ≥ 0.42 is presented in table Table D.9. The significant factor loadings are highlighted in green, and corresponding Q sorts were flagged and associated with one of the three factors for the final interpretation. The Q sorts highlighted in grey with confounded loadings were unflagged (discarded) and not associated with any factor at all. It regards Q sorts 22, 32, 17, 33, 42, 1 and 43. After this analysis, 85% of respondents were accounted for in the final set of three factors.

The 3-factor solution has a 52% cumulative explained variance, which is acceptable for this type of research (UCLA, n.d.). The composite factor reliability of the factors is greater than 95% for each factor, as presented in Table D.7.

Table D.7: Composite reliability of the factors

	Factor 1	Factor 2	Factor 3
No. of loading Q sorts	22	9	8
Composite Reliability	0,989	0,973	0,97

Exploring 4- and 5-factor solutions

A four- and five-factor solution were also briefly explored, however, not chosen by the researcher based on several considerations.

Firstly, extracting a fourth factor added relatively little explained variance to the total solution. This could be seen when giving the fourth factor a substantive look; both ends of the final factor array generally overlapped with the already existing third factor. Hence, it was decided it did not bring about an entirely different view than the already existing factors. Secondly, only two persons loaded significantly on the fourth factor, therewith mainly decreasing the number of defining persons on the existing third factor to four, which resulted in a composite reliability of the third and fourth factor that was below the desired 95%. This solution was not chosen.

Regarding a five-factor solution, this in turn also added relatively little to the total explained variance of the four-factor solution. Moreover, the third and fourth factor only had two significant loadings, resulting in a composite reliability well below 95%, and also had only few characteristic distinguishing statements, showing relatively much overlap. This was considered less desired. Regarding the fifth factor, it had four significant loadings and therewith a higher composite reliability. This factor seemed more vocal on several aspects that the initial third factor of the three-factor

solution was more moderate about. Nevertheless, despite the fifth factor being relatively acceptable, the less preferred third and fourth factor led to the five-factor solution not being considered as the optimal one. On top of this, the KADE software does not allow specifically choosing by hand which factors to extract from a solution. Therefore it was eventually decided to extract the three-factor solution to have as much confidence in the interpretation as possible, in the researcher's opinion.

Table D.8: Factor loadings for initial 3-factor solution

P	Factor 1	Factor 2	Factor 3
34	**0,88**	0,06	-0,16
25	**0,83**	0,07	0,03
30	**0,83**	0,09	0,10
5	**0,81**	0,12	-0,09
16	**0,81**	-0,15	-0,15
23	**0,79**	-0,14	0,21
45	**0,79**	-0,07	0,00
12	**0,78**	0,10	-0,16
20	**0,75**	0,11	0,05
10	**0,73**	0,27	0,36
46	**0,71**	0,19	0,14
39	**0,70**	0,05	0,24
21	**0,69**	0,06	0,17
19	**0,67**	0,01	0,19
22	**0,66**	0,46	0,09
41	**0,65**	-0,06	0,23
38	**0,65**	0,14	-0,05
40	**0,65**	0,09	0,08
35	**0,64**	0,24	0,22
28	**0,60**	0,05	-0,04
32	**0,60**	0,55	0,08
15	**0,60**	0,20	0,21
17	**-0,55**	0,50	0,39
7	**0,53**	0,21	0,37
4	**0,46**	0,38	0,18
31	0,06	**0,74**	-0,01
44	0,10	**0,68**	-0,06
27	-0,05	**0,64**	0,35
18	0,02	**0,63**	0,20
8	0,17	**0,62**	0,09
3	0,10	**0,61**	0,37
13	0,06	**0,61**	0,31
33	0,54	**0,61**	0,04
14	0,12	**0,59**	0,26
42	0,17	**0,56**	0,45
1	0,44	**0,53**	0,21
24	-0,34	**0,44**	-0,27
36	-0,08	0,25	**0,63**
26	0,38	0,05	**0,58**
2	0,10	0,12	**0,55**
37	0,25	-0,03	**0,54**
9	-0,30	0,25	**0,50**
43	0,49	0,21	**0,49**
6	-0,09	0,41	**0,48**
29	0,41	0,13	**0,45**
11	-0,03	0,27	**0,42**

Table D.9: Factor loadings for final 3-factor solution

P	Factor 1	Factor 2	Factor 3
34	0,88	0,06	-0,16
25	0,83	0,07	0,03
30	0,83	0,09	0,10
5	0,81	0,12	-0,09
16	0,81	-0,15	-0,15
23	0,79	-0,14	0,21
45	0,79	-0,07	0,00
12	0,78	0,10	-0,16
20	0,75	0,11	0,05
10	0,73	0,27	0,36
46	0,71	0,19	0,14
39	0,70	0,05	0,24
21	0,69	0,06	0,17
19	0,67	0,01	0,19
22	0,66	0,46	0,09
41	0,65	-0,06	0,23
38	0,65	0,14	-0,05
40	0,65	0,09	0,08
35	0,64	0,24	0,22
28	0,60	0,05	-0,04
32	0,60	0,55	0,08
15	0,60	0,20	0,21
17	-0,55	0,50	0,39
7	0,53	0,21	0,37
4	0,46	0,38	0,18
31	0,06	0,74	-0,01
44	0,10	0,68	-0,06
27	-0,05	0,64	0,35
18	0,02	0,63	0,20
8	0,17	0,62	0,09
3	0,10	0,61	0,37
13	0,06	0,61	0,31
33	0,54	0,61	0,04
14	0,12	0,59	0,26
42	0,17	0,56	0,45
1	0,44	0,53	0,21
24	-0,34	0,44	-0,27
36	-0,08	0,25	0,63
26	0,38	0,05	0,58
2	0,10	0,12	0,55
37	0,25	-0,03	0,54
9	-0,30	0,25	0,50
43	0,49	0,21	0,49
6	-0,09	0,41	0,48
29	0,41	0,13	0,45
11	-0,03	0,27	0,42

D.3. Factor interpretation

The Table D.10 shows the original set of statements in Dutch that was presented to the respondents, including the factor scores and Q sort values.

Table D.10: Factor scores with corresponding Q-sort values

No.	Statement	Factor 1		Factor 2		Factor 3	
		Z-score	Q-SV	Z-score	Q-SV	Z-score	Q-SV
1	Vliegen is een fijne manier van reizen.	-0,6	-2	0,7	1	0,5	1
2	Vliegschaamte vind ik overdreven, er zijn wel andere dingen waarvoor we ons kunnen schamen.	-1,1	-3	1,6	4	0,5	2
3	Vliegen is noodzakelijk kwaad.	-0,9	-2	-0,4	-1	-0,5	-1
4	Vliegen is noodzakelijk voor zakelijke doeleinden.	-0,5	-2	-0,8	-2	2,1	5
5	Vliegen is noodzakelijk om op vakantie te kunnen gaan.	-1,7	-4	-1,6	-4	-2,3	-5
6	Voor mij hoort vliegen bij het vakantiegevoel.	-1,6	-3	-0,7	-1	-1,3	-3
7	Vliegen is een efficiënte vervoerswijze ten opzichte van de alternatieven.	-0,4	-1	1,1	3	-0,1	-1
8	Mijn voorkeur gaat uit naar vliegen, ook al zijn er alternatieven voor de vliegreis.	-1,6	-3	0,0	0	-0,8	-2
9	Vliegen is te verantwoorden als ik reëel gezien niet op een andere manier op mijn bestemming kan komen.	0,6	1	1,1	2	1,9	4
10	De CO2-uitstoot van vliegen is niet problematisch.	-1,9	-4	-0,8	-1	-1,5	-4
11	Ik zie geen aanleiding en noodzaak om minder te vliegen, ik leef tenslotte maar één keer.	-1,9	-5	0,1	0	0,0	0
12	Zolang we goed nadenken over de keuze om te vliegen, moeten we altijd kunnen vliegen.	0,0	0	1,0	2	1,4	3
13	Stoppen met vliegen, dat zie ik mezelf niet doen in de nabije toekomst	-0,6	-2	1,5	4	1,9	4
14	Door te vliegen is het mogelijk mijn blik op de wereld verbreden.	0,0	0	0,7	1	0,3	1
15	Vliegen is vooral praktisch om op een verre bestemming te komen.	0,8	2	1,6	5	1,8	4
16	Het is fijn dat vliegen zo makkelijk en betaalbaar kan.	-0,7	-2	0,7	2	-0,1	0
17	Het is belangrijk voor de economie en maatschappij dat er goede luchtverbindingen zijn.	0,1	0	1,6	4	2,1	5
18	Als consument moeten we verantwoordelijkheid nemen in het aanpassen van ons eigen vlieggedrag.	0,9	3	0,1	0	0,4	1
19	Werkgevers moeten vliegen ontmoedigen en duurzaam reizen stimuleren met hun reisbeleid.	1,2	4	0,6	1	0,1	1
20	Schiphol moet vooral een netwerkrol hebben voor zakelijke vluchten naar internationale bestemmingen, in plaats van vakantievluchten.	-0,3	-1	-1,1	-3	-0,1	-1
21	De luchtvaartsector moet meer innoveren.	1,0	3	1,2	3	0,3	1
22	De overheid moet de vliegtaks of verplichte CO2-compensatie invoeren.	1,6	5	1,2	3	-1,1	-3
23	Voor korte reizen binnen Europa is vliegen onnodig, de trein moet hier de standaard worden.	1,8	5	1,1	2	-0,5	-1
24	Het is onterecht dat de verduurzaming van luchtvaart een hoofdthema is binnen het klimaatbeleid.	-1,6	-4	-1,3	-3	-0,7	-2
25	Het is onnodig om de groei van de Nederlandse luchtvaart tot een halt te roepen.	-1,3	-3	0,1	1	0,2	1
26	Vijf jaar geleden stapte ik onbevangen het vliegtuig in, nu ervaar ik meer vervelende gevoelens als ik vlieg.	0,1	0	-1,3	-4	-1,6	-4
27	Ik kijk nu kritischer naar of het nodig is dat ik ga vliegen dan vijf jaar geleden.	1,2	3	-1,6	-5	0,4	1
28	Vliegen voor zakelijke doeleinden is nu minder normaal dan vijf jaar geleden.	0,1	0	1,5	3	-0,1	-1
29	Vliegen voor vrijetijdsdoeleinden is nu minder normaal dan vijf jaar geleden.	0,0	-1	-0,1	0	0,9	3
30	Langer reizen of meer betalen voor een alternatief voor vliegen is voor mij minder problematisch dan vijf jaar geleden.	0,7	1	-0,3	-1	-1,4	-4
31	Mijn vliegreizen zijn steeds moeilijker te verantwoorden vergeleken met vijf jaar geleden.	0,1	0	-1,3	-4	-1,2	-3
32	Ik overweeg nu beter de verschillende opties voordat ik een vlucht boek vergeleken met vijf jaar geleden.	1,5	4	-0,9	-2	0,5	2
33	Mijn zorgen over de milieu-impact van vliegen zijn groter dan vijf jaar geleden.	1,0	3	-0,9	-2	0,0	0
34	Mijn bereidheid om minder vaak te vliegen is groter dan vijf jaar geleden.	0,7	1	-0,7	-1	0,0	0
35	Als mijn reisgezelschap kiest voor vliegen, zal ik nu sneller een andere keuze maken dan vijf jaar geleden.	0,2	1	-1,1	-3	-0,6	-1
36	Ik ben nu positiever over een hogere belasting op vliegtickets dan vijf jaar geleden.	0,9	2	0,4	1	-0,7	-2
37	Nu ben ik eerder bereid om de CO2-uitstoot van een vlucht te compenseren dan vijf jaar geleden.	0,8	2	-0,2	0	-0,8	-2
38	Vliegen is een andere rol gaan spelen in mijn leven.	0,3	1	-1,0	-2	-0,3	-1
39	Door de coronapandemie is een vliegreis maken nu meer gedoe dan vijf jaar geleden.	-0,3	-1	0,5	1	0,7	2
40	Door de coronapandemie weten we dat we ook goed online kunnen communiceren.	0,8	2	1,9	5	0,6	2
41	Door de coronapandemie weet ik dat een vrijetijdsbesteding zonder te vliegen ook leuk is.	0,1	0	0,0	0	0,0	0
42	De alternatieven voor vliegen zijn aantrekkelijker geworden.	0,2	0	-0,7	-1	-0,8	-3
43	Ik heb fijne ervaring opgedaan met de trein of auto als alternatief voor het vliegtuig.	0,7	1	-0,4	-1	0,8	3
44	Door de coronapandemie ben ik me nu bewuster van de gezondheidsrisico's van vliegreizen dan vijf jaar geleden.	-0,3	-1	-1,6	-5	0,0	0
45	Vliegreizen maken heeft een aanzienlijk toeristisch belang.	-0,3	-1	0,8	2	0,5	2
46	Doordat ik de gevolgen nu meer zie en hoor om me heen, ben ik me bewuster van het klimaatprobleem dan vijf jaar geleden.	0,9	2	0,1	1	0,0	0
47	De negatieve gevolgen van dat iedereen zo makkelijk over de wereld vliegt, zie ik nu meer dan vijf jaar geleden.	0,7	1	-1,0	-3	0,8	3
48	Dat mensen (bijv. familie, rolmodel) minder zijn gaan vliegen of zijn gestopt, heeft mij aan het denken gezet.	-0,2	-1	-0,9	-2	-1,6	-5
49	Ik ben me nu bewuster van mijn keuzes en verantwoordelijkheid als consument dan vijf jaar geleden.	1,3	4	-0,1	0	0,0	0
50	Na de ontwikkelingen van afgelopen jaren heb ik inmiddels wel genoeg van het klimaatgeneuzel.	-2,1	-5	-0,3	0	-0,7	-2

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