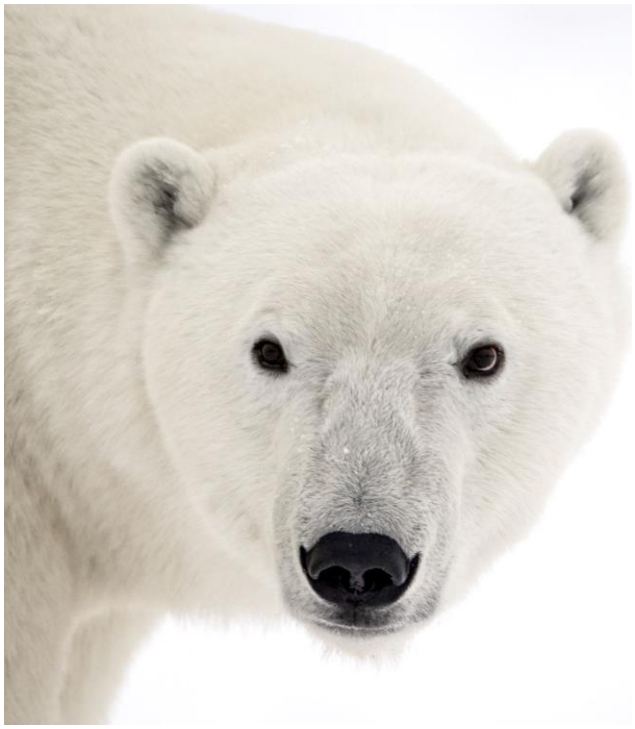


CLIMATE CHANGE COMMUNICATION: THE ROLE OF DOCUMENTARIES

Research Projects in Science Communication

Marloes Bodegom
m.j.l.bodegom@student.rug.nl

Contents

Abstract

Climate change is a problem that grows increasingly more urgent, raising the importance of effective communication on this issue. How do the media through which climate change is communicated impact the effect on an audience and their willingness to combat the issue? Some studies suggest the nature documentary genre may be a promising means for spreading climate change awareness, yet more research has to be done on this topic. This research project builds upon existing research regarding climate change communication strategies, the effectiveness of documentaries and the impact of imagery to help fill the gap in knowledge with regards to the effectiveness of nature documentaries on one's stance towards climate change.

The aim of this research is to investigate the impact nature documentaries might have on people's views about climate change. This is done via an experimental survey that was spread online amongst mainly residents of the Netherlands. An analysis of the data gathered for the pretest (n=58) shows that climate change concern, self-efficacy and climate change related behavioural intention are positively correlated with each other and that the average value of these variables appears to have risen over the years, based on a comparison with earlier studies. Analysis of the data from the experiment implies that nature documentaries may increase one's climate change concern, self-efficacy and climate change related behavioural intention yet explicitly addressing climate change in those fragments lessens this increase, however due to the small sample size for the experiment (n=36) this can not be concluded with certainty. Further research into the effect of nature documentaries on one's climate change attitude may be promising.

Keywords: climate change, nature documentary, self-efficacy, behavioral intention, survey experiment

Introduction & literature review

From rising temperatures causing rising sea levels to shifting weather patterns that threaten global food production, according to the United Nations (z.d.) climate change is one of the most defining issues of our time. We are currently reaching the point where, if no drastic action is taken, irreversible changes will occur in major ecosystems and the planetary climate system (UN, z.d.). According to NASA (2022), the effects of human-cost climate change we experience today will worsen in the upcoming decade and are irreversible within the timescale of people alive today. To mitigate these effects, action has to be taken. This is something to which not only governments or large industries can contribute: there are impactful measures like reducing food waste, saving energy and buying the sustainable equivalent of products, that individuals can take (Ripple et al. 2017). In this research the role nature documentaries play to encourage individuals to take measures against climate change is investigated.

Currently there is a gap in existing research with regards to climate change communication through nature documentaries. Earlier research has shown that nature documentaries might be an effective means to communicate about climate change but the way in which this best can be done is still up for debate. Using a survey experiment this research will investigate whether nature documentary fragments and whether addressing climate change explicitly in a nature documentary fragment increases or decreases climate change concern, behavioral intention and self-efficacy. Thus aiming to contribute to the gap in existing research.

In 2018, a discussion arose in the newspaper Guardian on the way nature documentaries address climate change. Should the documentaries fully depict the devastating effects climate change has on species and their habitats or is a more subtle approach more effective? On the one side, columnist George Monbiot blames the nature documentaries of BBC for depicting an idealized ‘pristine living world’, cultivating complacency with the status quo rather than motivating people to take action to combat ecological collapse (Monbiot, 2018). Yet on the other side, nature documentary narrator David Attenborough claims that ‘repeated warnings about human destruction of the natural world can be a “turn-off” for viewers’ (Watts, 2018). Although some documentaries do contain remarks on climate change and ecological collapse (like ‘95% of tigers have disappeared in the last century’) and they all carry a conservationist message, Attenborough points out that nature documentaries are also meant to offer some relief for viewers who are already confronted with a lot of grim news on tv. From this point of view, the audience of nature documentaries is not looking for or necessarily open to climate change activist remarks in nature documentaries.

If we follow Monbiot’s viewpoint, explicitly addressing climate change will increase viewers’ concern about climate change and their willingness to mitigate it; yet if we follow Attenborough’s than there will be a better effect if climate change is not highlighted in the documentary. In this research we will use an experiment with two nature documentary fragments (and one control group) in which one fragment does and the other does not explicitly address climate change to determine the effect of explicitly addressing climate change on people’s concern about climate change, intention to mitigate climate change and their self-efficacy.

Climate change in the media

Climate change is a global problem that grows more urgent by the day, the public can learn about it through a wide range of media outlets, including documentaries. There is much existing research on the effects of ways in which climate change is communicated to the public. But most is centred on an

American audience and little focusses on documentaries. Previous research findings indicate that watching documentaries, like *An Inconvenient Truth* (2006), can make people feel more concerned, motivated to mitigate and aware of climate change for a short while (Sakellari, 2014).

Climate change is a common topic for television, yet studies show it can be presented in a more effective way. For example Debrett (2015) concluded that climate science on television needs to be better contextualized for the public. Lin (2013) mentioned a similar viewpoint. Hart and Feldman (2014) investigated how climate change is conveyed on the US network television news and indicate that often the threat climate change poses stands central. Sakellari (2014) showed that framing climate change in a fearful way is, however, not effective when aiming to motivate people to start combating climate change. Instead, an engaging narrative that makes people feel as if they are actively witnessing climate change, will yield better results (Lam & Tegelberg, 2019). The purpose of the nature documentary genre is to both entertain and inform, making it suitable to create a story that is both engaging yet capable of conveying a scientific message. Supporting these findings, Bieniek-Tobasco et al. (2020) found that exposure to a climate change documentary series can affect people's beliefs about the risks and ability to do something about climate change through narrative transportation.

Quantitative studies about people's willingness to take action against and concern about climate change have been done before for several media types. Chu and Yang (2019) investigated the effect of psychological distance and trait empathy in relation to climate change concern through a set of two texts where the location differs. Duan et al. (2021) examined whether the concreteness of climate change images is a relevant factor to concern.

Yeo et al. (2018) showed that the spokesperson in a documentary can impact the likelihood of people engaging in information gathering, exchanging and promoting of the documentaries' topic, a famous politician was more effective than a relatively unfamiliar scientist. Moreno-Tarín et al. (2021) showed that there are also famous animals in climate science communication. Polar bears and penguins are the most common examples. Especially in climate change cartoons there appears to be a lack of diversity and animals may be placed in the wrong scenery leading to misconceptions (Moreno-Tarín et al. 2021). Nature documentaries do not have this last problem, but are not unfamiliar to polar bears on melting ice caps and thus may be a promising medium to use when investigating whether the familiarity with shown animals as climate change icons will stimulate engagement similar to the way a famous person does.

The nature documentary genre

A documentary is a type of non-fiction film, which is based on truth and reality. According to Saunders, (2010), documentaries are a medium that can be spread via multiple platforms and can satisfy both an audience's need for knowledge, political insights and social engagement as well as the need for entertainment. It thus has potential as medium to inform an audience in an engaging manner about a scientific topic. One subgenre of the documentary that focusses on a scientific topic is the nature documentary. In nature documentaries the topic is centred around non-human life form, often animals, in their natural habitat. Examples include *The Blue Planet (2001)*, *Insectia (1999)* and *Wild Russia (2009)*.

As discussed by Jones et al. (2019), there are mechanisms in which nature documentaries may have a positive impact on conservation of nature; it for example has been shown that nature documentaries increase environmental sensitivity to the species they portray. Nature documentaries typically show nature as pristine, using camera angles that avoid showing any sign of humans, and tell a story of nature's grandeur. They often have a main focus on a message of hope, which in combination with the engaging

storytelling and techniques used, appeals to a wide and large audience. This means that a potential message of the nature documentary reaches a lot of people, making it an appropriate approach for delivering messages on climate change (Jones et al. 2019).

Jones et al. (2019) argued how documentaries can be valuable in theory, yet stress that the practical effect of nature documentaries is still not well understood and needs further research, like experimental studies on the impact of exposure to a documentary on relatively easily measured outcomes.

Thus, currently literature stresses the importance of climate change communication and highlights the role documentaries and storytelling can play to do this effectively. There is, however, a gap in existing literature when it comes to the effectiveness of imagery in documentaries. Specifically, there is little research done on the impact nature documentaries might have, whilst this genre seems promising as nature documentaries appeal to a broad audience. To illustrate, Netflix nature documentary series *Blue Planet* was watched by 100 million households within its first two years of release (Moore, 2021).

People's views about climate change in the Netherlands

The Netherlands can still take action to mitigate climate change on both a governmental and individual scale. According to the CBS (2021a), only 10% of the energy consumption in the Netherlands is from renewable sources. Additionally the CBS shows that where around 70% of the Dutch choose to wear a sweater rather than turn up the heater, only 1/3rd avoids using the car for trips shorter than 5 kilometres. 58% of the Dutch think they should adopt a more sustainable lifestyle (CBS, 2021b). On average, the behaviour of inhabitants of the Netherlands can become more sustainable, making it an interesting target audience for this experimental survey.

In this research the target audience consists of inhabitants of the Netherlands. On average the Dutch population sees climate change as a problem that needs to be tackled. Ninety-four percent of the Dutch population believes the climate is changing, 60% thinks this is mainly due to humanity and 75% thinks humanity can still do something to mitigate climate change (CBS, 2021b).

Researching inhabitants of the Netherlands might yield results that would be similar to a case in which the European population in general is studied. In the European Social Survey, a survey amongst citizens of 23 European countries, the Netherlands scores fairly close to average on climate change concern and believes regarding the causes of climate change (ESS, 2018). An earlier global study regarding 33 countries does, however, report a positive correlation between a country's wealth and the perceived importance of climate change and a negative correlation with the perceived risk: in this study the Netherlands scored third lowest with respect to the perceived risk of climate change (Lo et al. 2015).

Importance

This study can possibly confirm the findings of previous studies, which are discussed in the chapter *Research Objectives* and might provide more insight into relationships between variables that differ between studies. Additionally, as the effects of climate change are becoming more and more apparent over time, this study can be compared to previous studies to see whether mean scores have changed over time. Are people more concerned about climate change now, compared to ten years ago? The study done by Broomell et al. (2015), which includes Dutch mean scores, has not been repeated recently yet, hence this research can make a contribution.

Research aim: *This research aims to establish the cause and effect between three different film fragments and one's willingness to mitigate and concern about climate change.*

Prediction pretest survey

The description of the measures *climate change concern*, *behavioural intention* and *self-efficacy* is given in the section *Research Design*.

Concern about climate change

The measure concern about climate change or climate change concern, measures how concerned respondents are about climate change and its effects. Spence et al. (2012) conducted a survey with a national representative sample of the population of Great Britain that aimed to explore the psychological distance of climate change people perceive. Spence et al. additionally examined how different aspects of the perceived distances relate to each other and concerns about climate change and sustainable behaviour intention. The questions used by Spence et al. (2012)to measure the concerns about climate change is also used in this project.

The sample of the study of Spence et al. (2012) consisted of 1822 people from Great Britain of which 52% female (48% male), a modal age bracket of 35-44, most people working full time (some part-time or retired), which they report to fit the most recent available demographic statistics for the Great Britain population at the time of the study. Spence et al. found a mean level of concern of 2.78 ± 0.77 on a four point scale, which they report as 'quite high'. In this research a 5-point scale is used, which result in a mean level of 3.48 ± 1.22 (as translated to a 5-point scale by Duan et al., 2021).

In the 10 years since the Spence et al. study, the effects of climate change are becoming more apparent, there is both more research on the topic (Lynas et al. 2021) and the effects, like higher temperatures, have continued to increase (UN, z.d.), making climate change more noticeable. There is likely less scepticism towards climate change as there is more evidence and the problem may be perceived as a more real threat. Spence et al. (2012) found that perceiving climate change more certain, raises the concern about climate change. Thus it is expected that compared to Spence et al. (2012), a higher mean value for climate change concern will be found in this project.

Behavioural Intention

Behavioural intention is defined as *respondents' intention to take action to address the negative effects of global climate change* (Heath & Gifford, 2006). Heath and Gifford conducted a survey with a sample of 185 Canadians, aiming to investigate the effect one's ideology could have on one's environmental views. Their sample consists of Canadian aged 18-88 with an average age of 51.4 of which 50.5% are female and 73% has completed university or college education. Their survey included questions on behavioural intention which are also used in this project. Heath and Gifford found a mean behavioural intention of 3.33 ± 0.38.

As it is predicted that concern about climate change has increased over the years and concern appears be correlated to behavioural intention, it is expected that compared to Heath and Gifford (2006), a higher mean value for behavioural intention will be found.

Self-efficacy

Within the context of climate change communication research self-efficacy means someone's perceived or personal efficacy with regards to taking action against climate change (Kellstedt et al. 2008). In the same study mentioned for behavioural intention, Heath and Gifford (2006) also measured self-efficacy and found a mean of 3.23±0.77. They also found that self-efficacy and behavioural intention are positively correlated with each other. They theorized that before individuals are ready to act against climate change

(high behavioural intention), they must first belief their individual actions can make a meaningful difference (high self-efficacy) (Heath & Gifford, 2006).

Based on Duan et al. (2021) it is expected that people who score high on self-efficacy, will also score high on climate change concern and behavioural intention. This is supported by the findings of Heath and Gifford (2006), whose results suggest concern and self-efficacy are important prerequisites for willingness to take action. In a study where the relation between personal efficacy, risk perception of climate change and various demographic variables is explored, Kellstedt et al. (2008) found a positive correlation between self-efficacy and climate change concern as well. Their sample consisted of 1093 randomly selected adults in the United States of which 55.6% female, with an average age of 47.31 and approximately 37% with a college or post-graduate degree. Kellstedt et al. report that their sample was on average slightly older and higher educated compared to national U.S. Census figures.

Demographic variables

Heath and Gifford (2006) did not find strong correlations between age and self-efficacy or behavioural intention. Their results do show that gender might have a slight impact on self-efficacy. Kellstedt et al. (2008) found that age has a small yet statistically relevant effect on personal responsibility, which may impact self-efficacy: older respondents tend to feel more responsible for climate change than younger people. Kellstedt et al. (2008) found that gender impacts climate change concern.

Results for self-efficacy and behavioural intention in relation to the demographic variables gender, age and country, can be compared to the results of a large survey conducted by Broomell et al. (2015). The Dutch sample of the Broomell et al. study consists of 470 people. Broomell et al. found a mean value for self-efficacy of 3.09 ± 1.13. The *General Intention to Act* measure used by Broomell et al. is similar to the behavioural intention measure in this study. The mean general intention to act measured for the Netherlands is roughly 3.4, which is the third lowest mean out of the 25 countries which took part in the survey. Based on figure 1 in Broomell et al. (2015), one would expect residents of China to score higher on this measure than residents of Germany, who in turn score higher than residents of the UK, who score higher than residents of the Netherlands. Broomell et al. found that self-efficacy and behavioural intention are positively correlated.

Hypotheses

1.1 *a)* concern about climate change, behavioural intention and self-efficacy are positively correlated with each other and *b)* will have increased compared to studies of five or more years ago.
1.2 Residents of the Netherlands will on average score lower on self-efficacy and behavioural intention than residents of other countries.
1.3 Older respondents score higher on climate change concern than younger respondents.
1.4 Gender will not have a significant impact.

Prediction post-test

As substantiated in the introduction, the nature documentary genre is predicted to be a promising genre in increasing people's concern about climate change. Construal level theory, used by Chu and Yang (2019), Duan et al. (2021) and Moreno-Tarín et al. (2021), suggests that using animals that are alien to the local collective imagination will increase psychological distance, decreasing concern and willingness to mitigate climate change, and that directly connecting the fragment to climate change decreases the psychological distance. Thus a nature documentary fragment with polar bears, animals that are not alien

to the collective imagination, is predicted to increase concern as well as a fragment that explicitly addresses climate change.

Based on the examination of existing literature, the following research question and hypotheses were formulated:

Research question: What is the effect of nature documentaries on people's concern about and willingness to mitigate climate change and does explicitly addressing the issue affect this?

Hypotheses

2.1 Explicitly addressing climate change increases people's *a)* climate change concern, *b)* behavioural intention and *c)* self-efficacy.

2.2 Nature documentaries increase people's *a)* climate change concern, *b)* behavioural intention and *c)* self-efficacy.

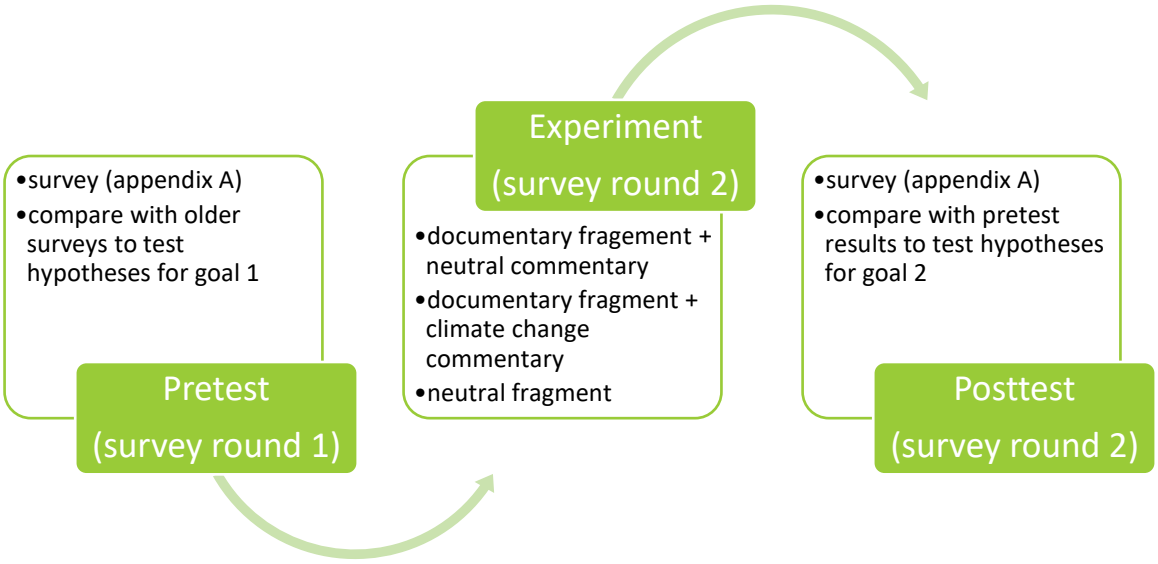
Research Design

Experimental survey

The method used in this research is a survey experiment. A survey experiment is an experiment embedded within a survey which is, in this case, administered online. According to Mize (2019) an experiment is a study in which the researcher controls the random assignment of participants to variations of the independent variable in order to observe their effects on a dependent variable. In this research the independent variables are 1. Being of the nature documentary genre and 2. Climate change being addressed in the narration; the dependent variables are climate change concern, behavioural intention and self-efficacy. The independent and dependent variables used in this study are further detailed in *Appendix A*. Figure 1 shows the set-up of the experiment used in this project.

Figure 1

A schematic overview of the experimental set-up



The main benefit of using a survey experiment is that they are very suitable for answering research questions that investigate a causal relationship. This is the case with this project that wonders whether nature documentaries and mentioning climate change *cause* people to be more concerned about climate change and more willing to take action against it. Another potential benefit of survey experiments in comparison to experiments is that a high external validity can be reached. This is, however, highly dependent on the sample size and characteristics. For example, in this research project the sample is unrepresentative of the entire population of the Netherlands, because there is a relative excess of people aged 20-29 and a lack of people aged 60-69 and to say something about the millions of people living in the Netherlands at a 95% confidence level, we would need a sample size of at least 384 people according to Denscombe (2017).

Mize (2019) mentions the following conditions for an experiment:

1. The independent variables must be able to be manipulated.

In this research project the video fragments shown to the audience differ, manipulating the independent variables. (Two are nature documentary fragments, the third is not and of the documentary fragments one explicitly addresses climate change and the other does not.)

2. Conditions should be as similar as possible on all aspects except of the independent variable of interest.

To try to achieve the conditions as similar as possible outside of the change in independent variable, the fragments were made to look (and sound) as similar as possible, see the section *Video fragments*. Additionally it was chosen to include a group that watch a control fragment (not a nature documentary or addressing climate change) rather than only compering the values of the dependent variables before and after watching nature documentary fragments, so that possible external factors (like a sudden spike in news items on climate change in between the two survey moments) will not affect the results.

Mize (2019) also stresses the importance of construct validity when designing experimental surveys. How well does the set of measures used actually represent the concepts they are meant to qualify? To investigate this for this study, the measure used are taken from validated surveys used in earlier research and the internal consistency of the measures is critically examined.

The measures

Climate change concern

The scale for measuring climate change concern from Spence et al. (2012) was used to assess respondent's concern about climate change. This scale contains a total of three items (e.g. *'Considering any potential effects of climate change which there might be on you personally, how concerned, if at all, are you about climate change?'*). Each item offers a 5-point response option, ranging from *not at all concerned* (1) to *very concerned* (5). The questions show good internal consistency (α=.83) in Spence et al.'s (2012) research (which uses a 4-point response option ranging from *not at all concerned* (1) to *very concerned* (4)).

Behavioural intention

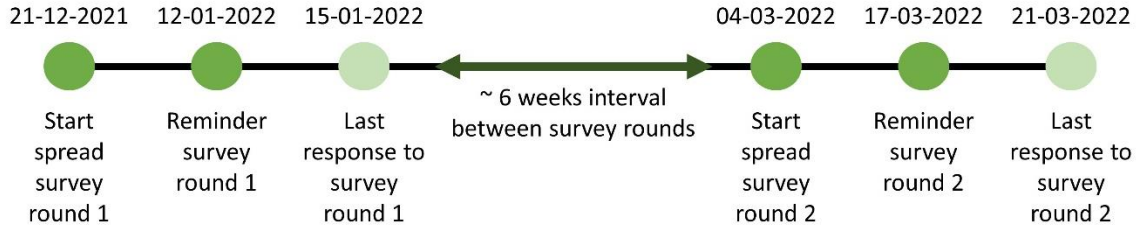
The scale for measuring behavioural intention taken from Heath and Gifford (2006) was used to measure respondent's *intention to take action to address the negative effects of global climate change* (definition used by Heath and Gifford, 2006). This scale contains a total of 4 items (e.g. '*I will make some efforts to mitigate the negative effects of global warming'*). Each item offers a 5-point response option, ranging from *strongly disagree* (1) to *strongly agree* (5). The questions show good internal consistency (α=.89) in Heath and Gifford's (2006) research.

Self-efficacy

The scale for measuring self-efficacy taken from Kellstedt et al. (2008) was used to measure respondent's perceived, aka personal, efficacy with regards to taking action against climate change. This scale contains a total of 3 items (e.g. '*Human beings are responsible for global warming and climate change.'*). Each item offers a 5-point response option, ranging from *strongly disagree* (1) to *strongly agree* (5). The questions show decent internal consistency (α=.64) in Kellstedt et al. (2008)'s research (which uses a 4-point response option ranging from *strongly disagree* (1) to *strongly agree* (4)).

Figure 2

A timeline of the spread of both rounds of the survey



Timeline

Figure 2 depicts the dates at which both the first and second survey round where spread, the moment a reminder was sent and the last date at which a response was received. Brown, et al. (2008) suggest to put an interval of 6 weeks between the pretest and the post-test. In this time participants will be able to forget the exact questions, thus avoiding that they might be bothered by the repetition. This appears to have been successful: a respondent revealed in a brief interview that they had not realised that the questions in both surveys were the same.

Participants

Due to the limited means available for this research, participants were selected via snowball sampling. Snowball sampling is a sampling technique where the sample emerges though a process of reference from one person to the next (Denscombe, M. 2017). The main benefit of this method is that it can be done for free. An invitation to fill out the questionnaire and to share the link with others was sent out in the author's network. The link was first shared in December 2021 and once again promoted in January 2022, which led to a total of 58 responses. Using a Latin Square Design, the participants were divided over the three fragments for the experiment, the groups are shown in appendix B. The links to the second survey where spread in March 2022 and after a reminder 36 responses in total were received. Tables 1, 2 and 3 provide an overview of the demographic characteristics of the participants of each survey.

Table 1

Demographic characteristics: gender

Survey Round	Respondents total	Female	Male	Other	Prefer not to say
Pretest	58	33	21	3	1
Post-test fragment 1	12	7	4	1	-
Post-test fragment 2	11	5	5	1	-
Post-test fragment 3	13	6	7	-	-

Table 2

Demographic characteristics: country of residency

Survey Round	Respondents total	Netherlands	Germany	United Kingdom	Hong Kong	Norway
Pretest	58	51	2	2	1	2
Post-test fragment 1	12	12	-	-	-	-
Post-test fragment 2	11	10	1	-	-	-
Post-test fragment 3	13	12	1	-	-	-

Table 3

Demographic characteristics: age

Survey Round	Respondents total	<20	20-29	30-39	40-49	50-59	60-69	70-79	80-89
Pretest	58	3	37	4	2	8	3	-	1
Post-test fragment 1	12	1	7	-	-	3	1	-	-

Post-test fragment 2	11	-	6	1	-	2	1	-	1
Post-test fragment 3	13	-	8	-	1	3	1	-	-

Figure 3

Demographic characteristics: English proficiency

Note. Number of respondents indicating *Strongly disagree* = 1, number of respondents indicating *Disagree* = 0.

In the pretest 58 people responded of which 33 female and 21 male. Out of the 58 respondents, 51 reside in the Netherlands. Most of the respondents (37 out of 58) are between 20 and 29 years old, the next largest age group was 50 to 59 years old (8 out of 58). Only one of the respondents disagreed with the statement *'I am confident in my ability to comprehend written English.'* Given that the participants were gathered using snowball sampling, the characteristics of this sample are to be expected. Most of the author's network consists of fellow students, who reside in the Netherlands, are in their twenties and follow their education in English. The age group of 50-59 years old being the second largest may be explained by this being the age category to which most of the parents (and the parent's network) of people aged 20-29 belong. The participants from Norway, Hong Kong and the United Kingdom may be people who have moved abroad or international acquaintances from people who further spread the survey. The people who do not reside in the Netherlands were spread evenly across the three post-test groups, yet the actual post-test respondent sample consists only of 2 respondents residing in Germany and all of the other respondents residing in the Netherlands. Looking at the largest two categories, the age distribution of the pretest and post-test groups remains similar, although the 20-29 category has grown smaller in relative size and the 50-59 category larger. The gender distribution of the pretest and post-test group 1 are very similar, yet in group 2 and 3 there are more male respondents than female respondents. Post-test group 3 is also the only group that does not have respondents who clicked the 'other'-option for gender.

Strictly speaking, the gender-question results in nominal data, there is no official order for each category. A way to tackle this is to assign the gender a number, like Kellstedt et. Al (2008), who include gender as a dichotomous variable where female = 0 and male = 1. It was chosen to use the same approach in this research. Data from respondents who answered *other* or *prefer not to say* was not included in the calculations, hence the sample size for correlations including gender is 54 instead of 58.

The survey

The survey is designed as a base measure before the experiment starts. In addition it can be used to measure whether people's attitude towards climate change has changed in comparison to earlier surveys or surveys conducted in different regions. Appendix A shows an overview of the questions used in the survey and the measured variables.

Adapting the questions

As some questions may be time and region specific or culturally sensitive, a pilot test was conducted in which 3 people provided feedback on the clarity of the questions. Based on this a few changes were made, which are included in Appendix A, and it was chosen to include a question where participants indicate their confidence in their English proficiency. The 3 people are a female science communication

student (age 20-30), a male international primary school teacher (age 20-30) and a male civil servant (age 50-60). The science communication student was chosen for the pilot test to gain feedback from someone who has some knowledge on conducting surveys. The primary school teacher and civil servant were chosen to gain feedback on the clarity of the questions from both someone who uses English on a daily basis and someone who does not have to use English for his occupation. Based on the interviews, the question *"I will make some efforts to mitigate the negative effects of global warming."* was changed to *"I will make some efforts to mitigate (to cause to become less harsh) the negative effects of global warming."*. Duan et al. (2021) uses measures from three different studies (Broomell et al., 2015; Brügger et al., 2016; Gifford & Comeau, 2011) to determine mitigation intention. Their measure includes various questions like "*I intend to choose a car that gets good gas mileage (this would reduce the purchase of trucks, vans, and Bronco type vehicles).*" and *"I intend to eat less meat."*, which may not make sense or be fully appropriate for the audience of this survey. As all interviewees indicated they did not know what was meant with "Bronco vehicles" and one of the interviewees indicated the questions on meat could be seen as offensive based on one's religious beliefs or that it is impossible to eat less meat if you already do not eat meat, it was chosen to avoid these questions altogether and only use the measure for behavioural intention provided by Broomell et al. (2015).

Ethical aspects

To ensure the privacy of the participants, the questionnaire is completed anonymously and only personal information relevant to the experiment is asked. This is done in a way that does not enable anyone to retrace responses to individuals, the dataset is anonymized and the version that contains identifiers is stored with password protection and not shared with any other parties. The privacy policy of Google Forms was also studied to ensure that it does not possibly endanger the protection of the data provided by the participants. Participation in the research is voluntary and participants are able to quit the questionnaire at any time. Any data collected is treated as confidential. The questionnaire starts with a message regarding participation and privacy, which is provided in appendix E. After which participants have to check a box confirming that they have read and understood the information above and agree to take part in the survey.

The questionnaire does not appear to concern topics that would require ethical approval, but care is taken that the research is set up in a way that protects the interests of the participants, stays within the law, avoids deception and operates with scientific integrity. Topics that may be sensitive, such as a participant's age or gender, have been made into optional questions: participants can choose to complete the survey without providing those variables.

The experiment

The experiment consists of three fragments which aim to measure whether watching a nature documentary fragment impact ones attitude towards climate change and whether explicitly addressing climate change in the nature documentary further increases factors like concern about climate change or not. To do so, 3 different fragments where used, which are further detailed in this section.

The effect of the documentary fragments on the aforementioned dependent variables is primarily measured through the survey. Two months after the first survey was spread, the survey with the fragments was spread amongst the participants. Each participant watches only one of the three fragments. The fragments are divided amongst the participants through a Latin Square Design (see appendix B, for details).

As external factors, like news about climate change, might impact people's attitude about climate change, some participants are assigned to a neutral non-climate change oriented film fragment, fragment 3.

Video fragments

During the experiment, participants were divided over three groups (N_1=19,N_2=20,N_3=19). Each group watched a different fragment before completing the questionnaire. Group 1 watched fragment 1 which is of the nature documentary genre but does not mention climate change explicitly. Group 2 watched fragment 2, which is of the nature documentary genre and which explicitly mentions that climate change poses a problem for certain animal species. Group 3 watched fragment 3, which is not a nature documentary but has similar colour scheme and background music compared to fragments 1 & 2. Group 3 serves as the control group. Comparing the results of groups 1&2 with group 3, hypotheses H1a,H1b&H1c are tested. By comparing the results of group 1 with group 2, hypotheses H2a,H2b&H2c are tested.

The narration of the fragments is done by an acquaintance of the author, who can be considered an anonymous narrator for most of the respondents. According to Yeo et al. (2018), using an anonymous narrator will result in a smaller intention to engage in information-related behaviours than when the narration was done by an authoritative source, like Al Gore in *An inconvenient Truth (2006)*. Determining up to what factor the results of this research would differ from a similar experiment with a well-known -and considered to be an expert- narrator is outside the scope of this research project.

The description of the video fragments and a transcript of the narration can be found in appendix D.

Results pretest survey

Results per question

The figures below (figure 4-6) show an overview of the results for the first survey. The questions can be found in Appendix A. Note that question 2.2 contributes to the measure in the opposite way compared to the other questions (meaning strongly disagreeing indicated a high behavioural intention and strongly agreeing to question 2.2 indicates a low behavioural intention).

Figure 4

Pretest results per question: Climate change concern

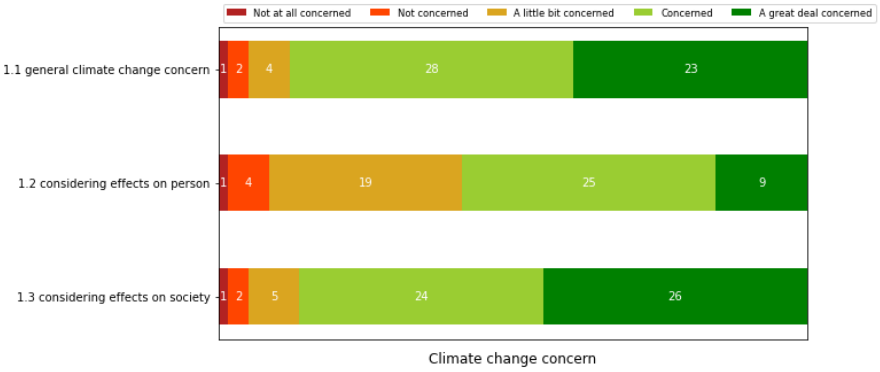


Figure 5

Pretest results per question: Behavioural intention

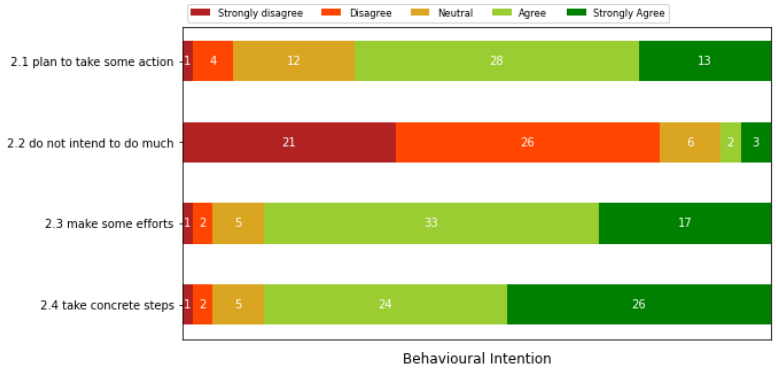
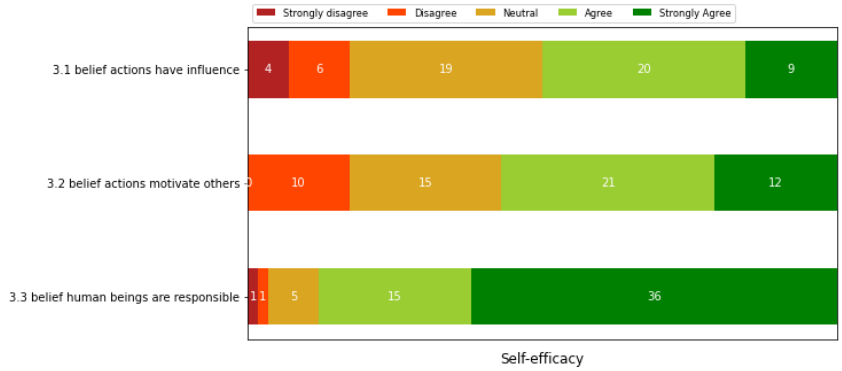


Figure 6

Pretest results per question: Self-efficacy



Mean values and uncertainties

Table 4 depicts the average values found for the three variables during the pretest, the standard error, Cronbach's alpha coefficient and skewness.

Table 4

Mean value and standard error of pretest

Measure	*Mean value and standard error*	*Cronbach's alpha*	*Skewness*
Climate change concern	4.03 ± 0.48	0.83	-1.43
Behavioural intention	3.92 ± 0.46	0.87	-1.30
Self-efficacy	3.82 ± 0.75	0.50	-0.23

The standard error is the uncertainty in the estimated mean and is computed as the square root of the sum of the standard deviations squared divided by the amount of responses. The difference in the standard error shown in table 1, is possibly attributable to the nature of the questions in measure three. Perhaps people might think human beings as a whole are the cause of climate change but not belief they as a person have anything to do with it, or vice versa, resulting in a mix of high (4-5) and low (1-2) scores, which cause a large standard deviation and thus a large standard error. The skewness of the measures were computed using *scipy.stats.skew*. The skew is negative in all cases and low for self-efficacy. the skewness is high for climate change concern and behavioural intention, meaning that compared to a normal distribution, the distribution has a tail to the left.

Correlations

To determine whether gender and age had an impact on one's climate change concern, behavioural intention and self-efficacy, the Pearson's correlation coefficient between the variables was computed (see table 5). The correlation was done manually as well as using *pingouin.corr* (Vallat, 2018) in Python.

Table 5

Correlations pretest

	r	n	p-value	<0.05, <0.01
gender and 1	-0.254	54	0.0640	No, no
gender and 2	0.169	54	0.221	No, no
gender and 3	-0.203	54	0.143	No, no
1 and 2	0.691	58	1.97e-9	Yes, yes
1 and 3	0.595	58	8.45e-7	Yes, yes
2 and 3	0.547	58	0.00001	Yes, yes
age and 1	0.0526	58	0.695	No, no
age and 2	0.0359	58	0.789	No, no
age and 3	-0.00491	58	0.971	No, no
English and 1	-0.0346	58	0.797	No, no
English and 2	-0.0752	58	0.575	No, no
English and 3	-0.147	58	0.273	No, no
gender and age	0.227	54	0.0990	No, no
gender and Eng.	-0.0684	54	0.624	No ,no
age and English	-0.297	58	0.0234	Yes, no

1 = Climate change concern 2 = Behavioural intention 3 = Self-efficacy

Results post-test survey

Cronbach's Alpha

Table 6 shows the Cronbach's alpha values computed for the responses in each of the groups used in the experiment, only including the data for respondents who completed both the first and second survey.

Table 6

Cronbach's alpha coefficients per group

	Cronbach's Alpha		
Group 1	**Climate Change Concern**	**Behavioural Intention**	**Self-efficacy**
Pretest	0,67	0,75	0,53
Post-test	0,42	0,90	0,45
Group 2			
Pretest	0,71	0,80	0,68
Post-test	0,71	0,78	0,80
Group 3			
Pretest	0,84	0,91	-0,01
Post-test	0,76	0,73	0,52

Note that the internal consistency for behavioural intention is acceptable or good for each of the groups. The internal consistency of climate change concern is acceptable in all cases except for the post-test of group 1. This means that one should be especially wary of how well the answers to the questions actually represent one's concern for climate change in this case. With regards to self-efficacy the internal consistency is acceptable for group 2 and poor in the other cases. Especially the pretest group 3

respondent's answers result in an extremely low Cronbach's alpha value. To verify that this extreme value is not do to some kind of error in the calculation, all of the Cronbach's alpha coefficients presented in this paper have been computed not only manually but also using two different Cronbach's alpha calculators[1].

Climate change concern

In this section and the upcoming two, the results of the experiment are shown. A description of the data of the pretest and post-test for each of the three groups per measure and question is provided in appendix C. The table (table 7-9) presented in each section shows the mean and standard deviation of the difference in the respondent's answers between the pretest and post-test. The difference is in this case defined as the response to the post-test survey minus the response to pretest-survey. As the uncertainty is large due to the limited amount of responses it was chosen to include the mean and standard deviation for each question separately as well.

Table 7

Differences in climate change concern before and after the experiment

Group 1: Climate Change Concern	Mean of difference	Standard Deviation of difference
Overall Measure	0.000	0.472
Question 1.1	0.000	0.409
Question 1.2	-0.25	1.09
Question 1.3	0.250	0.434
Group 2: Climate Change Concern	Mean of difference	Standard Deviation of difference
Overall Measure	-0.121	0.384
Question 1.1	0.091	0.288
Question 1.2	-0.182	0.936
Question 1.3	-0.273	0.617
Group 3: Climate Change Concern	Mean of difference	Standard Deviation of difference
Overall Measure	-0.359	0.562
Question 1.1	-0.462	0.634
Question 1.2	-0.462	0.843
Question 1.3	-0.154	0.949

The first thing one might notice is the large size of the standard deviation compared to the range of the differences, which could go from -4 to 4. In all cases the mean difference observed is of such a small size that 0.000 (meaning no difference is measured) falls within one standard deviation of the value. As was predicted in the R*esearch Design* section, this implies that either there is no difference between the situation before and after watching the fragments or that there is a difference but it is too small to measure with this 1-5 scale survey and that there is too little data to be able to say anything about this with sufficient certainty.

[1] The online Cronbach's alpha calculator's used are: https://datatab.net/statistics-calculator/reliability-analysis/cronbachs-alpha-calculator and https://www.statology.org/cronbachs-alpha-calculator/.

Behavioural intention

Table 8

Differences in behavioural intention before and after the experiment

Group 1: Behavioural Intention	Mean of difference	Standard Deviation of difference
Overall Measure	0.021	0.545
Question 2.1	-0.250	0.722
Question 2.2	0.25	1.02
Question 2.3	0.167	0.987
Question 2.4	-0.083	0.641
Group 2: Behavioural Intention	Mean of difference	Standard Deviation of difference
Overall Measure	-0.023	0.750
Question 2.1	0.000	0.853
Question 2.2	0.091	0.996
Question 2.3	-0.091	0.793
Question 2.4	-0.091	0.793
Group 3: Behavioural Intention	Mean of difference	Standard Deviation of difference
Overall Measure	0.019	0.475
Question 2.1	0.015	0.864
Question 2.2	0.000	0.680
Question 2.3	0.000	0.878
Question 2.4	-0.077	0.917

The results for behavioural intention suffer from the same problems with regard to large uncertainties as the previous measure. Notice also how 0.000, indicating no change, is within one standard deviation of the mean value for each of the questions in each of the three groups. The possible effect of the fragments is thus too small to be able to draw any conclusions given the current amount of data. Additionally which group experienced the most positive or negative change in behavioural intention differs between the questions.

Self-efficacy

Table 9

Differences in self-efficacy before and after the experiment

Group 1: Self-efficacy	Mean of difference	Standard Deviation of difference
Overall Measure	0.222	0.459
Question 2.1	0.500	0.646
Question 2.2	-0.25	1.02
Question 2.3	0.417	0.760
Group 2: Self-efficacy	Mean of difference	Standard Deviation of difference
Overall Measure	0.000	0.620
Question 2.1	-0.09	1.24
Question 2.2	0.000	0.739
Question 2.3	0.091	0.669
Group 3: Self-efficacy	Mean of difference	Standard Deviation of difference
Overall Measure	-0.231	0.561
Question 2.1	-0.38	1.28
Question 2.2	-0.308	0.606
Question 2.3	0.000	0.393

Once again the standard deviations are big and the measured mean effect is close to zero. This data set has an extremely poor internal consistency for group 3, which is partly due to the measure itself (see section *measures*) and mostly due to the small sample size.

Discussion

In this section the results presented in the previous section are interpreted and discussed. First there is a section on the general interpretation of the pretest results, after which the results are discussed in relation to the hypotheses formulated in the section *prediction pretest survey.* The discussion of the post-test is divided into an analysis of the results, including hypotheses, and a section with recommendations.

Pretest results discussion

The difference in distribution between question 2.2 (the reversed question) and the other questions indicates that there will likely not be many participants who did not actually read the questions when answering the survey.

Analysing the mean values presented in table 4, one finds that as hypothesized, the value for climate change concern, 4.03 ± 0.48, is higher compared to the value found by Spence et al. (2012) in 2012, 3.48 ± 1.22. Note, however, that due to the large error margin in the Spence et al. (2012) value, this is not fully certain. The value found for behavioural intention, 3.92 ± 0.46, is also higher than the value found by Heath et al. (2006), 3.23 ± 0.38, and the value found by Broomell et al. (2015): 3.43 ± 0.07. Notice how the mean value found in this study, 2022, is higher than the value found in the 2015 study which is higher than the 2006 value, indicating a possible rise in behavioural intentions throughout time. Additionally compared to Kellstedt et al. (2008) and Milfont et al. (2012), self-efficacy has risen, yet this rise is smaller compared to that found in the other two variables.

Based on the correlation computations shown in table 5, one can observe the following:

No statistically significant ($p<0.05$) correlations were found between gender, English proficiency or age and climate change concern, behavioural intention and self-efficacy.

A reason why the results for age are not statistically relevant might be that the majority of the participants, (37 out of 58), is between 20-29 years old, whilst the remaining 21 participants are spread amongst six other age categories, which may cause outliers in those age categories to have a big impact on the correlation. A study with more participants, who are distributed more evenly over the age categories will be more meaningful.

Three positive strong ($r>0.5$) and significant ($p<0.01$) correlations were found between climate change concern, behavioural intention and self-efficacy. This is in accordance with predictions based on literature and earlier surveys (for example Duan et al. 2021).

One can also see that age and self-reported English proficiency show a significant ($p<0.05$) moderate ($|r|<0.5$) negative correlation. This indicates that young people have scored their ability to comprehend English higher than older people. As this is a self-reported proficiency it may either indicate that younger people tend to be more confident in their English comprehension ability than older people or that they tend to be better at comprehending English.

Pretest hypotheses

Looking at the results and the hypotheses proposed in the section *Prediction Pretest Survey*, one can conclude that there is indeed an increase in concern about climate change, behavioural intention and self-efficacy compared to earlier studies. In confirmation with findings of earlier studies, in this project it was also found that climate change concern, behavioural intention and self-efficacy are positively correlated with each other. Therefore hypothesis 1.1 (*concern about climate change, behavioural intention and self-efficacy are positively correlated with each other and will have increased compared to studies of five or*

more years ago.) is supported. For the second hypothesis 1.2, there is too little data on residents outside of the Netherlands to be able to draw conclusions. Using a different sampling method, which shall be discussed in the *recommendations*-section, this hypothesis may be studied in a follow-up research project. Additionally, the uncertainty margin for correlations between age and climate change concern are too large to draw conclusions with regard to hypothesis 1.3. This is due to the age distribution of the sample: there were significantly more respondents aged 20-29 than those aged 60-89. Nevertheless, a negative correlation between age and English proficiency was found. Based on this survey, young people tend to score higher in self-reported English proficiency than older people. With regards to hypothesis 1.4, no evidence was found for any correlation between gender and climate change concern, behavioural intention or self-efficacy.

As there were some indications of nature documentaries influencing one's climate change concern, behavioural intention and self-efficacy in the results, yet the observed effects were small and uncertain, there is a chance that the independent variables have an effect on the dependent variables which is too small to be measured through the survey. Maybe the change is not enough to go from 'agree' to 'strongly agree' or 'neutral'? Maybe the participant now scores higher on a measure but had already selected 'strongly agree' in the first round of the survey? This is one of the limitations of using a quantitative approach. In a future research project, it might be an idea to use a larger scale (e.g. 1-7) or to substantiate the survey results with qualitative research, for example some interviews with participants in which they are asked to share their views on one of the fragments.

Post-test results discussion

Disclaimer: the part below is the conclusion if the uncertainty in the data was small enough for the data to be usable for drawing conclusions and is NOT the actual conclusion of this research project. It was chosen to include this to be able to see what the data might imply to identify a possible direction for follow-up research.

Climate change concern

If, for the sake of this research project being purely educational, the data from the post-test is analysed without focussing on the standard deviation (bearing in mind that the conclusions drawn are not substantiated by enough evidence), we could conclude the following by purely looking at the means: looking at climate change concern we see that the mean value has stayed the same for group 1, has decreased slightly for group 2 and has decreased the most for group 3. This trend only applies to the entire measure of climate change concern and differs for the individual questions although group 3 has a bigger decrease in score than group 1 in all cases.

This would be in agreement with hypothesis 2.2a**,** as the groups with a nature documentary fragments have a smaller decrease than the group that did not watch a nature documentary fragment. Additionally it would contradict hypothesis 2.1a, because the group with the climate change-related narration scored lower than the group with the animal facts narration. This might support the view of Attenborough (Watts, 2018) that viewers are repelled by confronting messages in nature documentaries, rather than positively influenced.

Since the mean difference for all three groups is either zero or negative, there has likely been some external factors in the time between the pretest and post-test that have negatively influenced respondent's climate change concern.

If we look at the responses for individual questions, we can see that group 2 actually only has a bigger decrease than group 1 with regards to question 3. This further weakens the validity of these conclusions and shows, as the large standard deviation also indicates, that the sample is simply too small.

Behavioural intention

Looking only at the mean values for behavioural intention, one can see that the mean difference (which is in all cases very small, <0.1) is an increase in behavioural intention for both group 1 and group 3, yet a decrease for group 2, with once again group 1 showing the most positive mean difference. This would contradict hypothesis 2.1b as the nature documentary fragment without climate change related narration brings about the largest increase in willingness to take action against climate change. As group 3 scores better than group 2 but worse than group 1, hypothesis 2.2b appears to be true with regards to nature documentary fragments that do not explicitly address climate change and false with regards to nature documentary fragments that address climate change. The hypothesis thus can't be confirmed.

In the original research proposal an extra control group, that watched a neutral fragment with climate change related narration, was included. If the results of this extra group would be compared with group 2's results it could be examined whether nature documentaries positively influence behavioural concern but mentioning climate change has a larger negative influence on behavioural concern or whether nature documentaries positively influence behavioural concern only when climate change is not addressed. Of course this may be highly dependent on the choice of fragments and further experiments should be conducted with different fragments to be sure. As it was initially expected that it would be difficult to get enough responses for four groups, it was chosen to narrow down the experiment to three groups.

Self-efficacy

Examining the mean for self-efficacy, one can observe a trend similar to climate change concern: group 1 shows the highest increase in self-efficacy, followed by group 2 (which shows no change) and finally group 3 (which show a decrease). This contradicts hypothesis 2.1c, supporting Attenborough's (Watts, 2018) idea and is in agreement with hypothesis 2.2c, showing that nature documentaries positively influence one's self-efficacy.

In contrast to climate change concern, self-efficacy does not show an overall decrease. The difference in mean for the control group with regards to self-efficacy is a smaller negative number than in that for climate change concern and even positive for behavioural intention. This would imply that external factors have had a bigger negative impact on climate change concern than on self-efficacy and a slightly positive impact on behavioural intention. As it was earlier discovered that climate change concern, behavioural intention and self-efficacy are positively correlated with each other, this seems quiet peculiar. Notice also how the difference between the mean difference for group 1 and 3 is roughly 0.4 for both behavioural concern and self-efficacy. Is this a coincidence or would another research project show a similar trend?

Notice also how the data contradicts hypothesis 2.1 in both version a, b and c. Based on this data explicitly addressing climate change does not increase people's concern about and willingness to mitigate climate change, rather it decreases the increase brought about by watching a nature documentary fragment.

Post-test improvements discussion

The data of the second round is not sufficient to be able to answer the research question with certainty. This is because there are simply too few responses, causing the uncertainties to be large and the internal consistency of measures for some of the groups to be low. This is one of the disadvantages of using an online survey: Laguilles et al. (2011) show that response rates to web-based surveys are typically low.

The initial survey round got 58 responses. The total amount of responses to the second round (after sending a reminder e-mail and reminding respondents in the author's direct network face to face to complete the survey) was 36 responses (13+11+12). This yields a response rate of 62% for the second survey round, which is quite high for a web-based survey without reward. Four different participants reported that the invitation to the second round of the survey had landed in their spam-folder. As participants might not check the content of their spam-folder or might not trust the e-mails inside it, this can partially explain the missing responses.

Due to the limited amount of responses to questionnaire round 1, it was chosen to limit the scope of the experiment to testing whether explicitly mentioning climate change has an impact on people's attitude towards climate change and to not test whether the depicted animal makes a difference. Polar bears are a poster animal for climate change and thus their presence may make people think more about climate change than if a different animal, like a sand iguana, was depicted. As it requires more technical skills or access to video footage to create fragments that differ only in the animal present compared to a difference in narration, it was chosen to test the second option. Yet the first option may still be worth investigating in a follow-up research.

Conclusion

We can indeed see that climate change concern, behavioural intention and self-efficacy are tightly correlated. Additionally we see that these values have risen compared to those found in surveys from several years ago (like the surveys conducted by Heath et al. 2006, Spence et al. 2012 and Kellstedt et al. 2008). This might indicate that over the years people have become more aware of the effects of climate change and its possible dangers. Perhaps natural effects of climate change have become more visible and/or attempts to raise awareness on the topic have been successful. Additionally it was found that for a sample mainly consisting of residents of the Netherlands, age and English proficiency show a slight negative correlation.

Recommendations

Based on the challenges encountered in this research, the following recommendations are suggested for similar future research projects:

- A repetition of the experiment in a setting with more means than the current project.
- A change of the scale in the measures to (for example) 1-7 so that a smaller changes can be measured.
- The main limitation of this research is that the response rate is too low. With less than 15 participants per group in the second survey round, uncertainties get too large and the averages will lie within each other's margin of error. There are several improvements that can be made to this experiment to solve this problem:

  Offer a reward: It is shown that people are more inclined to complete a survey if a reward is offered (Laguilles, et al., 2011). Perhaps a raffle to win a gift card or gadget or a fixed amount of money can be offered for completing both surveys.

  Change the sampling method: this research makes use of snowball sampling. The author has asked her private network (via LinkedIn, WhatsApp and face to face) to fill out the survey and if possible to share it with their own network. The benefit of this method is that it is cheap (namely free) and that it is easy to send reminders to your direct network. There are however two big downsides:

  1. the resulting sample will primarily consist of the people the researcher knows, which might cause some groups (in this case Dutch students aged 20-30) to be overrepresented and other groups (for example the elderly) to be underrepresented. This puts limitations on the analysis of the influence of demographic variables.
  2. the total amount of responses depends on the size of the author's personal network and the willingness of others to share the survey.

  To get a guaranteed number of responses or a representative group, it may be better to use a paid platform.

The analysis of the post-test results is overshadowed by the uncertainty in the data and thus the research question cannot be answered by this experiment. The outcome of the experiment does suggest that nature documentaries might increase people's concern about climate change, behavioural intention and self-efficacy and that explicitly addressing climate change in a nature documentary fragment negatively influences this increase. This suggestion may indicate that it is promising to further investigate the effect of nature documentaries on climate change, therefore contributing to the field of climate change communication science. By applying the recommendations mentioned above and in the *Discussion*-section, a future experiment may be able to identify the effect of nature documentaries on one's concern about and willingness to mitigate climate change.

Acknowledgements

The author would like to thank Pepijn Bodegom for narrating the fragments used in the experiment, the three participants of the pilot-test for helping to improve the survey, Sibel Telli and Lucy Avraamidou for their guidance during the project and finally all friends and family who helped to spread the survey!

Sources

BBC Earth. (2017). *Hungry Polar Bear Ambushes Seal | The Hunt | BBC Earth*. (BBC Earth) Retrieved from https://www.youtube.com/watch?v=zNO0kxTClYo

BBC News. (2020, July 20). *Climate Change: Polar bears could be lost by 2100*. Retrieved from BBC News: https://www.bbc.com/news/science-environment-53474445

Bieniek-Tobasco, A., Rimal, R. N., McCormick, S., & Harrington, C. B. (2020). The Power of Being Transported: Efficacy Beliefs, Risk Perceptions, and Political Affiliation in the Context of Climate Change. *Science Communication, 42(6)*, 776-802. https://doi.org/10.1177/1075547020951794

Broomell, S. B., Budescu, D. V., & Por, H. H. (2015). Personal experience with climate change predicts intentions to act. *Global Environmental Change, 32*, 67-73. https://doi.org/10.1016/j.gloenvcha.2015.03.001

Brown, G., Irving, E., & Keegan, P. (2008). *An introduction to educational assessment, measurement and evaluation.* North Shore, N.Z.: Pearson Education.

Brügger, A., Morton, T. A., & Dessai, S. (2016). "Proximising" climate change reconsidered: A construal level theory perspective. *Journal of Environmental Psychology*, 46, 125-142. https://doi.org/10.1016/j.jenvp.2016.04.004

CBS. (2021a). *Klimaatverandering en energietransitie: opvattingen en gedrag van Nederlanders in 2020. [Climate change and energy transition: beliefs and behaviour of the Dutch in 2020].* Retrieved from https://www.cbs.nl/nl-nl/longread/rapportages/2021/klimaatverandering-en-energietransitie-opvattingen-en-gedrag-van-nederlanders-in-2020

CBS. (2021b). *Nederland in cijfers [The Netherlands in numbers]*. Retrieved from cbs.nl: https;//longreads.cbs.nl/nederland-in-cijfers-2021/

Chu, H., & Yang, J. Z. (2019). Emotion and the Psychological Distance of Climate Change. *Science Communication, 41(6)*, 761-789. https://doi.org/10.1177/1075547019889637

Debrett, M. (2017). Representing climate change on public service television: A case study. *Public Understanding of Science, 26(4)*, 452-466. https://doi.org/10.1177/0963662515597187

Denscombe, M. (2017). *The Good Research Guide* (6th ed.). London: Open University Press.

Duan, R., Takahashi, B., & Zwickle, A. (2021). How Effective Are Concrete and Abstract Climate Change Images? The Moderating Role of Construal Level in Climate Change Visual Communication. *Science Communication, 43(3)*, 358-387. https://doi.org/10.1177/10755470211008192

European Social Survey. (2018). *European Attitudes to Climate Change and Energy: Topline Results from Round 8 of the European Social Survey.* London: European Social Survey ERIC.

Gifford, R., & Comeau, L. (2011). Message framing influences perceived climate change competence, engagement, and behavioral intentions. *Global Environmental Change*, 21(4), 1301-1307. https://doi.org/10.1016/j.gloenvcha.2011.06.004

Hart, P. S., & Feldman, L. (2014). Threat Without Efficacy? Climate Change on U.S. Network News. *Science Communication., 36(3)*, 325-351. https://doi.org/10.1177/1075547013520239

Heath, Y., & Gifford, R. (2006). FreeMarket Ideology and Environmental DegradationThe Case of Belief in Global Climate Change. *Environment and Behavior, 38(1)*, 48-71. https://doi.org/10.1177/0013916505277998

Intellectual Property Office. (2021, January 4). *Exceptions to copyright*. Retrieved from gov.uk: https://www.gov.uk/guidance/exceptions-to-copyright

Jones, J. P., Thomas-Walters, L., Rust, N. A., & Veríssimo, D. (2019). Nature documentaries and saving nature: Reflections on the new Netflix series Our Planet. *People Nat., 1*, 420-425. https://doi.org/10.1002/pan3.10052

Kellstedt, P. M., Zahran, S., & Vedlitz, A. (2008). Personal Efficacy, the Information Environment, and Attitudes Toward Global Warming and Climate Change in the United States. *Risk Analysis, 28*, 113-126. https://doi.org/10.1111/j.1539-6924.2008.01010.x

Laguilles, J., Williams, E., & Saunders, D. (2011). Can lottery incentives boost web survey response rates? findings from four experiments. *Research in Higher Education*, 52(5), 537-553.

Lam, A., & Tegelberg, M. (2019). Witnessing glaciers melt: climate change and transmedia storytelling. *Journal of Science Communication, 18(02)*, A05. https://doi.org/10.22323/2.18020205

Lin., S. J. (2013). Perceived Impact of a Documentary Film: An Investigation of the First-Person Effect and Its Implications for Environmental Issues. *Science Communication, 35(6)*, 708-733. https://doi.org/10.1177/1075547013478204

Lo, A., & Chow, A. (2015). The relationship between climate change concern and national wealth. *Climatic Change, 131(2)*, 335-348. https://doi.org/10.1007/s10584-015-1378-2

Lynas, M., Houlton, B., & Perry, S. (2021). Greater than 99% consensus on human caused climate change in the peer-reviewed scientific literature. *Environmental Research Letters*, 16.

Mize, T. D. (2019). Survey Experiments Testing Causality in Diverse Samples. *IU Workshop in Methods*.

Monbiot, G. (2018, November 7). *David Attenborough has betrayed the living world he loves*. Retrieved from The Guardian: https://www.theguardian.com/commentisfree/2018/nov/07/david-attenborough-world-environment-bbc-films

Moore, K. (2021, October 25). *Every Viewing Statistic Netflix Has Released So Far*. Retrieved from What's on Netflix: https://www.whats-on-netflix.com/news/every-viewing-statistic-netflix-has-released-so-far-october-2021/

Moreno-Tarín, S., Pina, T., & Domínguez, M. (2021). Worlds apart, drawn together: Bears, penguins and biodiversity in climate change cartoons. *Public Understanding of Science, 30(4)*, 384-399. https://doi.org/10.1177/0963662521992508

NASA. (2022, June 24). *Global Climate Change: Effects*. Retrieved from NASA Global Climate Change and Global Warming: Vital Signs of the Planet.: http://climate.nasa.gov/effects/

Ripple, W., Wolf, C., Newsome, T., Galetti, M., Alamgir, M., Crist, E., . . . Laurence, W. (2017). World Scientists' Warning to Humanity: A Second Notice. *BioScience, 67*(12), 1026-1028.

Sakellari, M. (2014). Cinematic climate change, a promising perspective on climate change communication. *Public Understanding of Science, 24(7)*, 827-841. https://doi.org/10.1177/0963662514537028

Saunders, D. (2010). *Documentary* (1st ed.). London: Routledge. https://doi.org/10.4324/9780203852682

Spence, A., Poortinga, W., & Pidgeon, N. (2012). The Psychological Distance of Climate Change. *Risk Communication, 32*, 957-972. https://doi.org/10.1111/j.1539-6924.2011.01695.x

United Nations. (z.d.). *Climate Change*. Retrieved from un.org: https://www.un.org/en/global-issues/climate-change

Vallat, R. (2018). Pingouin: statistics in Python. *Journal of Open Source Software*, 3(31), 1026. https://doi.org /10.21105/joss.01026

Watts, J. (2018, November 4). *David Attenborough: too much alarmism on environment is a turn-off*. Retrieved from The Guardian: https://www.theguardian.com/environment/2018/nov/04/attenborough-dynasties-ecological-campaign

Wikipedia. (2022, February 11). *Polar Bear*. Retrieved from Wikipedia: https://en.wikipedia.org/wiki/Polar_bear

Yeo, S. K., Binder, A. R., Dahlstrom, M. F., & Brossard, D. (2018). An inconvenient source? Attributes of science documentaries and their effects on information-related behavioral intentions. *journal of Science Communication, 17(2)*, A07. https://doi.org/10.22323/2.17020207

Appendix A: variables

Dependent & demographic variables (survey items)

The Cronbach's alpha provided in this table is the one found in the research done in the paper in the source-column.

Dependent Variable	Questions	Changes & Adaptations	Item Number	Scale	Cronbach's Alpha	Source
Concern about climate change [*Climate change concern* is used as synonym to *concern about climate change* in this study.]	1. "How concerned, if at all, are you about climate change, sometimes referred to as 'global warming'?" 2. "Considering any potential effects of climate change which there might be on you personally, how concerned, if at all, are you about climate change?" 3. "Considering any potential effects of climate change there might be on society in general, how concerned are you about climate change?"		3	5-point scale (Very concerned–Not at all concerned)	0.83	Spence et al. (2012)
Behavioural intention "The intention to take action to address negative effects of global climate change." [*mitigation intention* and *intention to mitigate* are used as synonyms to *behavioural intention* in this study.]	1. "I plan to take some actions to stop global warming." 2. "I personally do not intend to do much to stop global warming." 3. "I will make some efforts to mitigate the negative effects of global warming." 4. "I intend to take concrete steps to do something to mitigate the negative effects of global warming."	3. "I will make some efforts to mitigate (to cause to become less harsh) the negative effects of global warming." *Reason:* two out of three participants of the pilot* indicated the word 'mitigate' was unclear to them.	4	5-point scale (Strongly agree-Strongly disagree)	0.89	Heath & Gifford (2006)

Personal Efficacy "the perceived ability of someone to influence climate change outcomes, to induce others to behave in ways that mitigate human sources of climate change and whether a respondent accepts climate change as a human responsibility." [*self*-efficacy and perceived *efficacy* are synonyms to *personal efficacy* in this study.]	1. "I believe my actions have an influence on global warming and climate change." 2. "My actions to reduce the effects of global warming and climate change in my community will encourage others to reduce the effect of global warming through their own actions." 3. "Human beings are responsible for global warming and climate change."		3	Scale 1-5 (Strongly agree-Strongly disagree)	0.63	Kellstedt et al. (2008)
Demographic Variables	Questions		Item Number	Scale		
Self-reported written English proficiency	1. I am confident in my ability to comprehend written English.		1	Scale 1-5 (Strongly agree-Strongly disagree)		
Country of residency	1. In which country are you currently living?		1	Multiple choice/open text (the Netherlands, other [text field])		
Age (Not required, because might be sensitive)	1. Please enter your age here:		1	Number, greater than 0		
Gender (Not required, because might be sensitive)	1. Please select your gender:		1	Multiple choice (female, male, other, prefer not to say)		

Independent variables

Independent Variable	Items
Nature Documentary	Fragments 1&2 are nature documentary fragments Fragment 3 is not
Explicit mention climate change	Fragment 1: explicitly mentions climate change Fragment 2: Does not explicitly mention climate change

Appendix B: division pretest participants over groups post-test

group 1	group 2	group 3
13	44	43
26	2	45
35	4	19
11	47	7
16	14	46
32	31	3
17	30	8
25	12	5
15	10	48
28	22	29
6	49	52
40	20	36
51	9	18
39	23	50
27	38	33
42	24	37
41	34	21
58	*56*	*57*
53	*54*	*55*
	1	

Legend
NL-resident
Male
other/prefer not to say
<20
>60
50-59
40-49
30-39

Each of the respondents has been assigned a number, that can be reconnected to the e-mail addresses in a password protected excel sheet. The legend provides some demographic characteristics of the sample. In the current groups, there is 17 Dutch residents in each group. Each group has roughly (±1) the same amount of male/female/other people and a similar age distribution. As 52/3 leaves 1 person, it was chosen to have the group with the 1 person who indicated not being confident in their ability to comprehend written English consist one more person than the other two groups. (This is group 2, which has the fragment that mentions climate change)

Appendix C: description of data experiment

The anonymized table with all the data from both the pretest and the post-test is available upon request.

Description of the data on climate change concern per question

Group 1: Climate Change Concern	Mean round 1	Standard Deviation round 1	Median round 1	Mode round 1	Mean round 2	Standard Deviation round 2	Median round 2	Mode round 2
Overall Measure	4.000	0.528	-	-	4.000	0.385	-	-
Question 1.1	4.250	0596	4	4	4.250	0.434	4	4
Question 1.2	3.750	0.722	4	None:3&4	3.500	0.646	4	4
Question 1.3	4.000	0.708	4	4	4.250	0.596	4	4
Group 2: Climate Change Concern	Mean round 1	Standard Deviation round 1	Median round 1	Mode round 1	Mean round 2	Standard Deviation round 2	Median round 2	Mode round 2
Overall Measure	4.030	0.559	-	-	3.909	0.452	-	-
Question 1.1	4.091	0.515	4	4	4.182	0.386	4	4
Question 1.2	3.546	0.988	4	4	3.364	0.643	3	3
Question 1.3	4.455	0.498	4	4	4.182	0.575	4	4
Group 3: Climate Change Concern	Mean round 1	Standard Deviation round 1	Median round 1	Mode round 1	Mean round 2	Standard Deviation round 2	Median round 2	Mode round 2
Overall Measure	4.205	0.532	-	-	3.846	0.736	-	-
Question 1.1	4.462	0.635	5	5	4.000	0.785	4	4
Question 1.2	3.769	0.576	4	4	3.308	0.992	3	3
Question 1.3	4.385	0.625	4	None:4&5	4.231	0.891	4	5

Description of the data on behavioural intention per question

Group 1: Behavioural Intention	Mean round 1	Standard Deviation round 1	Median round 1	Mode round 1	Mean round 2	Standard Deviation round 2	Median round 2	Mode round 2
Overall Measure	3.938	0.653	-	-	3.958	0.653	-	-
Question 2.1	3.917	0.863	4	4	3.667	0.850	4	4
Question 2.2	4.00	1.09	4	4	4.250	0.596	4	4
Question 2.3	4.000	0.817	4	None	4.167	0.688	4	4
Question 2.4	3.833	0.898	4	4	3.750	0.694	4	4
Group 2: Behavioural Intention	Mean round 1	Standard Deviation round 1	Median round 1	Mode round 1	Mean round 2	Standard Deviation round 2	Median round 2	Mode round 2
Overall Measure	3.932	0.684	-	-	3.909	0.597	-	-
Question 2.1	3.727	0.750	4	4	3.727	0.750	4	4
Question 2.2	3.91	1.09	4	4	4.000	0.954	4	None:4&5
Question 2.3	4.273	0.446	4	4	4.182	0.575	4	4
Question 2.4	3.82	1.03	4	4	3.727	0.750	4	4
Group 3: Behavioural Intention	Mean round 1	Standard Deviation round 1	Median round 1	Mode round 1	Mean round 2	Standard Deviation round 2	Median round 2	Mode round 2
Overall Measure	3.923	0.756	-	-	3.942	0.539	-	-
Question 2.1	3.692	0.911	4	3	3.846	0.770	4	None:3&4
Question 2.2	4.154	0.770	4	None:4&5	4.154	0.662	4	4
Question 2.3	4.077	0.829	4	4	4.077	0.616	4	4
Question 2.4	3.769	0.891	4	4	3.692	0.756	3	3

Description of the data on self-efficacy per question

Group 1: Self-efficacy	Mean round 1	Standard Deviation round 1	Median round 1	Mode round 1	Mean round 2	Standard Deviation round 2	Median round 2	Mode round 2
Overall Measure	3.806	0.739	-	-	4.028	0.518	-	-
Question 2.1	3.34	1.11	3	3	3.834	0.898	4	4
Question 2.2	3.67	1.03	4	4	3.417	0.862	3.5	4
Question 2.3	4.417	0.954	5	5	4.834	0.373	5	5
Group 2: Self-efficacy	Mean round 1	Standard Deviation round 1	Median round 1	Mode round 1	Mean round 2	Standard Deviation round 2	Median round 2	Mode round 2
Overall Measure	3.727	0.839	-	-	3.727	0.709	-	-
Question 2.1	3.09	1.45	3	None:3&4	3.000	0.954	3	None:3&4
Question 2.2	3.636	0.980	4	4	3.636	0.980	4	4
Question 2.3	4.455	0.656	5	5	4.545	0.498	5	5
Group 3: Self-efficacy	Mean round 1	Standard Deviation round 1	Median round 1	Mode round 1	Mean round 2	Standard Deviation round 2	Median round 2	Mode round 2
Overall Measure	3.898	0.479	-	-	3.667	0.763	-	-
Question 2.1	3.692	0.822	4	4	3.31	1.33	4	None:2&4
Question 2.2	3.615	0.924	4	4	3.308	0.911	3	4
Question 2.3	4.385	0.738	5	5	4.385	0.924	5	5

Appendix D: description of the video fragments

Fragment 1

Video: 39 seconds of BBC Earth's *Hungry Polar Bear Ambushes Seal | The Hunt | BBC Earth* (BBC Earth, 2017). The footage was taken from the first 45 seconds of the video with a minor crop at 17-23 seconds in the video to limit the length of the fragment to at most 40 seconds whilst preserving the visual narrative. This fragment was chosen because the walking polar bear fits both a climate change related message as well as a more neutral animal-facts message and the fragment has a clear ending point (polar bear gazing in the distance on top of some ice). Based on the UK's *Exceptions to copyright* guide (Intellectual Property Office, 2021), it is allowed to use copyrighted video fragments, like this one, for (educational and) non-commercial research and private study, provided you use only the amount you actually need and you credit the source. As the guide does not mention whether editing the material is allowed, it was chosen to only use the visual element of the video fragment and create the audio separately using only non-copyrighted material.

Background music: the first 39 seconds of Way To Silence by Sergey Chermisinov. This music was licensed under a creative commons Attribution 4.0 International License. This means the music can be freely used and edited but the original composer and licence should be referenced. The music was chosen because it is an instrumental and tranquil piece that can fit both the climate change and not climate change related narrative.

Narration: narration is a characteristic of the nature documentary genre. The narration in this fragment does not mention climate change explicitly and occupies the same moments as the narration in fragment 2. The polar bear facts mentioned were taken from Wikipedia (Wikipedia, 2022).

Transcript of the narration:

Polar bears are carnivorous mammals that roam the Northern Arctic.

With their big and powerful limbs, polar bears are the only living marine mammal that can cover long distances and even run on land.

With their excellent sense of smell, polar bears can detect seals at distances of more than one kilometre away.

Fragment 2

Video, Background music: Identical to fragment 1

Narration: the narration in this fragment is centred on climate change and the problem this poses for polar bears. The prediction in the third line was taken from BBC News (BBC News, 2020).

Transcript of the Narration:

Here we see a polar bear in search of food...

Due to Climate change, this search is getting increasingly more difficult.

Some scientists predict polar bears may be extinct by 2100, as sea ice continues to melt earlier each year and finding food becomes harder.

Fragment 3:

Video: *White background video white motion background hd 1080p Royalty Free Footages White background*. A copyright free film fragment of light grey cloudy fluid patterns. This fragment was chosen because it resembles the whitish colour scheme of the polar bear fragment. The length of the fragment was cropped to match the length of fragments 1&2.

Background music: Identical to fragment 1.

Narration: not applicable. As this is not a nature documentary, both depicting an animal and talking about said animal are not a requirement. Adding narration to this fragment would require talking about a certain topic which might have an impact on the results, hence it was chosen to exclude narration in this fragment.

Appendix E: participation and privacy message

Please read the information below, regarding participation and privacy:

The data gathered by this survey will be used to get an indication of climate change concern and willingness to mitigate (to cause to become less harsh) climate change amongst residents of the Netherlands.

This survey is the first of a set of two, please leave your e-mail address so that a follow-up questionnaire can be sent to you later. Your response to this first questionnaire will form a baseline for the second questionnaire, which will be sent to you in a few weeks' time.

Your e-mail address will also be used to link your response to the first questionnaire with your response to the second questionnaire, after which the responses are anonymised. (Reported results will not be retraceable to individuals.)

Participation to this survey is voluntary and the data you provide will be handled confidentially.

If you have any questions, contact the researcher at m.j.l.bodegom@student.rug.nl