Sofie Kathrine Marhaug

The effects of natural disasters on the belief in climate change

A quantitative cross-national analysis of European public opinion

Master's thesis in Globalisation and Sustainable Development
Supervisor: Thomas Halvorsen
May 2023

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Abstract

As global temperatures are rising and climate is changing, natural disasters are expected to increase in frequency and strength. Despite countless warnings and cries for action from experts, the UN and environmentalists, some individuals do not believe that the climate is changing, namely climate sceptics. This paper examines the effect experiencing a natural disaster has on Europeans' belief in climate change, where the effect of heat waves, wildfires, and droughts are investigated. Additionally, the interaction between individuals' values and experiencing a natural disaster is analysed, to evaluate how this can impact climate sceptic beliefs. The analysis uses data from the European Social Survey round 8 and the Emergency Event Database to conduct an ordered logistic regression analysis. A limitation to the data is the fact that within the sample only a small proportion of the respondents have experienced a wildfire or a drought period, which means that these results should be investigated further. Nevertheless, the results show that experiencing a natural disaster has an effect on the respondents' belief in climate change. Individuals who have experienced a heat wave or a wildfire are more likely to believe that climate is changing. In contrast, are people who have experienced a drought period more likely to be climate sceptics. Anticipating, values having a large impact on Europeans' belief in climate change, the analysis reaches a surprising conclusion, where the only value that has a significant interaction with all three natural disasters is the value of living in safe and secure surroundings. Nevertheless, the analyses show that there is a connection between an individual's values and the effect of a natural disaster on whether the person believes the climate is changing.

Preface

I want to thank everyone who have aided me in some way on this journey of completing my master thesis. Thank you to my thesis supervisor, Thomas Halvorsen, who have guided me through everything from tricky data preparation to the analysis itself. Furthermore, I want to give a special thanks my relative Marita Monsen, who took the time to read through the complete thesis, as well as those who have read through parts of the thesis. I am grateful for your time and feedback which helped me make this thesis as good as possible. Lastly, I want to thank my dog, Ebba, who ensured that I took plenty of breaks in between heavy writing and researching.

Sofie Kathrine Marhaug

Sortland May 13, 2023

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“The perspective that humans are part of their environment and can influence it is radical to some worldviews. Thus, as temperatures increase and other direct and indirect impacts are felt, climate change may become a catalyst for changes in beliefs, worldviews, and values.”

O’Brien & Wolf, 2010, p. 236

1. Introduction

The last couple of years it seems to be new media reports about yet another heat record broken yearly. This is in fact true! In January 2023, the world meteorological organisation (WMO) presented that the "past eight years were the warmest on record globally" (WMO, 2023). This has caused the United Nations (UN) to sound the alarm, as they presented a report in March 2023, emphasising that the effects of climate change are already, to some extent, irreversible. However, the worst and most damaging consequences can be limited if we act now and reduce emissions drastically (IPCC, 2023, p. 19). Yet, policies do not stretch as far as the UN wishes. Politicians need the people on their side regarding drastic changes in their everyday life (Tuitjer, Dirksmeier, & Mewes, 2022, p. 1). Nevertheless, despite the warnings from the UN and WMO, some people seem not to believe these warnings. The climate sceptics ensure that there is debate on the topic, which to environmentalists' frustration, can be one reason why politicians do not take a firm stand in mitigation policies (Stern, Dietz, Abel, Guagnano, & Kalof, 1999, p. 81).

Although climate change is a global phenomenon, many of the climate sceptics seem to be located in the global north (Lee, Markowitz, Howe, Ko, & Leiserowitz, 2015, p. 1015), which according to the UN is the region which so far has been the least impacted by climate change consequences (IPCC, 2023, p. 5). It is however predicted that also the global north will have an increase in natural disasters due to climate change. Nevertheless, some of the consequences of climate change are already evident, and Europe has experienced several natural disasters caused by climate change (IPCC, 2023, p. 19). It is, therefore, possible to examine what effect natural disasters have on climate sceptics beliefs. Based on the literature review my assumption is that all three of the natural disasters that will be analysed will have a positive effect on Europeans’ belief in climate change. Additionally, as the quote by O'Brien & Wolf (2010, p. 236) points out, values are an important factor in public opinion’s climate change perception. Therefore, I assume that some values have a positive impact and some have a negative impact based on the worldview these values can be categorised as. Values such as family and friends, and safe surroundings are expected to have a positive effect. On the contrary, values such as success are expected to have a negative effect on the belief in climate change, indicating a higher possibility of being climate sceptic.

Climate scepticism consist of different opinions and views, ranging from not believing in climate change at all to believing that climate change can have positive consequences (Rahmstorf, 2005, pp. 77-79). However, in research on climate scepticism, the different views are often not accounted for, which Howarth & Sharman (2015) critique in their article. Therefore, in order to not generalise all climate sceptics into one category, this paper examines one specific type of climate scepticism, namely those who do not believe that the climate is changing at all.

To explore Europeans' values and beliefs about climate change, the paper uses data from the European Social Survey (ESS) round 8 from 2016. This survey round has a particular focus on European beliefs and opinions regarding climate change and is therefore appropriate for this research. The respondents, aged between 15 and 100, come from 12 different European countries: Austria, Belgium, France, Germany, Hungary, Italy, Lithuania, the Netherlands, Portugal, the Russian Federation, Spain, and the United Kingdom.

To assess how natural disasters influence the values and beliefs of Europeans, this paper uses data from the Emergency Event Database (EM-DAT) to get statistical information about the natural disasters. The data is narrowed down to three natural disasters, heat waves, droughts, and wildfires, that have occurred in the countries mentioned earlier within the timeframe from 2006 to 2016.

Climate scepticism has fallen short of the study of environmentalists in climate change science (Tranter & Booth, 2015, p. 154). However, some research has aimed to examine these sceptic beliefs, yet most of the research has been conducted in larger countries such as the United States of America or Australia, or qualitatively within communities in Africa or Asia (Tuitjer, Dirksmeier, & Mewes, 2022, pp. 2,4). This means that there is a knowledge gap when it comes to climate sceptic perceptions in Europe. Additionally, Tranter & Booth (2015, p. 155) highlight that most of the research on climate sceptic beliefs are within a nation, and it is, therefore, a lack of cross-national research on the topic. Since there is an assumption that the global north, such as Europe, will experience an increase in natural disasters (Field et al., 2012, p. 7), it is essential to gain a better picture of how natural disasters influence climate sceptic beliefs in Europe. Such insight can be beneficial for politicians and decision-makers in their process of reaching a wider audience when presenting new sustainable policies. This paper aims to address these knowledge gaps in both cross-national research as well as research on climate scepticism in Europe. Additionally, the paper will explore the expectation that experience with a natural disaster will influence individuals' beliefs. Based on this expectation, the first research question is: "**What effect do natural disasters have on Europeans' belief in climate change?"**

In order to understand how natural disasters influence climate sceptics, the individuals' values must be included in the analysis. O'Brien & Wolf (2010, p. 235) argue that economic values are just one part of climate change research which often has received too much focus. Applying a values-based approach allows for a human-based analysis that considers individuals' experiences and cultures and highlights how this may influence people's resistance to sustainable policies (O'Brien & Wolf, 2010, p. 237). By examining the values of the respondents in line with their experience with a natural disaster, it is possible to get a deeper insight into what impacts people's beliefs, values, and willingness to adapt to climate change. This can provide a better foundation of understanding of which sustainable policies should be implemented, that does not stem from a cost-benefit-analysis (O'Brien & Wolf, 2010, p. 239). To accommodate the criticism of O'Brien & Wolf (2010, p. 235), this paper will focus on how the interaction between people's values and their experience with a natural disaster influences their belief in climate change. The second research question is therefore: **"Is there a connection between an individual's values and the effect of a natural disaster on whether the person believes the climate is changing or not?"**

To answer the two research questions, this paper is structured as follows: First, there is an extensive literature review that is presented, which goes more into detail about the existing research and its gaps, aiming to justify the decisions that are made for the analysis in this paper. Second, the theoretical framework for this paper is introduced. The theory chapter is divided into four different sections. The first two sections define the two key concepts within this thesis, namely climate scepticism and natural disasters. Within these sections, the different ways to perceive climate scepticism will be addressed. Additionally, the theory chapter goes deeper into the different natural disasters that are being researched in this paper, namely the three dry hazards, which are: heat waves, droughts, and wildfires. Further in the theory section, human adaptation will be presented before moving along to an explanation of what values are and how they are essential in this thesis.

Moreover, the methodology chapter aims to explain the two datasets used to conduct the analysis, namely European Social Survey (ESS) and the Emergency Events Database (EM-DAT). The variables used from these two datasets are presented. Furthermore, the methodology chapter explains what an ordered logistic regression is and why it is used in this paper's analysis. The result of the analysis is divided into three parts based on the three natural disasters examined. Within each of the parts of the result, both research questions identified above are examined. After presenting the findings in the result chapter, a summary of the main findings is presented, before the thesis moves on to the discussion. In this chapter the results are discussed against the theoretical perspectives and previous literature. Additionally, limitations to this research are identified and discussed before providing recommendations for future research on the topic, as well as recommendations to policymakers based on the findings. Finally, I bring al chapters together and present a conclusion.

2. Literature review

"Climate change can only be tackled with public support for sustainable policies" (Tuitjer, Dirksmeier, & Mewes, 2022, p. 1). However, despite confirmed climatic changes such as increases in CO2 in the atmosphere, the public is not unanimously supporting sustainable policies (Rahmstorf, 2005, p. 77). Climate sceptics often express their opinions that oppose the ones of the environmentalists on social media (Moernauta, Masta, Temmerman, & Broersma, 2022, p. 1048), suggesting several different perspectives opposing climate research. Despite this, when climate sceptics are discussed in academic research, they are often stirred into one category where all individuals called climate sceptics are thought to have similar values. Howarth & Sharman's (2015) article criticises this practice, emphasising how assigning similar values to all climate sceptics enforces a dualistic view on a complex matter. Which again reinforces the polarised debate between climate sceptics and environmentalists. This paper, therefore, uses Rahmstorf's (2005) and Tuitjer, Dirksmeier, & Mewes' (2022) sub-categories of climate sceptics to highlight the different views within the concept, as well as examine if there is a change in beliefs and values within the most extreme climate sceptic category, namely the ones who do not believe climate change is happening.

> *"A values-based approach to climate change can be considered important for at least four reasons: climate change cannot be assessed or responded to in only one way; there may be value conflicts between different actors' responses; future generations may judge based*

on different value systems; and climate change itself challenges worldviews and values." (O'Brien & Wolf, 2010, p. 235)

In their article, O'Brien & Wolf (2010, p. 235) identify four reasons for applying a values-based approach to climate change research. This thesis focuses primarily on the last reason, which states that climate change challenges values. By using a values-based approach to the question of climate change, it is possible to examine if there are any changes and, if so, what are the changes in humans' and societies' values, beliefs, and responses to climate change (O'Brien & Wolf, 2010, p. 237). This approach enables the understanding of how the consequences of natural hazard events caused by climate change impacts the society experiencing these events (O'Brien & Wolf, 2010, p. 239). Additionally, it will highlight what these consequences mean to the specific society and how it impacts the society's willingness to adapt.

Howarth & Sharman (2015, p. 245) emphasize that values and opinions are not fixed, meaning they constantly evolve due to different inputs and experiences. However, in Hobson & Niemeyer's (2012, p. 409) article, they examine if exposure to climate facts can alter climate sceptic perception. They find that the participants' beliefs have a minor change towards less sceptic but eventually return to their original belief. This may be due to the individuals only learning about climate change. As Lee, Markowitz, Howe, Ko, & Leiserowitz' (2015, p. 1017) argue that there will be a global shift in belief in climate change as more people experience its consequences, such as natural disasters and extreme weather. Marshall et al. (2019, p. 2) builds upon this argument but emphasise how personal experience and an increased fear of climate change consequences impacting their lives may lead to more acceptance towards climate change and sustainable policies. This is evident in Africa and Asia, where there has been an increase in temperature and natural hazard events, which has resulted in a higher level of climate change awareness (Lee, Markowitz, Howe, Ko, & Leiserowitz, 2015, p. 1017).

Asia and Africa are not the only continents that have experienced increased temperatures. In 2005 Rahmstorf (p. 77) pointed out that global temperatures have never been higher since the beginning of registering temperature data than it was in the period 1995-2005. NASA's records show that the temperatures continued to increase at an all-time high in 2016 and 2020 (Shaftel, Callery, Jackson, & Bailey, 2023). This global increase in temperature has also resulted in heat-related natural disasters. In Europe, there are three years prior to 2016 that stand out as particularly hot and dry, namely 2003, 2010, and 2015 (Sutanto, Vitolo, Di Napoli, D'Andrea, & Van Lanen, 2020, p. 1). This paper, therefore, uses disaster data from 2006 to 2016, which includes two of the hottest and driest years. This timeframe is because the European Social Survey from 2016 has more in-depth questions regarding climate change, making it the most helpful questionnaire for answering this paper’s research questions. The reason for not using EM-DAT data before 2006 is due to how humans perceive time, where the past and the future are perceived as distanced from the present (Pahl, Sheppard, Boomsma, & Groves, 2014, p. 379). Since humans only can visualise a certain number of years it is essential to ensure that the ESS respondents can remember the disaster events, which is more likely when they only have to remember ten years or less back in time (Tonn, Hemrick, & Conrad, 2006, p. 810). This temporal aspect will be discussed further in the theory chapter.

Since exposure to natural hazard events has had an impact on climate change perception in Africa and Asia, it is interesting to examine if this is the case in other locations too. As much of the research on climate scepticism focuses either on the larger countries such as the United States of America or Australia or qualitatively on smaller regions in Africa or Asia, there is a lack of knowledge about climate change scepticism in Europe (Tuitjer, Dirksmeier, & Mewes, 2022, p. 2,4). Tranter & Booth (2015, p. 155) argue that there is a need for a more significant focus on comparative cross-national studies. This paper, therefore, aims to address these two gaps in the research by conducting a quantitative analysis on climate scepticism in several European countries, twelve to be specific. The countries are selected based on whether they have experienced a drought period, heat wave, or wildfire in the timeframe 2006-2016 and whether they participated in the European Social Survey in 2016. All countries that fill that requirement have been included in the analysis.

3. Theory

This chapter presents the essential theories of the thesis. The chapter starts with thoroughly explaining climate scepticism and natural disasters, the key terms in this paper. Furthermore, the chapter introduces two theoretical aspects that will help to understand people's reactions to natural disasters and why they can influence climate sceptics. First, a brief overview of human adaptation is described. Secondly, the theory around values is presented, focusing more on human values.

3.1 Climate scepticism

It has come to a general agreement that climate change is caused and driven by human activity (Marshall et al., 2019, p. 2). Nevertheless, there are still individuals who deny these "common agreements", namely the climate sceptics. Despite climate sceptics or climate deniers being a familiar concept among the public, the various rationales for and positions within climate scepticism make presenting a singular definition close to impossible (Hobson & Niemeyer, 2012, p. 397). As climate scepticism is often examined in various academic fields such as geography, psychology, and anthropology, the phenomenon has become an umbrella definition in order to include as many perceptions and rationales as possible (Tuitjer, Dirksmeier, & Mewes, 2022, p. 2). In their article, Tuitjer, Dirksmeier & Mewes (2022, p. 2) therefore, present the following broad definition where climate change scepticism is seen as a "sceptical perspective on the existence of climate change and/or sceptical attitude towards climate science".

Labelling an individual as a climate sceptic enables us to examine their surrounding opinions and values, which allows us to make assumptions on what views define climate sceptics. Despite this being helpful in structuring public opinion, it is not necessarily always beneficial in practice. Howarth & Sharman (2015, p. 244) argue that "labels in the climate debate focus on identifying those at polarized extremes". This means that the label climate sceptic or denier is at the opposite end of the scale, whereas the other label an individual would get is environmentalist, which does not portray the complexity of the climate perception. This also forces all the different types of climate sceptic perceptions to be categorised and analysed as one and the same. Again, this can result in a "us vs. them" mentality during a debate between a climate sceptic and an environmentalist, even though the two individuals might be closer in belief than the labels indicate (Udah, 2019, p. 3).

Another criticism of the labelling of climate sceptics is the use of the word scepticism, as it modifies the meaning of the word itself (Howarth & Sharman, 2015, p. 241). Scepticism is a cornerstone in science as it represents the view that a scientist must doubt claims that are either not grounded in empirical evidence or not possible to reproduce (Bryce & Day, 2014, p. 606). Within science, scepticism, therefore, drives science towards more accurate representations of the elements researched. However, the methodology is not necessarily applied when it comes to climate scepticism. Rahmstorf (2005, p. 79) exemplifies this with several articles produced by climate sceptics, who have "cherry-picked" scientific data which coincides with their beliefs in order to influence the public.

In addition to the criticism highlighted above, Tuitjer, Dirksmeier & Mewes's (2022, p. 2) definition of climate scepticism only enables an understanding of the concept. However, it does not allow for operationalisation of climate sceptic tendencies. To operationalise this concept, it is better to categorise different beliefs within climate scepticism. This also addresses one of the main critiques of climate scepticism as it provides a diverse set of beliefs within the concept. Hobson & Niemeyer (2012, p. 398) use Cohen's (2001) operationalisation of denial and applies it for climate sceptic perception. They identify three categories of climate sceptics, interpretive deniers, implicatory deniers, and literal deniers. The definition of these categories coincides much with the categories Rahmstorf (2005, p. 77) identifies in his paper. However, Rahmstorf (2005, p. 77) identifies a fourth category, which he names the impact sceptic.

The interpretive deniers (Hobson & Niemeyer, 2012, p. 398) are called attribution sceptics in Rahmstorf's (2005, p. 77) article. The attribution sceptics do recognise that there is a change occurring in the climate, yet they do not believe that it is due to human activity but rather natural cycles. One argument used by attribution sceptics is that there have always been periods of higher and lower temperatures, such as ice ages (Rahmstorf, 2005, p. 79). The rise in temperatures today is, therefore, just a continuation of these cycles, according to attribution sceptics. The implicatory deniers (Hobson & Niemeyer, 2012, p. 398), like the attribution sceptics, see that there is a climatic change but do not believe that there is anything humans can do about it. Furthermore, Rahmstorf (2005, p. 79) identifies the impact sceptics, who also believe that the climate is changing. They, however, do not see it as something negative but rather something that can have a positive effect on the environment. One argument they use is that a rise in temperature can allow for more agriculture in locations that are now too cold.

The final category within climate scepticism is the trend sceptics (Rahmstorf, 2005, p. 77), also called literal deniers (Hobson & Niemeyer, 2012, p. 398). Individuals who can be categorised into this type of scepticism do not believe that climate change is taking place. Some of their arguments include that climate change research is too uncertain to act upon (Diethelm & McKee, 2009, p. 3) or that the findings are due to other influences than actual climate change (Rahmstorf, 2005, p. 77). These claims are easier to put forward for sceptics in the global north who are yet to experience frequent devastating natural hazard events. However, as Lee, Markowitz, Howe, Ko, & Leiserowitz (2015, p. 1017) emphasise, experienced increases in temperature have led to an increase in climate change awareness in the global south. Since this paper wants to examine if there is a change in climate sceptic perceptions after the exposure of a natural disaster in Europe, an interesting angle is to look at the most extreme category of climate sceptics, namely the trend sceptics, to examine if they acknowledge the changes.

For the sake of being consistent and remaining with the concept of scepticism, the paper will continue to use Rahmstorfs's (2005, p. 77) names for the different categories of climate sceptics. Since Rhamstorf (2005) does not have a name or category for the implicatory deniers, this paper adjusts the name to implicatory sceptic to avoid confusion. It is, however, used as the "implicatory deniers" category of Hobson & Niemeier (2012, p. 398). In this paper, when using the term climate sceptic, it includes all four of the sub-categories.

One might ask why some individuals do not believe in climate change? One reason may be due to political or ideological reasons (Weber, 2010, p. 332). Researchers have identified a pattern where conservatives and people who identify with the political right have a tendency to be more climate sceptic and against mitigation policies (McCright, Dunlap, & Marquart-Pyatt, 2016, p. 343) (Tranter & Booth, 2015, p. 162). Other individuals who possess climate sceptic tendencies are people who benefit from not having strict mitigation policies and who most likely would suffer economic consequences from said policies, such as people working in the fossil fuel industry (Rahmstorf, 2005, p. 79). Another reason that has been highlighted as essential to understanding why some individuals do not believe that climate is changing is the psychology of humans, as this determines human values, beliefs, and how humans perceive different inputs from the environment around them (Weber, 2010, p. 332).

This paper will go deeper into values and beliefs, but one aspect directly related to human psychology is the temporal aspect, meaning how humans perceive time. In terms of evolution, humans are wired to care about the environment in which they find themselves at the time, meaning that they will "prioritize short-term consequences" (Pahl, Sheppard, Christine Boomsma, & Groves, 2014, p. 376). This means in practice that due to climate change happening over a long period of time and the consequences of our actions today will not be visible for another several years, humans do not perceive climate change as an imminent threat (Pahl, Sheppard, Christine Boomsma, & Groves, 2014, p. 376). In a psychological study, it was found that people are unable to imagine further than a maximum of 20 years into the future (Tonn, Hemrick, & Conrad, 2006, p. 810). This creates a greater distance between humans today and the expected rise in climate change impacts in the future (Field et al., 2012, p. 7). Pahl, Sheppard, Christine Boomsma, & Groves (2014, p. 376) argue that the most significant impacts of climate change lie ahead of us, but some are already happening. This paper examines if the impact happening now will shift the public perception towards more people believing that climate is changing.

3.2 Natural Disasters

The Intergovernmental Panel on Climate Change (IPCC) assumes that the occurrence of natural hazard events will increase in strength and frequency due to climate change (Field et al., 2012, p. 7). To understand the connection between the two, it is essential to understand what is meant by climate change. Much of the time, climate change is used interchangeably with the term global warming, both by the public, but also by politicians and even scientists (Tranter & Booth, 2015, p. 158). However, global warming is only one aspect of climate change if one uses Schuldt, Konrath & Schwarz' (2011, p. 116) understanding of the two. They argue that global warming is limited to the increase in temperatures, whereas climate change speaks of general changes in different climatic variables, including temperature. The IPCC defines climate change as

> *"A change in the state of the climate that can be identified (e.g., by using statistical tests) by changes in the mean and/or the variability of its properties and that persists for an extended period, typically decades or longer. Climate change may be due to natural internal processes or external forcings, or to persistent anthropogenic[1] changes in the composition of the atmosphere or in land use." (Field et al., 2012, p. 5)*

The definition above allows for the inclusion of other aspects than purely rising temperatures, such as extreme colds, windier conditions, or more humidity (Burroughs, 2007, p. 2). Nevertheless, when speaking about climate change, it is often about how greenhouse gas emissions cause global increases in temperature (Singh & Singh, 2012, p. 93). Which has led to the Paris Agreement's goal of limiting the temperature rise to 2°C above pre-industrial levels (UNFCCC, n.d). In the media, on the other hand, it is more common to hear about the 1.5°C goal, as the IPCC has stressed the fact that going beyond this will result in even more damaging and unpredictable climatic impacts. Due to this, it is not odd that the concepts of climate change and global warming are used interchangeably.

Despite the interchangeable use of global warming and climate change, Schuldt, Konrath & Schwarz (2011, p. 116) argue that when individuals are asked questions regarding climate change, whether the question contains the term climate change or global warming has an impact on the answers of the individual. In their article, they highlight Whitmarsh's (2009, p. 418) findings, which state that the concept of climate change is less linked with human causation than what the term global warming is. A logical expectation would be to use the term global warming in this paper as it will be focusing on heat-related natural hazard events. However, due to Schuldt, Konrath & Schwarz's (2011, p. 116) discovery that the term used in survey questions influence the answers of the respondents, this paper will use the concept of climate change. Both because the term is more accurate, as global warming technically does not encompass drought nor wildfires, but also because the European Social Survey uses the term climate change in their survey questions.

Climate change causes long-term impacts, such as rising sea levels and an increase in global temperature, but also a higher frequency of short-term events, such as heat waves, floods, or hurricanes (Singh & Singh, 2012, p. 102). These types of events can be categorised into natural hazard events, natural disasters, and extreme weather or climate events (Banholzer, Kossin, & Donner, 2014, p. 24).

Natural hazards can be understood as an umbrella definition of all types of natural processes or phenomena. It describes possible threatening events in a specific location (UNISDR, 2009, p. 20-21). In some cases, the term is used to describe actual hazard events in addition to the possible events. However, in the Emergency Events Database

[1] Caused by humans.

(EM-DAT), the use of hazard is restricted to a "threatening event, or probability of occurrence of a potentially damaging phenomenon" (CRED, 2023). A natural disaster, on the other hand, is an event which has occurred and has led to either one, two, or all of the following consequences: economic, environmental, or human losses (UNISDR, 2009, p. 9). These consequences are often of such magnitude that it exceeds the resources of the affected community to cope, resulting in the need for national or international assistance (UNISDR, 2009, p. 9) The data registered in EM-DAT is defined as disasters based on EM-DATs definition, which states that a disaster is a

> *"Situation or event, which overwhelms local capacity, necessitating a request to national or international level for external assistance (definition considered in EM-DAT); An unforeseen and often sudden event that causes great damage, destruction and human suffering. Though often caused by nature, disasters can have human origins." (CRED, 2023)*

On the other hand, extreme weather or climate events do not include the consequences of the event. Field et al. (2012, p. 5) define them as the "occurrence of a value of a weather or climate variable above (or below) a threshold value near the upper (or lower) ends of the range of observed values of the variable." For instance, temperature above the average temperature for a given location and time. An extreme weather or climate event can become a natural disaster when it results in damaging consequences. Since the data in EM-DAT only register disaster events and this paper aims to examine how an event impacts the perception of climate change, the paper will not be examining extreme weather or climate events but be applying the term natural hazard events as a general term about possible events, while applying the concept of natural disaster when discussing the actual events measured in EM-DAT.

According to Banholzer, Kossin, & Donner (2014, p. 21), it is likely that a "one-in-20-years hottest day" will, by the end of the century, occur every two years. This statement exemplifies how significant temperature is when actualizing the connection between natural hazard events and climate change, which is why this paper only focuses on heat-related natural hazard events, namely heat waves, wildfires, and droughts. These three events are defined as dry hazards and are characterised by elevated temperatures and below-average rainfall (Sutanto, Vitolo, Di Napoli, D'Andrea, & Van Lanen, 2020, p. 1). These three events have been researched together on multiple occasions, including in Sutanto, Vitolo, Di Napoli, D'Andrea, & Van Lanen (2020) and in Field et al. (2012, pp. 496-498). Both emphasise how a rise in global temperatures and a decrease in precipitation due to climate change will have an impact on the severity of these events (Banholzer, Kossin, & Donner, 2014, p. 3), (Field et al., 2012, p. 496).

Heat waves can be defined as a period in which the temperature is above average for a given time (CRED, 2023). Since the average temperature varies from location to location across the world, there is no global measure for when to name an event a heat wave (Sutanto, Vitolo, Di Napoli, D'Andrea, & Van Lanen, 2020, p. 3). There are, however, some characteristics that help define a period with increased temperatures, such as the longevity of the increased heat. This characteristic may also vary from research to research. However, in EM-DAT, an event is characterised as a heat wave when there is an above-average temperature or unusually humid weather for more than two consecutive days (CRED, 2023).

Defining droughts leads to many of the same challenges when defining heat waves. The parameters for when something is called a drought depend on the location and duration of the event (Tate & Gustard, 2000, p. 23). Nevertheless, there are some general understandings of what characterises a drought period, which is illustrated in McMahon & Diaz Arenas' (1982) definition. They define drought as

> *"a period of abnormally dry weather sufficiently prolonged for the lack of precipitation to cause a serious hydrological imbalance and carries connotations of a moisture deficiency with respect to man's usage of the water" (McMahon & Diaz Arenas, 1982, p. 2).*

EM-DAT applies the same understanding of drought, where drought is understood operationally as the "degree of precipitation reduction that constitutes a drought, vary by locality, climate and environmental sector." (CRED, 2023). However, EM-DAT emphasises the fact that droughts develop over time, which is different from heat waves and wildfires, which are more sudden in occurrence.

Like droughts, wildfires often occur when there is a lack of precipitation. Nevertheless, like all fires, wildfires need fuel and something that ignites the spark (Sutanto, Vitolo, Di Napoli, D'Andrea, & Van Lanen, 2020, p. 3). The latter can come from natural phenomena such as lightning or an erupted volcano; however, it is often due to human activity like bonfires or a cigarette. The fuel is different types of vegetation like forest, brush, or bush (Youssouf et al., 2014, p. 239). What is similar for all wildfires is that they are uncontrolled and cause severe damage to the vegetation. In addition to this, EM-DAT acknowledges that environmental conditions such as wind and topography influence the severity of the wildfire (CRED, 2023). Besides causing damages to the environment these dry hazards have consequences that impacts humans to various degrees.

3.3 Human adaptation

According to Phillips (2013, p. 1) does "the term 'human adaptation' refer to a person's response to the complexities of living in society". By this umbrella definition, there are multiple ways of examining and explaining human adaptation. In Harrison and Morphy (1998), four categories of adaptation are identified, genetic, physiological, behavioural, and cultural (Himmelgreen, 2001, p. 159). The two categories, genetic and physiological, can be categorised into one overviewing category, namely biology. The biological way of looking at human adaptation is rooted in Darwin's theory of evolution. It examines and explains how human physically and biologically adapts to the environment in which they live (Dyson-Hudson, 2019, p. 2), for instance, through natural selection and developing opposing thumbs (Himmelgreen, 2001, p. 160). However, biological adaptions require years to unfold, while the current change in climate is happening so fast that it exceeds human adaptivity biologically (Rahmstorf, 2005, p. 79).

On the other hand, behavioural and cultural adaptation can occur rapidly and within the life of a human being (Fogarty & Kandler, 2020, p. 1). Behavioural and cultural adaptation are related to the theory of natural selection but in a broader sense. Behavioural adaptation describes the changes in, for instance, movements, food production, and social behaviours in order to maximise survival (Tuomainen & Candolin, 2010, p. 640). An example can be the production of new grains due to changes in soil, moisture, or temperature (Tuomainen & Candolin, 2010, p. 649). Although behavioural adaptations usually coincide with cultural adaptation, some individuals in a society can decide not to change their behaviours. Cultural adaptation can be seen as the change in a group's values, beliefs, and practices, which are significant for the group's survival and satisfactory living (Heyd & Brooks, 2009, p. 270).

In climate change research, however, adaptation is rarely split into genetic and cultural categories. Due to climate change happening rapidly, adaptation is used as a word to describe the necessary changes in current practices which have the potential to reduce climate change or at least the damages that occur due to it (Smit & Pilifosova, 2001, p. 879). Smit and Pilifosova (2001, p. 879) explain that "Adaption refers to adjustments in ecological, social, or economic systems in response to actual or expected climatic stimuli and their effects or impacts". However, empirical evidence shows that some individuals do not agree with the need for such adaptations, namely climate sceptics. According to Tuomainen & Candolin (2010, p. 640), a reason for this may be due to climate change being an environmental condition that humans have not encountered previously. This can confuse individuals and drive them to maladaptive responses, such as denying climate change or refusing to adopt mitigation policies. Climate scepticism can also be due to different stages in behavioural and cultural adaptation, as both are dependent on individual or group values. According to O'Brien & Wolf (2010, p. 233), "from the perspective of values, climate change means different things to different individuals and groups". Can exposure to climate change-related natural hazard events impact an individual's values and perception of climate change? To examine this, it is crucial to understand what is meant with values and how they change.

3.4 What are values?

There are two main descriptions of the concept of values. In order to comprehend the relation values has to climate change, and why this is an interesting element to examine, it is crucial to highlight both definitions and how they are implemented in climate change science (Corner, Markowitz, & Pidgeon, 2014, p. 412). When speaking of values within climate change research, it is often economic values, either in terms of economic loss when implementing adaptation policies or when expressing the damages of natural hazard events in the number of deaths or cost of property destroyed (O'Brien & Wolf, 2010, p. 232). When applying this definition of values to research on climate change adaptation, a cost-benefit analysis will likely be used. This means that a policy on adaptation due to climate change will only be implemented once the benefit of this implementation outweighs the monetary costs. This approach does not take the impact on human cultural societies into consideration, which is why O'Brien & Wolf (2010, p. 239) emphasises the need for a new understanding of values in climate change research and highlights subjective human values as a topic of research.

In sociology, *values* are defined as "those moral beliefs to which people appealed for the ultimate rationales of action." (Spates, 1983, p. 28). This definition of values is based on human morale and their beliefs, which is what O'Brien & Wolf (2010, p. 232) suggests being implemented in climate change vulnerability and adaptation research. The importance of this perspective is due to values differing from person to person and will therefore impact how an individual experience and think about climate change (O'Brien & Wolf, 2010, p. 233). This argument is rooted in Rokeach's (1979, p. 2) explanation that values not only influence the rationales of action in humans but also provide a standard for "judgment, choice, attitude, evaluation, argument, exhortation, rationalization, and one might add, attribution of causality" (Rokeach, 1979, p. 2). In short, values serve as the foundation in human behaviour and reflection (O'Brien & Wolf, 2010, p. 233). After highlighting the two ways of defining values, this paper continues to focus on human values, from now on values.

According to Schwarz (2010, p. 20), a key element of values is the fact that they are "ordered by importance relative to other values to form a system of value priorities". This aspect is evident in Maslow's Hierarchy of Needs. Through the illustration of a pyramid, Maslow demonstrates how there are different hierarchical levels of human needs and how each level must be fulfilled before humans prioritise the needs higher up in the hierarchy (Maslow, 1970, p. 59). Figure 1 illustrates the most basic human needs, such as food and sleep, at the foundation of the pyramid while increasingly illustrating more and more abstract human values, such as status and self-esteem, the further up on the pyramid one goes. This figure can therefore be applied to values as a lack in, for instance, safety will make a person value safety measures and will behave accordingly in order to fulfil this need. A consequence of the fulfilment of needs is the constant chase of the higher needs and lack of value on the lower hierarchical needs, as these eventually are taken for granted (Maslow, 1970, p. 61).

Figure 1: Maslow's Hierarchy of Needs (McLeod, 2018, p. 5)

Maslow's Hierarchy of Needs exemplifies human values in general but is specific to the values of an individual human being. Although values are primarily individualistic, as social creatures' humans tend to develop similar values as the social group in which they find themselves (Schwartz, 2010, p. 21), which relates to cultural adaptation (Heyd & Brooks, 2009, p. 270). An example could be the value of fair play within a football team. According to O'Brien & Wolf (2010, p. 234), due to interlinkage with individual and group values, it is hard to determine whether an individual's value is, in fact, their own or if it is imposed on the person due to their belonging in a societal group. Additionally, the values of a group are not necessarily a product of the group itself but of the group's leader. An example here can be the value of celibacy before marriage in a religious community because the religious leader has emphasised the importance of this value. A consequence of such societal group values is that although an individual might experience a change in their individual values, they may not express it externally due to fear of being rejected or ridiculed by the group. This results in a mismatch of personal and group values. In the case of climate sceptics, a change in these values in a given climate sceptic society will most likely not lead to an adaptation toward mitigation strategies.

Maslow's hierarchy of needs is a popular theory in many research fields, such as geography, psychology, and economics (Fallatah & Syed, 2018, p. 36). This is due to the simplicity of the model, enabling it to be applicable to many different topics (Fallatah & Syed, 2018, p. 37). However, the wide range of usage and simplicity of the model has ensured that the theory has gotten much critique. One critique is directed at the fact that Maslow argues that the importance of a need or value will decrease once the need is fulfilled. Research has found that the fulfilment of different needs was, in fact, not hierarchical, where the social need was often more fulfilled than the security need (Fallatah & Syed, 2018, p. 42). This means that there are more ways than the fulfilment of a need that motivates the importance of higher needs (Wahba & Bridwell, 1976, p. 214). This leads to another critique which is directed at the disproportionate emphasis on the different levels. Hanley & Abell (2002, p. 38) argue that the "love and belonging" level of the pyramid has more considerable importance also within the lower hierarchal levels. Humans are social creatures who are predisposed to form social bonds with other humans (Berscheid, 2003, p. 37). Hanley & Abell (2002, p. 38) argue that the social bonds humans form are also necessary to fulfil the physical, safety, and even esteem needs. Indicating that Maslow's hierarchy does not acknowledge this dimension.

Lastly, Hanley & Abell (2002, p. 37) argue that Maslow does not account for other value systems or worldviews as his model is based on Western ideals. This argument is possible to build upon, as there are also several different value systems within the Western world. Inglehart's (1997, p. 4) theory identifies two of them, namely materialist and post-materialist values. The distinction between the two lies in what the individuals within these worldviews focus on. Materialists have a tendency to focus on economic and physical security, which in a broad sense, can follow Maslow's hierarchy of needs. On the other hand, post-materialist values focus less on economic issues and a greater deal on more abstract values such as freedom of speech and political participation (Tranter & Booth, 2015, p. 156). This is why research has found that individuals with post-materialist values have a higher likelihood of believing climate change and that something needs to be done against it (Tranter & Booth, 2015, p. 156) (Kvaløy, Finseraas, & Listhaug, 2012, p. 16). Although these two worldviews co-exist, Inglehart (1997, p. 5) argues that there is an overall cultural shift from materialist to post-materialist values in Western societies. Lastly, Inglehart (1997, p. 3) emphasises the importance of "deep rooted changes in mass worldviews (in) reshaping economic, political, and social life".

It is no secret that values have changed over a long period of time, from the early primitive days of humankind until today (Calman, 2004, p. 366). As the world has become modernised, a large proportion of humans have been able to rely on the physiological and safety needs being a constant, enabling them to focus on reaching higher level of needs, if we use Maslow’s theory . The action of constantly striving for a higher level of need is derived from active motivations (Schwartz, 2010, p. 21). These motivations work as active values of the individual reaching for a higher goal and will change once a goal is met, resulting in a change of value (Maslow, 1970, p. 38). However, this way of looking at value changes relies solely on a singular direction of value change, giving the impression that once a goal is reached, it will never be lost.

Additionally, this type of value change describes a whole category of values, not a change in individual values within one level of needs.

As Calman (2004, p. 366) illustrated, a change in values can happen gradually over several generations but can also occur during the lifetime of one person (O'Brien & Wolf, 2010, p. 234). Paradoxically, when it comes to changes in values related to climate change, the rate at which the climate is changing the changes in values are lacking in speed. Marshall et al. (2019, p. 2) argue that changes in perceptions and beliefs related to climate change have developed exceptionally slowly, and there is still a long way to go before the climate sceptics accept that climate change is happening, that it is human-caused, and that it needs to be addressed with adaptation efforts.

According to Williams Jr. (1979, p. 16), values and beliefs are strongly connected to knowledge; as Williams Jr. quotes, "our judgements of what should be are always related to what is" (Williams Jr., 1979, p. 16). This argument builds on the fact that access to new knowledge will have an impact on a person's values and beliefs. However, in the days of fake news, it is easy to mislead and create a sense of knowledge which is, in fact, not based on scientific facts (Zhang & Ghorbani, 2020, p. 2). Due to algorithms, individuals with similar opinions tend to receive content aligning with their beliefs on their social media platforms, which may fuel their false beliefs as well as link them with like-minded individuals online (Zhang & Ghorbani, 2020, p. 14). This has been the case for several topics, such as vaccination, the 2016 U.S. presidential election, and climate change (Zhang & Ghorbani, 2020, p. 3). On the other side, knowledge can change through experience, which again could change an individual's values (Williams Jr., 1979, p. 16). Experiencing a natural hazard event may provide a different view on the individual's knowledge of climate change.

4. Methodology

The methodology chapter aims to present a clear understanding of the data and methods used to conduct the analysis. First, it introduces the two datasets that are used, the Emergency Event Database (EM-DAT) and the European Social Survey (ESS). Second, the different variables are presented. Furthermore, the analysis method, ordered logistic regression, is described. Finally, a brief overview of the software used to conduct the analysis is given.

4.1 The data

The Emergency Event Database (EM-DAT) contains data on natural and technical disasters that have occurred around the world. The objective of this database is to provide necessary data for decision-making on risk assessment and disaster preparedness (CRED, 2023). EM-DAT was launched by the Centre for Research on the Epidemiology of Disasters (CRED) in 1988 and includes disaster data from 1900 until today. The data is categorised into various subgroups based on their cause, such as geophysical, hydrological, or biological. This paper focuses on disaster types within the climatological and meteorological categories. Where the data has been narrowed down to include events of the three dry hazards, extreme temperature, drought, and wildfire, from 2006 to 2016 in Europe. EM-DAT collects its data from several different sources, such as UN agencies, insurance companies, media, and research institutes. However, this proves to make the database less of quality as many of the different variables do not have any registered values, making the database incomplete. Additionally, the EM-DAT data follows the climate change research pattern of only including the economic values, such as damages and injured, which O'Brien & Wolf (2010, p. 233) critique in their article. To compensate for this and follow O'Brien & Wolf's (2010, p. 235) values-based approach, the analysis includes data from the ESS.

The European Social Survey (ESS) is a cross-national survey which examines values and public attitudes in Europe(ESS8, 2023). ESS was launched in 2002 and has since been published biennially, with different focus questions each round. However, there are some standard questions that are repeated for each survey, such as socio-demographic characteristics or political attitudes. The data is collected through face-to-face interviews, where the respondents are European residents above 15 years old chosen through a strict random probability sampling regime. For this analysis, the data from the ESS round 8 in 2016 is used, as this has a wide range of survey questions around climate change. A disadvantage of using this data for the values variables is that the ESS round 8 is the only round which asks questions about climate change. This makes it hard to conduct a longitudinal study, which would have been the most ideal way to examine change in climate sceptic perceptions.

4.2 The variables

This analysis will focus on one of the four types of climate sceptics, the trend sceptics. These do not believe that the climate is changing. To identify these trend sceptics, the dependent variable is the ESS variable "clmchng", which presents the respondents answer to the question "Do you think world's climate is changing?". The variable is re-named to think.climate.change in the analysis. The variable is at the ordinal level, with values from 1-4, where 1 is definitely changing and 4 is definitely not changing, 2 and 3 are probably changing and probably not changing. Additionally, the respondent could refuse (7), not know (8), or not answer (9); these have, however, been recoded to NA and are not included in the analysis.

Due to this being a quantitative analysis of climate scepticism, which independent variables that might influence climate scepticism are not easy to pinpoint. This is because what characterises a climate sceptic is different based on the individual's location in the world (Lee, Markowitz, Howe, Ko, & Leiserowitz, 2015, p. 1014). Nevertheless, some studies have found that women are more likely to believe that the climate is changing than men ((Marshall et al., 2019, p. 2) (Devine-Wright, Price, & Leviston, 2015, p. 74). In Tranter & Booth's (2015, p. 161) article, they conduct a statistical analysis to examine which variables that are most significant when examining climate scepticism. They identify gender and age as significant when adjusted for country variation, where men are more likely to be climate sceptics, as are older individuals, which Devine-Wright, Price, & Leviston (2015, p. 74) also finds in their article. Tranter & Booth (2015, p. 161) also identify that individuals who have completed higher levels of education are less prone to climate sceptic tendencies. Therefore, these three are some of the most common socio-demographic variables significant for climate sceptics and are included in this paper's analysis.

The gender variable is a dummy variable where male equals 1 and female equals 0. The ratio variable, age, goes from 15 to 100. The respondent also had the opportunity to refuse to reveal their age; these are coded NA and are not included in the analysis. The education variable illustrates the number of years of full-time education completed, going from 0 to 54, which makes this a ratio variable. Additionally, to analyse the changes in human values, the analysis includes three different human values variables. One common element for all variables is that the different missing categories, such as "Refusal", "Don't know", and "No Answer", have been recoded to NA. A descriptive statistic of all variables can be found in Table 1.

For this analysis, the countries have been selected through a merging of ESS and EM-DAT, where all the European countries that are in both datasets are included. This has resulted in the following 12 countries being included in the analysis: Austria, Belgium, Germany, Spain, France, Hungary, Italy, Lithuania, the Netherlands, Portugal, the United Kingdom, and the Russian Federation. Additionally, these countries have been dummy coded into 12 separate variables. However, as both datasets have data on regions, the analyses of the different natural disaster events are on a regional level. The region variable is on a nominal level and is coded after the ESS categorical format, meaning that the EM-DAT regional data has been recoded to fit with the ESS data (ESS ERIC, 2017).

As mentioned, this analysis deals with dry hazards, namely heat waves, droughts, and wildfires. For this analysis, there are, in total, 31 natural disaster events. Each of the three natural disasters have been dummy coded to experienced disaster = 1 or not experienced disaster = 0, with the variable names "Heat.wave", "Drought", and "Wildfire". This enables the distinction of the effect of the different natural disasters but also between regions that have experienced any form of natural disaster and the regions that have not experienced any.

The three variables regarding human values have been included to fit with the theory of Maslow's hierarchy of needs. The variables measure how important the respondent thinks it is to " live in secure and safe surroundings, "to be loyal to friends and devote to people close", and "to be successful and that people recognize achievements", which fits into Maslow's pyramid levels 2, 3, and 4, respectively. The variables regarding values that have been included in this analysis are on an ordinal level and have the following response categories: Very much = 1, Like me = 2, Somewhat like me = 3, A little like me = 4, Not like me 5, and Not like me at all =6. For the analysis, the variables have been coded to "imp.safe.surround", "imp.friends", and "imp.success".

Table 1: Descriptive statistics

Variable				**N**		**%**
Dependent variable						
Do you think world's climate is changing						
Definitely changing				19710		57.97
Probably changing				11770		34.62
Probably not changing				1455		4.28
Definitely not changing				1063		3.13
Independent variables						
Categorical variable						
Important to live in secure and safe surroundings						
Very much like me				9370		27.26
Like me				12072		35.12
Somewhat like me				6891		20.05
A little like me				3544		10.31
Not like me				1992		05.79
Not like me at all				506		01.47
Important to be loyal to friends and devote to people close						
Very much like me				11650		33.93
Like me				14084		41.01
Somewhat like me				5901		17.18
A little like me				1894		5.52
Not like me				619		1.80
Not like me at all				192		0.56
Important to be successful and that people recognize achievements						
Very much like me				3904		11.42
Like me				8617		25.21
Somewhat like me				8553		25.02
A little like me				5992		17.53
Not like me				5257		15.38
Not like me at all				1863		5.45
Continuous variables	**N**		**Mean**	**SD**	**Min**	**Max**
Age	34812		49.41	18.67	15	100
Education	34514		12.74	3.92	0	54
Dummy variables	**N**	**N (1)**	**N (0)**	**%(1)**		**% (0)**
Male	34900	16148	18752	46.27		53.73
Heat wave	34900	17319	17581	49.62		50.38
Drought	34900	8293	26607	23.76		76.24
Wildfire	34900	4628	30272	13.26		86.74
Austria	34900	2010	32890	5.76		94.24
Belgium	34900	2747	32153	7.87		92.13
Germany	34900	2852	32048	8.17		91.83
Spain	34900	2502	32398	7.17		92.83
France	34900	4349	30551	12.46		87.54
United Kingdom	34900	1959	32941	5.61		94.39
Hungary	34900	1614	33286	4.62		95.38
Italy	34900	5112	29788	14.65		85.35
Lithuania	34900	2122	32778	6.08		93.92
The Netherlands	34900	1681	33219	4.82		95.18
Portugal	34900	1600	33300	4.52		95.42
Russian Federation	34900	6352	28548	18.20		81.80

4.3 Ordered logistic regression

To answer the research questions, this paper will use ordered logistic regression because the dependent variable is on an ordinal level. Variables on an ordinal level are often found in social science research, especially when the research examines public values or beliefs (Fullerton, 2009, p. 306). Survey questions regarding values or beliefs often have several response categories which can be ranked, but not in the same way as continuous variables, due to individuals defining the distance between the categories differently. This quality favours a logistic regression (Peng, Lee, & Ingersoll, 2002, p. 3), which uses maximum likelihood to estimate the likelihood of a value on the dependent variable given the values of one or more independent variables (Eliason, 1993, p. v). For ordinal variables, the more advanced ordered logistic regression model is the most suited model, as this allows for more than two response categories on the dependent variable (Kropat, Bochud, Murith, Palacios, & Baechler, 2017, p. 378).

Within ordered logistic regression, there are several different ways of modelling the result (Fullerton, 2009, p. 306). The most common model is the proportional odds logistic regression (McCullagh, 1980, p. 110). This is also the default logistic model for ordered variables in R and the one which will be used in the analysis. The proportional odds logistic regression is a model within the cumulative approach of ordered logistic regression (Fullerton, 2009, p. 311). This means that the model determines the probability of being in the different categories of the dependent variable based on logit equations. Following Fullerton's (2009, p. 311) explanation, the cumulative approach for this paper's dependent variable will be as follows:

Climate is

> Definitely changing (1) vs. probably changing + probably not changing + definitely not changing (0) → Equation 1
> Definitely changing + probably changing (1) vs. probably not changing + definitely not changing (0) → Equation 2
> Definitely changing + probably changing + probably not changing (1) vs. definitely not changing (0) → Equation 3

Another way to conduct this analysis would be to make the dependent variable dichotomous and run an ordinary logistic regression (Peng, Lee, & Ingersoll, 2002, p. 3). However, the advantage of running an ordered logistic regression lies in the possibility of discovering slight changes in perception, which provides a more informative analysis. A logistic regression with a dichotomous dependent variable would, in this case, mean that the values would be "believe climate is changing" and "do not believe climate is changing" which would not allow us to examine the slight changes within the trend sceptics perception.

4.4 Software

To run the analysis, the software R Studio with the R version 4.2.2 was used with the programming language R to conduct statistical analyses. The R-script with the code for the analyses can be found in appendix C.

5. Results

This chapter presents the results from the various analyses that have been conducted in order to examine the research questions. The chapter is structured into three sections according to the natural disaster examined. Within each section, both models examining the effect of the disaster itself on the belief in climate change, as well as models which examine the effect of natural disasters and values, are included in all parts.

5.1 Heat waves

The first natural disaster variable the analysis examines is the heat wave variable. When running the analyses, it becomes evident that the simplest model, Model 1, which only examines the effect heat waves have on the dependent variable, "do you believe world's climate is changing", has a higher Akaike's Information Criterion (AIC) than Model 2. This means that Model 2 is a better fit than Model 1, as the AIC is a measurement used to compare models to find the best fit, where the lower value indicates a better fit (Bozdogan, 1987, p. 346). Model 2 is similar to Model 1 but with the included control variables, age, gender, and education. Table 2 illustrates the results from these models.

Table 2: Ordered logistic regression models for heat waves

	Dependent variable Do you think world's climate is changing							
	Model 1				**Model 2**			
Variables	*Coeff. (OR)*	*Std. Error*	*t-value*	*p-value*	*Coeff. (OR)*	*Std. Error*	*t-value*	*p-value*
Heat wave	-0.344 (0.709)	0.022	-15.94	3.27e-57***	-0.352 (0.704)	0.022	-16.11	2.05e-58***
Age					0.002 (1.002)	0.001	2.69	7.17e-03**
Male					0.104 (1.11)	0.022	4.76	1.95e-06***
Education					-0.038 (0.962)	0.003	-13.09	3.98e-39***
Observations	33 998				33 584			
AIC	62751.01				61626.68			
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1								

However, despite Model 1 not being the best model fit, it shows that the independent variable, heat wave, is significant and negative. This indicates that someone who has experienced a heat wave is less likely to be a trend sceptic than someone who has not experienced a heat wave. Due to its simplicity, Model 1 can provide an estimate of the probability of being in any of the four response categories of the dependent variable depending on whether the respondent has been exposed to a heat wave or not. This can be done by following Fullerton's (2009, p 311) setup for cumulative probability. The ilogit(model$zeta) function calculates the intercepts, which are the log-odds of cumulative probabilities. The setup below shows these intercepts.

Definitely changing (1) vs. probably changing + probably not changing + definitely not changing (0) → 0.6176453

Definitely changing + probably changing (1) vs. probably not changing + definitely not changing (0) → 0.9446823

Definitely changing + probably changing + probably not changing (1) vs. definitely not changing (0) → 0.9843374

This information makes it possible to use the cumsum() function to identify the cumulative probabilities of being in each category. In theory, the raw cumulative probabilities follow the intercepts shown above. However, since the function includes the predictor (heat wave), the estimated cumulative probabilities differ slightly from the intercepts. Table 3 illustrates the probability of being in any of the response categories of the dependent variable based on whether the respondent has experienced a heat wave.

Table 3: Predicted probability of believing climate is changing when exposed to a heat wave

	Climate is definitely changing	**Climate is probably changing**	**Climate is probably not changing**	**Climate is definitely not changing**
Experienced heat wave	62%	32%	4%	2%
Not experienced heat wave	54%	37%	4%	5%

Table 3 shows that most of the respondents do believe that the climate is changing (categories 1 and 2) regardless of whether they have been exposed to a heat wave or not. However, the percentage of people wo do not believe that the climate is changing is larger for the respondents who have not experienced a heat wave, which matches the expectations one had for the effect of heat waves. Figure 2 visualises these results in a scatterplot for Model 1.

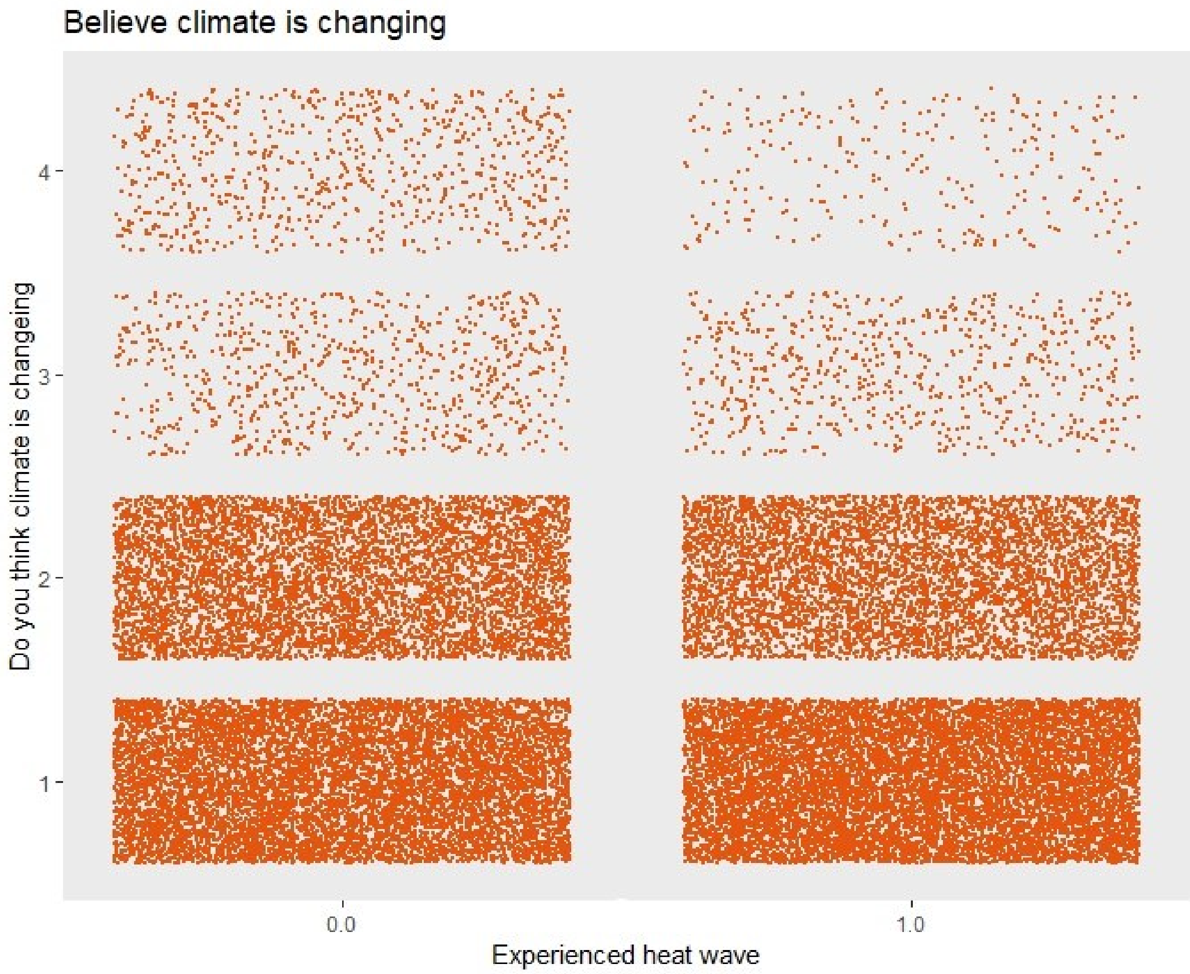

Figure 2: Scatterplot for Model 1

In Model 2, all four independent variables are significant, where heat waves and education stand out as highly significant. Looking at the coefficients, heat wave has a negative sign, meaning that an individual who has experienced a heat wave is more likely to believe that the climate is changing than individuals who have not experienced a heat wave. The odds ratio(OR) coefficient tells us that individuals who have not experienced a heat wave have 29.6% higher odds of being in a higher response category than those who have not experienced a heat wave. Similar is it with education since this also has a negative coefficient, meaning that for each year of completed full-time education, the odds of being in a higher response category are reduced by 4%. The male coefficient is positive, meaning that men are more likely to be trend sceptics than women, where the OR indicate that they have 11% higher odds of being in a response category above women. The last variable is age, where for every year older one is, the odds of being a trend sceptic increases by 0.2%

In Model 16 (Table 11 in the appendix) we control for country variation, by including the country dummies, and holding Austria as a reference category. In this model, the heat wave variable loses its significance. This can be due to a country's population as a whole being emotionally affected by a heat wave within their country. Since eleven out of the twelve countries have had a heat wave, there might be a strong correlation between the country variables and the heat wave variable which results in the effect of the heat wave not being captured. Nevertheless, despite heat waves not being significant, the country variables are significant and provide interesting information on country variation. The three post-communist countries, Lithuania, Hungary, and the Russian Federation, all have positive coefficients, with respectively 35.6%, 17.2 %, and 99.2% odds of being in the higher response categories, indicating trend sceptic tendencies. In contrast, all the remaining countries have negative coefficients indicating that they are less likely to be trend sceptics. Additionally, the age, gender, and education variable are still significant. This implies that these variables have a similar effect on the dependent variable in a significant number of countries. Lastly, the AIC of this model is slightly lower than for the models without the included country variables, this means that this model is the best fit for explaining the variation in the dependent variable. What this means will be examined further in the discussion chapter.

5.1.1 Heat waves and human values

In order to examine the effect of heat waves and human values on the dependent variable, the paper has conducted three models with interaction terms with three different questions regarding human values. In Table 4 below, the results of the models are presented.

Table 4: Ordered logistic regression models for heat waves and human values

	Dependent variable Do you think world's climate is changing											
	Model 3				**Model 4**				**Model 5**			
Variables	*Coeff. (OR)*	*Std. Error*	*t-value*	*p-value*	*Coeff. (OR)*	*Std. Error*	*t-value*	*p-value*	*Coeff. (OR)*	*Std. Error*	*t-value*	*p-value*
Heat wave	-0.269 (0.764)	0.048	-5.61	2.0e-08***	-0.179 (0.836)	0.051	-3.52	4.37e-04***	-0.368 (0.692)	0.055	-6.68	2.47e-11***
Age	0.002 (1.002)	0.001	2.85	4.44e-03**	0.001 (1.001)	0.001	2.38	1.74e-02*	0.002 (1.002)	0.001	2.82	4.47e-03**
Male	0.091 (1.096)	0.022	4.14	3.52e-05***	0.095 (1.1)	0.022	4.31	1.65e-05***	0.112 (1.119)	0.022	5.09	3.57e-07***
Education	-0.04 (0.96)	0.003	-13.63	2.73e-42***	-0.036 (0.965)	0.003	-12.11	9.45e-34***	-0.039 (0.961)	0.003	-13.24	4.89e-40***
Important to live in secure and safe surroundings	0.09 (1.094)	0.013	6.98	3.03e-12***								
Heat wave * Important to live in secure and safe surroundings	-0.036 (0.965)	0.018	-2.01	4.41e-02*								
Important to be loyal to friends and devote to people close					0.250 (1.284)	0.015	17.11	1.23e-65***				
Heat wave * Important to be loyal to friends and devote to people close					-0.058 (0.943)	0.023	-2.58	9.86e-03**				
Important to be successful and that people recognize achievements									-0.013 (0.988)	0.012	-1.08	2.79e-01
Heat wave * Important to be successful and that people recognize achievements									0.009 (1.009)	0.016	0.54	5.91e-01
Observations	33 168				33 134				32 995			
AIC	60795.49				60384.84				60490.83			
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1												

Model 3 examines heat waves and how important the respondent thinks it is to "live in secure and safe surroundings". In this model, the control variables, age, gender, and education, have the same trends as in previous models, while the interaction term is significant, which makes interpreting the model appropriate. However, interpreting the coefficients is not beneficial since this is an ordered logistic regression model. Figure 3, therefore, presents the results of the interaction term graphically through predicted probabilities to aid the interpretation of the effect of the interaction term.

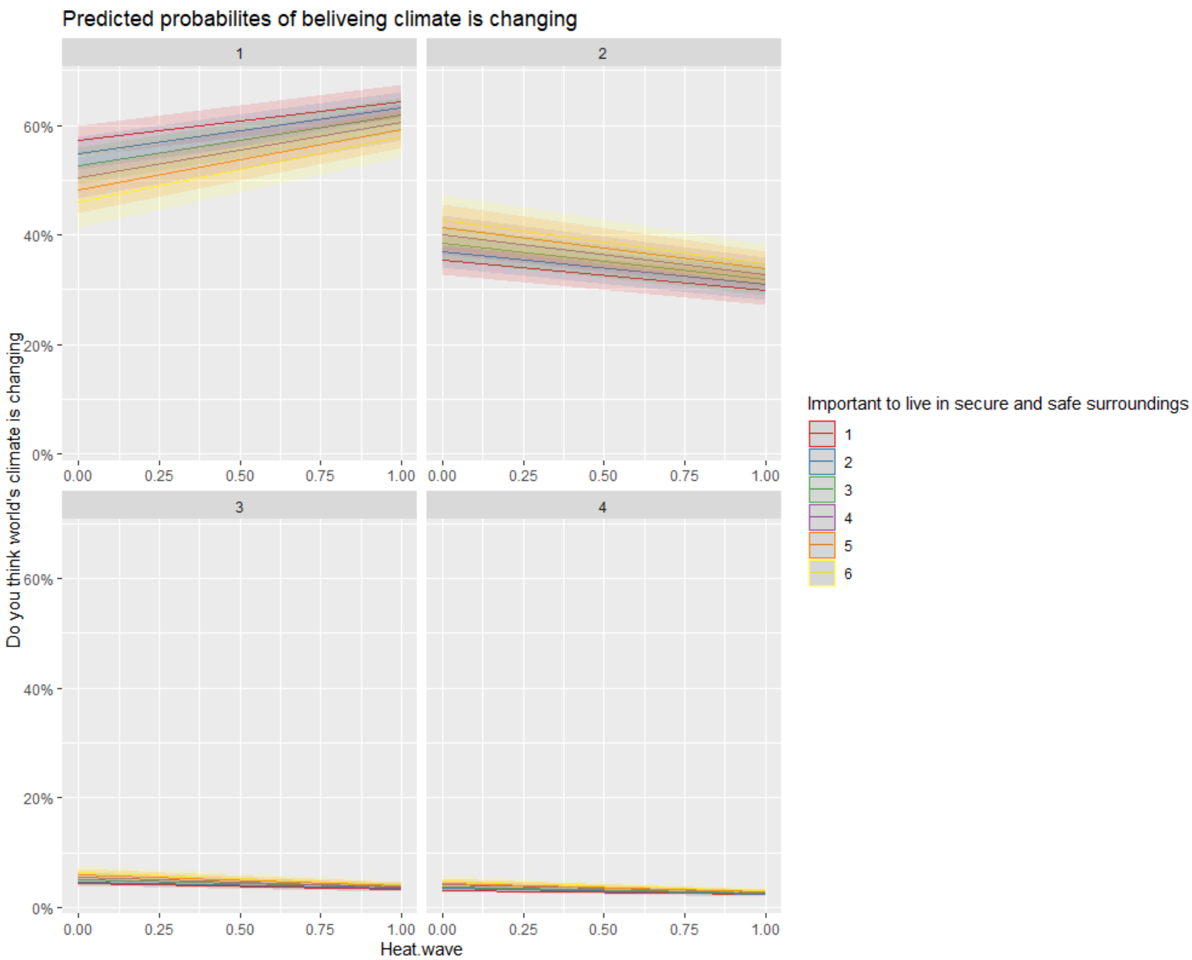

Figure 3: Predicted probabilities of heat wave and value of living in secure and safe surroundings[2]

Figure 3 has four different predictions, one for each response category of the dependent variable. In prediction 1, which predicts the probability of individuals thinking that the climate is definitely changing, all responses on the human value variable increase their belief in climate change when exposed to a heat wave. It is also possible to see that individuals who value secure and safe surroundings (1) score the highest regardless of whether they have experienced a heat wave or not. However, they have a lower rate of increase than all the other values, indicating that these individuals have a smaller change in belief than, for instance, individuals who do not value living in safe and secure surroundings (6). These have the highest rate of increase when exposed to a heat wave. There is a similar trend in prediction 2, only with the rate of decrease. Prediction 2

[2] All figures with predicted probabilities for a natural disaster and a human value can be found enhanced in appendix B

illustrates the probability of responding “climate is probably changing”. In this prediction all slopes decrease, but the slope for individuals who value safe surroundings has the lowest rate of reduction. In contrast, individuals who do not value safe surroundings has the steepest decline. The negative rate is most likely due to a shift towards the first response category, "climate is definitely changing," when exposed to a heat wave.

In predictions 3 and 4, the predictions for trend sceptics, it is visible that individuals that do not value safe surroundings make up most of the two groups. However, common for both predictions is that all values on "important to live in safe surroundings" experience a decrease in trend sceptic tendencies when exposed to a heat wave. In general, does Figure 3 illustrate that for people who have experienced a heat wave, there is less variance in the answer on the dependent variable. This indicates that for these individuals how much they value safe surroundings has less effect on the dependent variable, than it has for someone who has not experienced a heat wave. This is true for all the responses on the "important to live in secure and safe surroundings"-variable . Additionally, the figure shows that the lower someone values safe surroundings, the more will a heat wave impact the respondent's belief in climate change.

As mentioned, this model type is run for three interactions with human values and heat waves. Model 4 examines the interaction between heat waves and the variable that measures how "important (it is) to be loyal to friends and devote to people close". The interaction term is significant, indicating that the interaction between the two variables has a significant effect on the dependent variable. Figure 4 illustrates this effect.

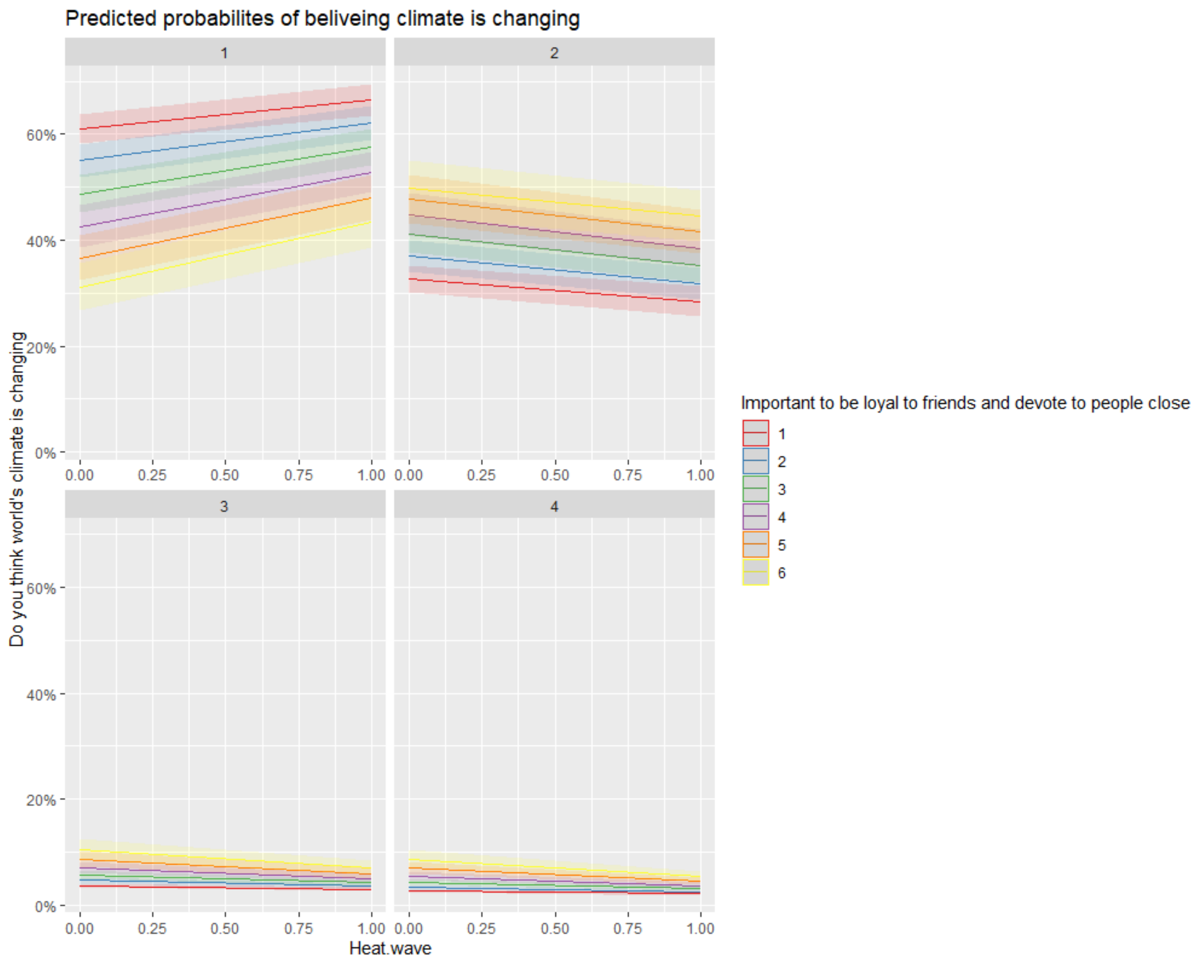

Figure 4: Predicted probabilities of heat wave and value of being loyal to friends and devote to people close

Figure 4 has the same structure as Figure 3, where each prediction represents one of the response categories of the dependent variable. However, this is not the only similarity with Figure 3, as individuals who value loyalty to friends highly (1) have the highest belief that climate is definitely changing, with only a low increased rate when exposed to a heat wave. Whereas individuals who do not value loyalty to friends (6) have the most considerable increased rate in the first prediction when exposed to a heat wave. In prediction two, we can see the opposite effect, where all responses on the "friends" variable experience a decrease in the "climate is probably changing" response when experiencing a heat wave.

The two predictions for trend sceptics (3 and 4) illustrate a small decrease rate of not believing in climate change when exposed to a heat wave. Indicating that no matter how much an individual values friendship, they will shift towards slightly less trend sceptic beliefs when exposed to a heat wave. Nevertheless, Figure 4 illustrates that the more someone values being loyal to friends, the smaller the effect of heat waves on the dependent variable.

The final interaction term within the heat wave chapter is the interaction between heat wave and the value question that examines the importance of being "successful and that people recognize achievements". Model 5 does, however, show that the interaction is not significant. It is, therefore, unnecessary to create a predicted probability figure, as the model itself already illustrates that the interaction between the human value and experience with heat waves has no significant effect on whether a person believes in climate change.

5.2 Drought

Further, the analysis examines the second natural disaster, which is drought. Table 5 shows the results from the two simplest models, with only drought and with the three control variables. The AIC is higher in Model 6 than in Model 7, indicating that the model with the control variables has a slightly better model fit.

Table 5: Ordered logistic regression models for droughts

				Dependent variable				
				Do you think world's climate is changing				
		Model 6				**Model 7**		
Variables	*Coeff. (OR)*	*Std. error*	*t-value*	*p- value*	*Coeff. (OR)*	*Std. error*	*t-value*	*p-value*
Drought	0.621 (1.861)	0.025	24.81	7.2e-136***	0.620 (1.858)	0.025	24.44	7.1e-132***
Age					0.002 (1.002)	0.001	3.02	2.52e-03**
Male					0.121 (1.129)	0.022	5.51	3.52e-08***
Education					-0.036 (0.964)	0.003	-12.28	1.23e-34***
Observations		33 998				33 584		
AIC		62395.70				61626.68		
Signif. codes:	0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1							

In Model 6, the only independent variable is drought. Surprisingly, the positive coefficient signals that an individual who has experienced drought is less likely to believe in climate change. Given the high t-value, this result is highly significant. This result is also in Model 7, where the OR of drought indicates that someone who has experienced drought is 85.8% more likely to be in a higher category on the dependent variable than someone who has not experienced a drought. The three control variables are all significant, where age and being male indicate higher odds of being in the higher response categories. However, the more years of completed education, the odds of being in a higher response category drops by 4% each year. The control variables have the same tendencies in Model 7 as in Model 2.

Returning to Model 6, although this model has a high AIC, it is possible to estimate the probability of the responses to the dependent variable based on whether the responders have experienced a drought or not. Again, applying Fullerton's (2009, p. 311) set up the cumulative probability of being in the response categories of the dependent variable when experiencing a drought period is

Definitely changing (1) vs. probably changing + probably not changing + definitely not changing (0) → 0.6149647

Definitely changing + probably changing (1) vs. probably not changing + definitely not changing (0) → 0.9369031

Definitely changing + probably changing + probably not changing (1) vs. definitely not changing (0) → 0.9736640

From this setup, we create Table 5, which visualises the predicted probability of the responses to the question "do you think the world's climate is changing" based on whether or not the respondent has experienced a drought.

Table 6: Predicted probability of believing climate is changing when exposed to a drought

	Climate is definitely changing	**Climate is probably changing**	**Climate is probably not changing**	**Climate is definitely not changing**
Experienced drought	46.7%	41.5%	5.3%	6.5%
Not experienced drought	61.4%	32.5%	4%	2.1%

Table 6 shows that most of the respondents are not trend sceptics. However, surprisingly there is a higher percentage of trend sceptics among the individuals who have experienced a drought than among those who have not experienced a drought. Figure 5 visualises the scatterplot for the results of Model 6.

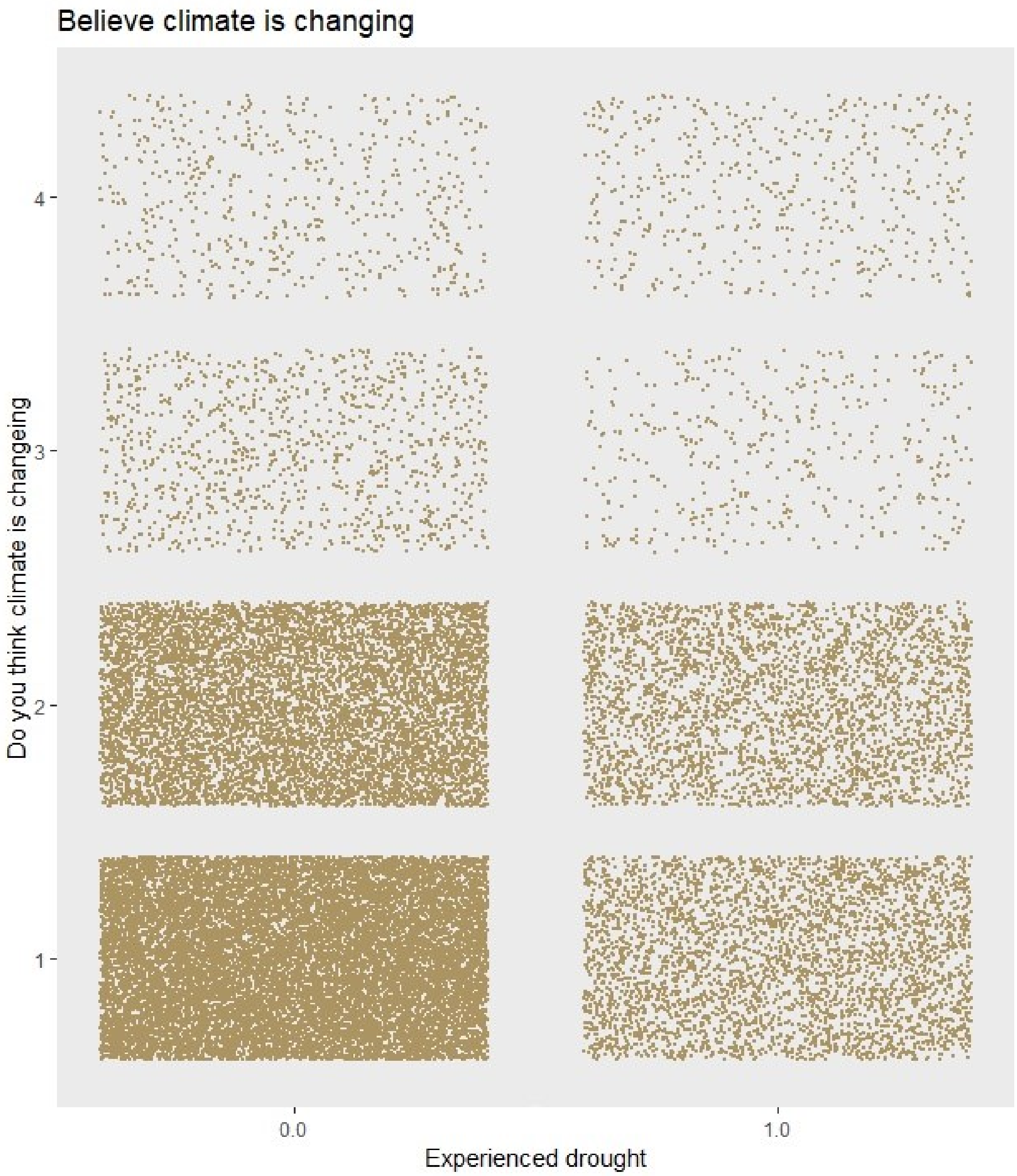

Figure 5: Scatterplot for Model 6

The scatterplot in Figure 5 clearly visualises that most of the respondents are not trend sceptics, but a more considerable amount of climate change believers have not experienced a drought. However, in the scatterplot, it looks like there are more respondents in response category 3, "climate is probably not changing", for individuals who have not experienced a drought than individuals who have experienced a drought. This may, at first glimpse, be confusing as Table 6 presents a higher percentage in category 3 of individuals who have experienced a drought. However, Table 6 only presents the percentage of predicted individuals in each response category for a given value of the predictor (drought). Since only 23.76% of all responders have experienced a drought[3], Figure 5 and Table 6 do not provide the exact same information.

[3] See *Table 1: Descriptive statistics*

One reason for the unexpected result, that experience with drought makes people more climate sceptic, may be due to which countries have experienced drought. Model 17 (in table 11 in the appendix), adds all the country variables to the already existing Model 7. The drought variable is significant, with 13 % odds of belonging in a higher response category on the dependent variable than someone who has not experienced a drought. Nevertheless, out of the 23.76%, only three of the 12 countries in the sample have experienced drought, namely Italy, Lithuania, and the Russian Federation[4]. In contrast to Model 16, which examined heat waves and controlled for countries, Model 17 does not have the same level of correlation between the country variables and the drought variable. The positive coefficient for drought may therefore be due to country-specific results.

For the country variables, there is a similar trend as in the model for heat waves, as only the three post-communist countries, Lithuania, Hungary, and the Russian Federation, have positive coefficients. This means that people from these countries have higher odds of being in trend sceptic response categories than people from other countries. Russians have 89.5% odds of being in the higher categories and Lithuanians have 23% higher odds. For Italians, the odds of being in a higher response category are reduced by 36%. This may be why the drought coefficient is positive, as there is a correlation between experiencing drought and being a trend sceptic. However, an experienced drought is not necessarily the causation for being a trend sceptic, as this is a spurious correlation. The model does however have the lowest AIC out of all the models with drought, indicating that countries are important variables for understanding the variation in the dependent variable.

5.2.1 Drought and human values

When running models with interaction terms with drought and the three variables on human values, all three models show significant interaction terms, as shown in Table 7 below.

[4] See *Table 12: Table 12 Descriptive statistics of how many people have experienced a natural disaster within 2006-2016 (in the appendix)*

Table 7: Ordered logistic regression models for droughts and human values

	Dependent variable											
	Do you think world's climate is changing											
	Model 8				**Model 9**				**Model 10**			
Variables	*Coeff. (OR)*	*Std. Error*	*t-value*	*p-value*	*Coeff. (OR)*	*Std. Error*	*t-value*	*p-value*	*Coeff. (OR)*	*Std. Error*	*t-value*	*p-value*
Drought	0.392 (1.48)	0.056	6.97	3.1e-12***	0.708 (2.031)	0.06	11.75	7.36e-32***	0.294 (1.242)	0.062	4.73	2.28e-06***
Age	0.002 (1.002)	0.001	3.2	1.37e-03**	0.002 (1.002)	0.001	2.72	6.48e-03**	0.002 (1.002)	0.001	2.7	6.94e-03**
Male	0.109 (1.115)	0.022	4.89	9.9e-07***	0.108 (1.114)	0.022	4.86	1.17e-06***	0.131 (1.140)	0.022	5.9	3.6e-09***
Education	-0.038 (0.963)	0.003	-12.6	2.0e-36***	-0.034 (0.966)	0.003	-11.51	1.24e-30***	-0.036 (0.964)	0.003	-12.19	3.48e-34***
Important to live in secure and safe surroundings	0.051 (1.052)	0.01	4.94	7.91e-07***								
Drought * Important to live in secure and safe surroundings	0.101 (1.107)	0.022	4.67	2.98e-06***								
Important to be loyal to friends and devote to people close					0.221 (1.247)	0.014	15.99	1.55e-57***				
Drought * Important to be loyal to friends and devote to people close					-0.081 (0.922)	0.024	-3.36	7.68e-04***				
Important to be successful and that people recognize achievements									-0.016 (0.984)	0.009	-1.77	7.68e-02
Drought * Important to be successful and that people recognize achievements									0.113 (1.12)	0.02	5.78	7.29e-09***
Observations	33 168				33 134				32 995			
AIC	60446.31				60161.14				60130.76			
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1												

The first model, Model 8, has an interaction term between drought and how important the respondent finds it "to live in a secure and safe environment". Figure 6 visualises the results of Model 8.

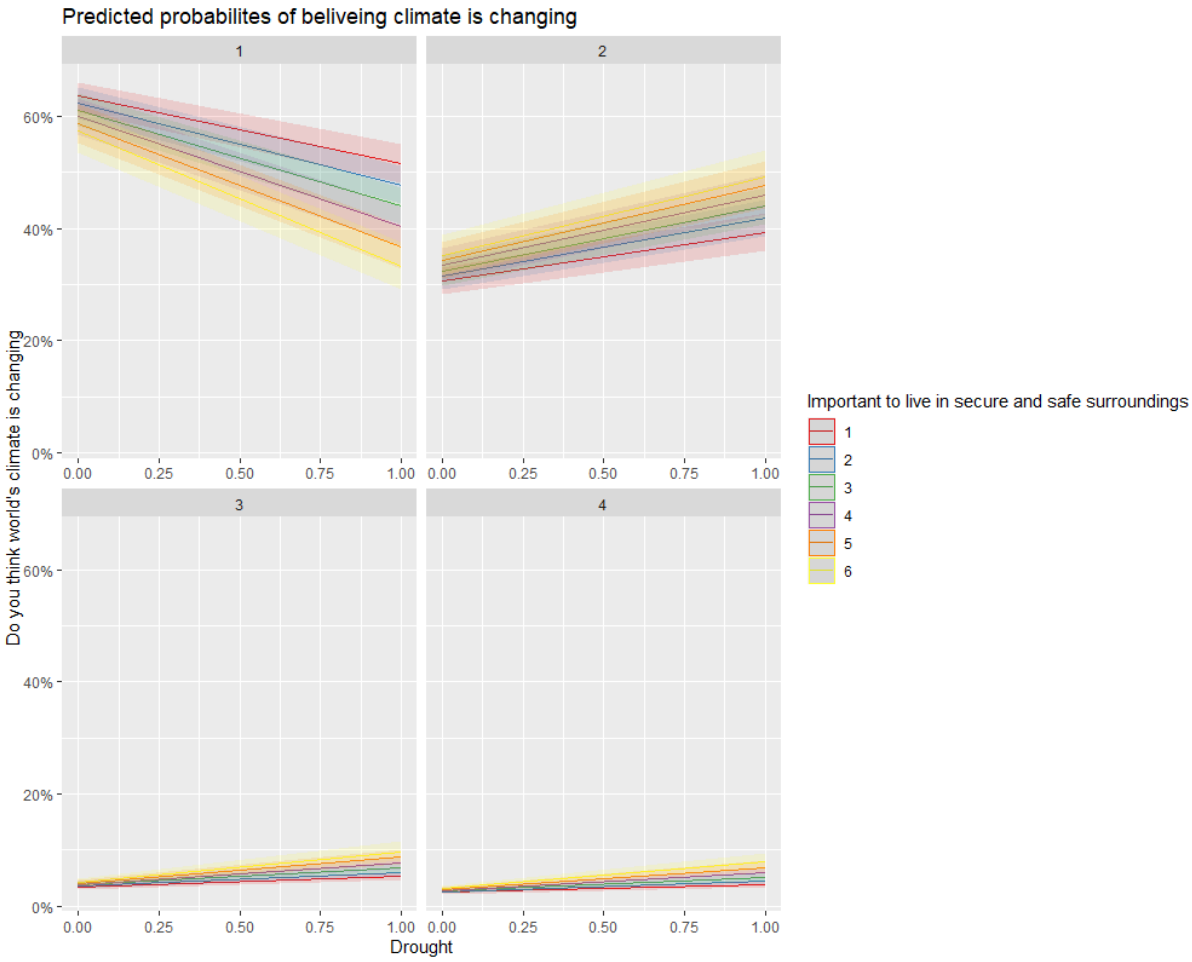

Figure 6: Predicted probabilities of drought and value of living in secure and safe surroundings

Like the figures for predicted probabilities of heat waves and values, Figure 6 has four graph windows representing the dependent variable's four response categories. In response to category 1, there is a decrease in believing climate is definitely changing for all responses of the importance of living in secure surroundings. The figure also shows an increase in variance when exposed to drought, indicating that for individuals who do not value safe surroundings (6), experiencing a drought makes them flee the response category 1 more than for individuals who value safe surroundings very much (1).

In response category 2, all graphs are positive, indicating that no matter how much one values safe surroundings, exposure to a drought period makes more people believe "climate is probably changing". However, this is most likely in connection with the results in category 1 being negative, as both categories for trend sceptics (3 and 4) experience an increased rate when exposed to a drought period. This means that when exposed to a drought period, more people will become trend sceptics, with individuals who do not value safe surroundings having the steepest slope, making them the most trend sceptic out of the six categories within the value question how "important (is it) to live in safe and secure surroundings". In general, does the effect of drought on the value variable result in a shift toward more trend sceptic tendencies.

The second modelled interaction term is between drought and the importance of being "loyal to friends and devote to people close"; its result can be seen in Table 7 in Model 9. The interaction term in this model is significant, meaning there is a significant overall effect of drought and valuing friendship. Figure 7 illustrates the results from Model 9.

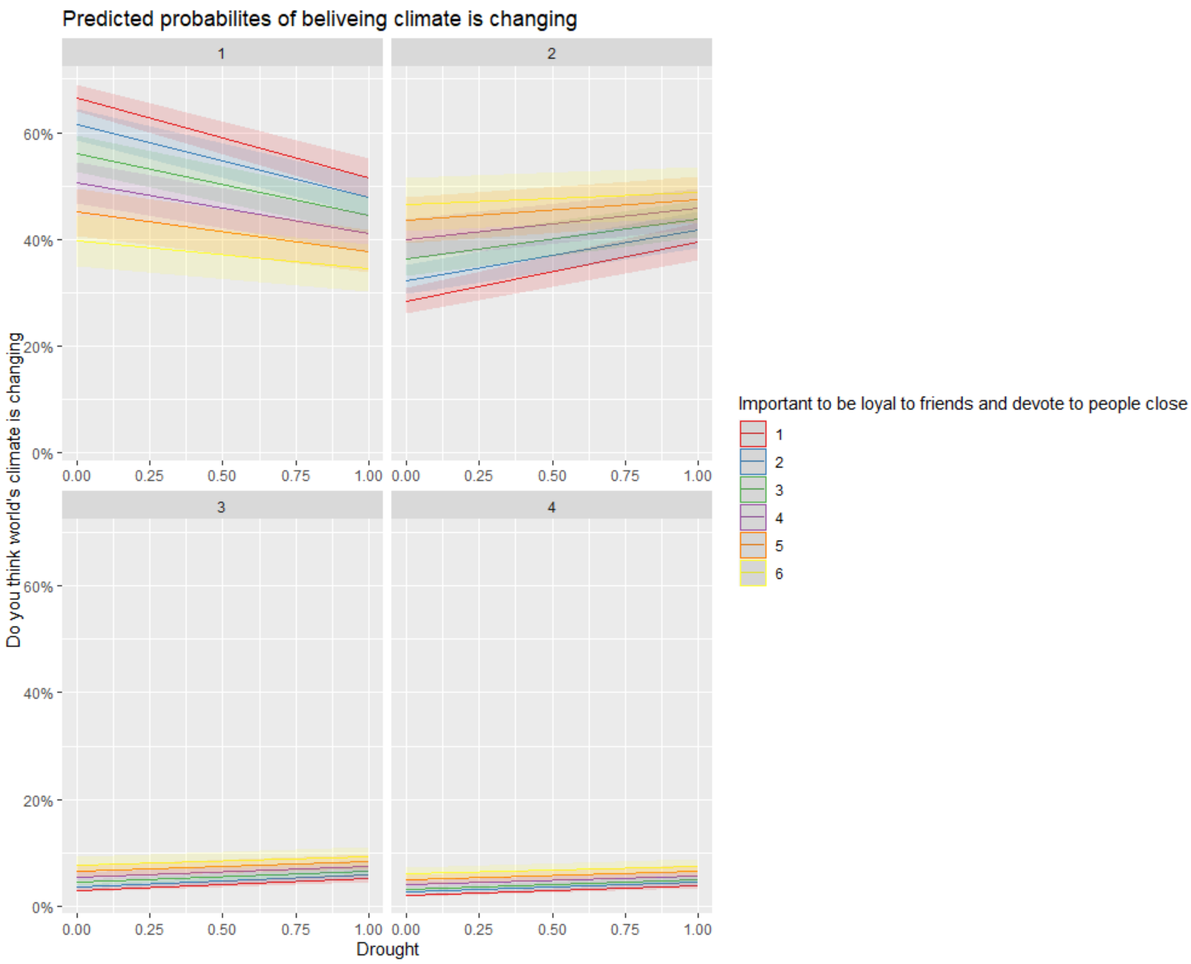

Figure 7: Predicted probabilities of drought and value of being loyal to friends and devote to people close

Figure 7 illustrates that when exposed to drought, all response categories within the human value variable experience a decrease in category 1 of the dependent variable. This means that when they have experienced a drought, fewer people believe that the climate is definitely changing. However, this does not mean that all automatically become trend sceptics when experiencing a drought. Category 2, "climate is probably changing", shows an increase in all categories of the "friends" variable, illustrating the same trend as in figure 6. In the predictions one and two, the variance between the individuals who value friendship and those who do not decrease. This means that when exposed to a drought period, how much someone values friendship has less effect on the dependent variable. The trend sceptic categories, however, have fairly small changes depending on whether someone has experienced drought or not. This means there is a relatively low effect of the interaction term within the two trend sceptic response categories (3 and 4).

The final figure in the drought chapter illustrates the interaction term between drought and how important the respondent finds it "to be successful and that people recognize achievements". The results of model (10) are presented in table 7. Interestingly this is the only significant interaction term with the mentioned value question, as the interaction with heat waves and wildfires both are insignificant.

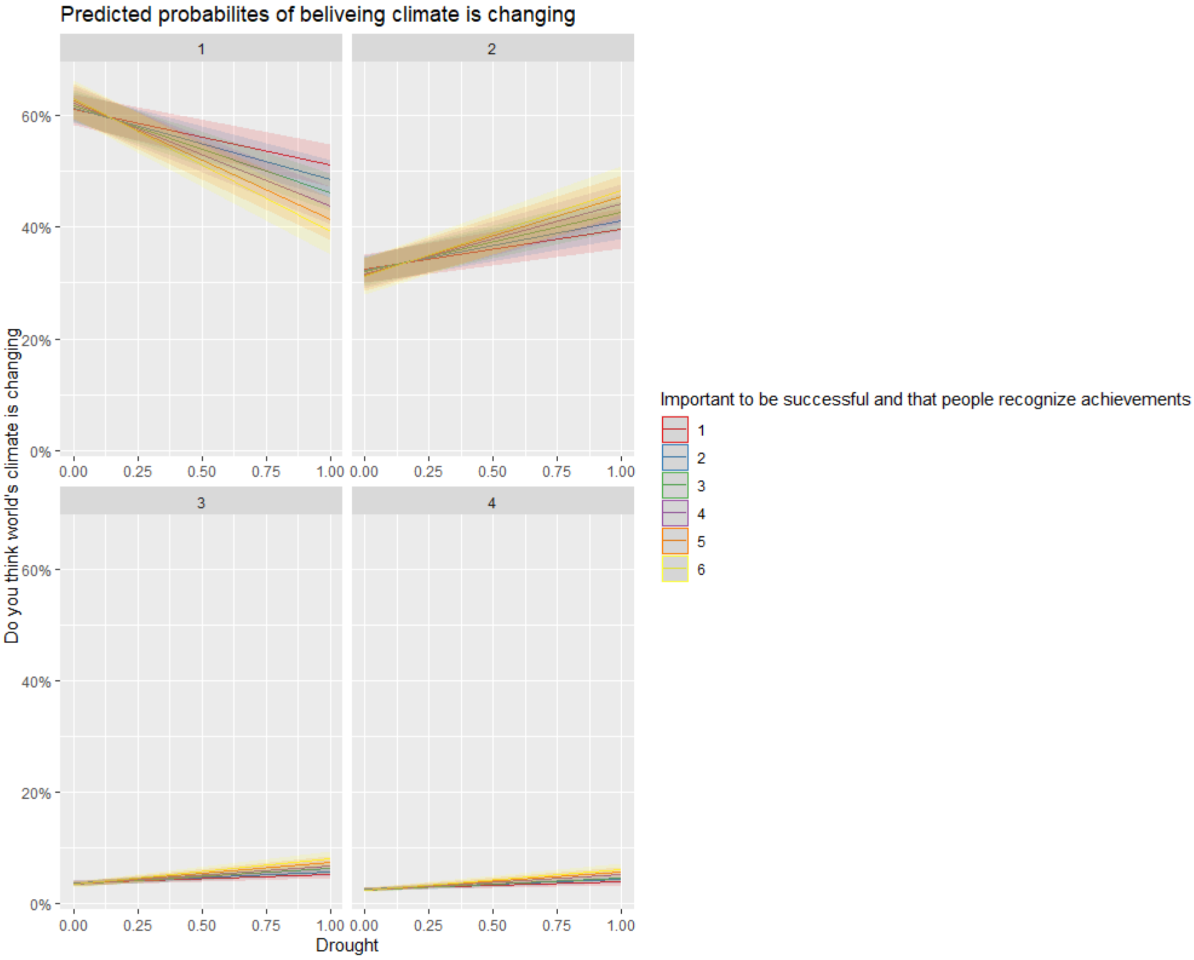

Figure 8: Predicted probabilities of drought and value of being successful and that people recognize achievements

Figure 8 illustrates an interesting trend in the two first categories of the dependent variable. If we consider category 1 first, the order of who believes that climate is definitely changing the most switches when there is an experience with a drought. When they have not experienced a drought event, individuals who do not care about success at all (6) believe that the climate is definitely changing the most, and those who identify strongly with valuing success make up the least of the response category. However, when exposed to a drought period, this trend is flipped, making individuals who care about success (1) the ones who make up most of response category 1. However, for all responses on the success variable, there is a decrease in rate, with those who do not value success having the steepest decrease.

In the second response category of the dependent variable, in which the respondents believe that the climate is probably changing, the same trend as in category 1 is visible only the opposite. Opposite in terms of all of the slopes being positive, indicating that when exposed to a drought period, there is an increase in the belief that the "climate is probably changing". As well as the opposite in terms of which response categories on the success variable make up the most in the experienced and not experienced drought categories. For those who have not experienced drought, the individuals who value success very highly (1) make up most of those who believe the climate is probably changing. Simultaneously, those who do not care about success (6) make up the least. This trend changes when exposed to a drought period, indicating that individuals who do not care about success make up more of the response category 2 when exposed to drought.

Surprisingly, both response categories for the trend sceptic tendencies (3 and 4) seem to experience an increased rate when exposed to drought. Although this trend is anticipated due to drought having a positive coefficient in the simple models, the surprising element is that the people who do not value success make up most of the two response categories. At the same time, individuals who highly value success have the lowest rate of increase.

Looking at the model as a whole, there is an increased variance when exposed to a drought period, indicating that when someone has experienced drought, how much they value success has a more considerable impact on if they believe the world's climate is changing, than for someone who has not experienced drought. Additionally, the figure illustrates that when experiencing a drought, there is a shift towards more trend sceptic tendencies, with individuals who do not value success experiencing a steeper shift away from the belief that "climate is definitely changing" than someone who values success highly.

5.3 Wildfire

The final type of natural disaster this chapter will cover is wildfires. Table 8 below presents the two simplest models (Model 11 and Model 12). Model 11 has only the wildfire variable, which is not significant. This means there is no use in creating cumulative predictions for wildfire, as these are based on the simplest model, which in this case is insignificant.

Table 8: Ordered logistic regression models for wildfires

	Dependent variable: Do you think world's climate is changing							
	Model 11				**Model 12**			
Variables	*Coeff. (OR)*	*Std. error*	*t-value*	*p-value*	*Coeff. (OR)*	*Std. error*	*t-value*	*p-value*
Wildfire	-0.05 (0.951)	0.032	-1.548	1.22e-01	-0.066 (0.936)	0.033	-2.02	4.31e-02*
Age					0.001 (1.001)	0.001	1.78	7.5e-02
Male					0.104 (1.11)	0.022	4.78	1.75e-06***
Education					-0.039 (0.962)	0.003	-13.25	4.41e-40***
Observations	33 998				33 584			
AIC	63003.73				61883.27			
Signif. codes:	0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1							

In model 12, the wildfire variable becomes significant since the three control variables, age, gender, and education, explain some of the variances in the dependent variable. Since the wildfire variable is negative, the odds of believing the climate is changing (response categories 1 and 2) increase by 4% when exposed to a wildfire. The age variable is insignificant, but the other two control variables are significant. The odds of being a trend sceptic are 11% higher for males than females. The education variable shows that the odds of being a trend sceptic decrease by approximately 4% for each year of completed full-time education.

In the appendix, Model 18 presents the results of the analysis of the model with wildfire that includes all the country variables. In this model, wildfire is significant and negative, meaning that individuals who have experienced a wildfire are more likely to believe in climate change. All the country variables are significant, where all but the three post-communist countries have a negative coefficient, which means that those three countries have higher odds of being trend sceptics. People from Russia have 112% odds of being in a higher category of the dependent variable. Russia is one of five countries in the sample which have had a wildfire event within the time frame 2006-2016. The other four countries are Portugal, France, Spain, and Italy[5], all of which have 73%, 35%, 59%, and 30% odds of being in the lower response categories of the dependent variable, respectively. Meaning there is a higher probability that these individuals believe in climate change. Not surprisingly, the AIC is lowest for this wildfire model, as were the country models for heatwave and drought, indicating that countries are important variables for explaining the variation in belief in climate change.

5.3.1 Wildfire and human values

When running more advanced models with interaction terms between wildfire and human value variables, only one model presents a significant interaction term, which can be seen in Table 9 below. This means that it is only appropriate to show predicted probability models for the interaction term between wildfire and how "important (it is) to live in secure and safe surroundings".

[5] See *Table 12 in the appendix*

Table 9: Ordered logistic regression models for wildfires and human values

	Dependent variable: Do you think world's climate is changing											
	Model 13				**Model 14**				**Model 15**			
Variables	*Coeff. (OR)*	*Std. Error*	*t-value*	*p-value*	*Coeff. (OR)*	*Std. Error*	*t-value*	*p-value*	*Coeff. (OR)*	*Std. Error*	*t-value*	*p-value*
Wildfire	-0.322 (0.725)	0.072	-4.49	7.08e-06***	-0.195 (0.822)	0.077	-2.55	1.09e-02*	-0.005 (0.995)	0.08	-0.06	9.5e-01
Age	0.001 (1.001)	0.001	1.86	6.36e-02	0.001 (1.001)	0.001	1.54	1.23e-01	0.001 (1.001)	0.001	2.35	1.9e-02*
Male	0.094 (1.099)	0.022	4.27	1.94e-05***	0.092 (1.096)	0.022	4.16	3.12e-05***	0.11 (1.117)	0.022	5	5.59e-07***
Education	-0.041 (0.96)	0.003	-13.77	3.89e-43***	-0.036 (0.964)	0.003	-12.24	1.83e-34***	-0.04 (0.961)	0.003	-13.48	2.01e-41***
Important to live in secure and safe surroundings	0.049 (1.05)	0.01	5.14	2.77e-07***								
Wildfire * Important to live in secure and safe surroundings	0.118 (1.125)	0.028	4.17	3.08e-05***								
Important to be loyal to friends and devote to people close					0.235 (1.265)	0.012	19.79	3.99e-87***				
Wildfire* Important to be loyal to friends and devote to people close					0.056 (1.057)	0.033	1.69	9.15e-02				
Important to be successful and that people recognize achievements									-0.02 (0.961)	0.009	-2.35	1.87e-02*
Wildfire* Important to be successful and that people recognize achievements									-0.022 (0.978)	0.023	-0.94	3.48e-01
Observations	33 168				33 134				32 995			
AIC	61040.39				60563.08				60722.57			
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1												

Model 13 shows a significant interaction between wildfire and the question of how "important (it is) to live in secure and safe surroundings". The results of model 13 are visualised in Figure 9.

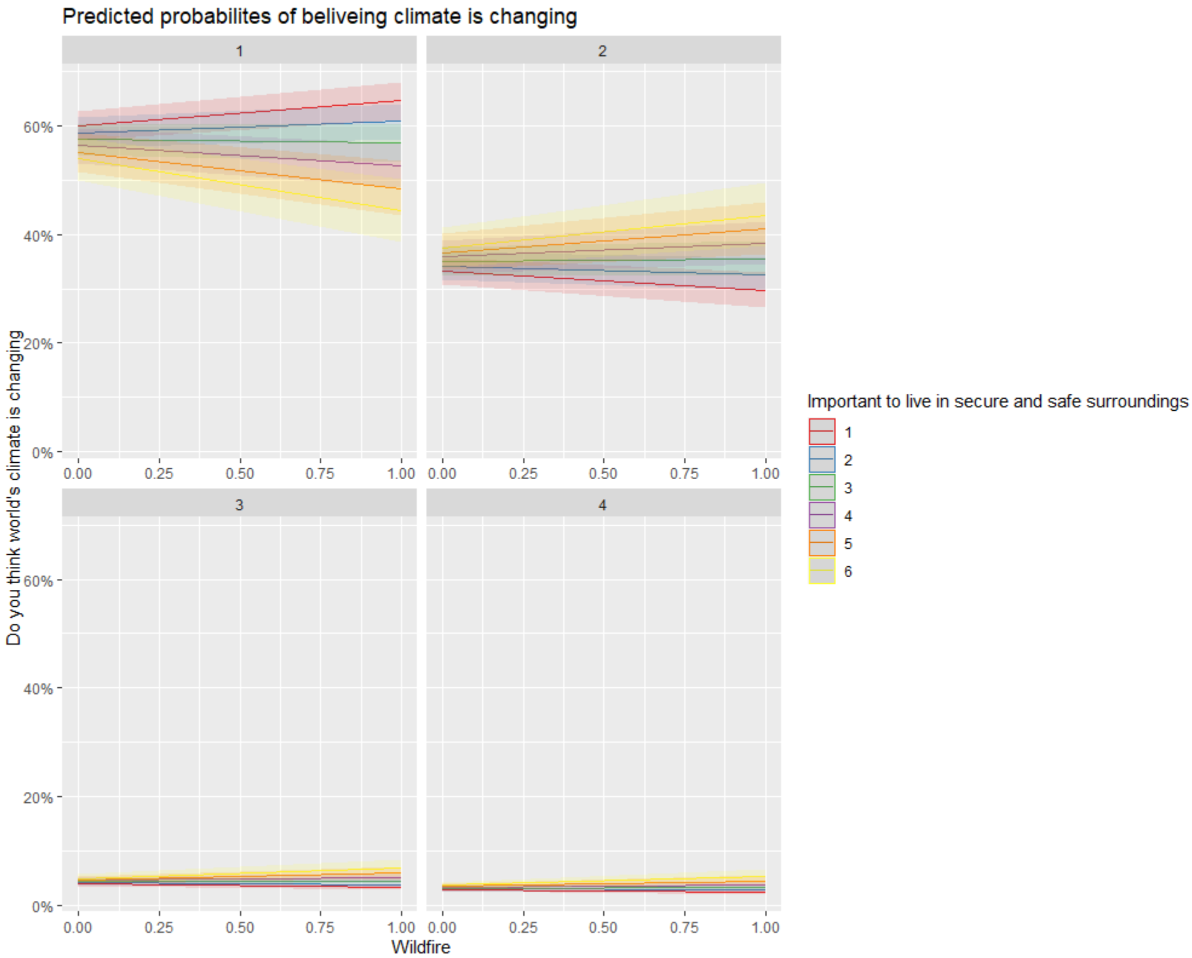

Figure 9: Predicted probabilities of wildfire and value of living in secure and safe surroundings

Figure 9 shows an interesting trend different from all the other prediction graphs, namely that not all graphs have the same direction when exposed to a wildfire. In response category 1, respondents who answer "very much like me" and "like me" on the value question experience an increase in believing climate is changing when exposed to a wildfire. On the other hand, individuals who answer "somewhat like me", "a little like me", "not like me", or "not like me at all" to the value question seem to have a negative slope in response category 1, indicating that when exposed to a wildfire they drift towards higher values of the dependent variable.

In response category 2, the trend is opposite to the first response category. The two that value secure surroundings the most have a negative slope when exposed to a wildfire, and the rest have a positive slope. In the response categories for trend sceptics (3 and 4), the ones who do not value safe surroundings (6) make up most of the responses and experience a slight increase rate when exposed to a wildfire. This indicates that individuals who do not value safe surroundings are more likely to be trend sceptic when exposed to a wildfire.

In general, the increased spread within the predictions for those who have experienced a wildfire indicates that whether they believe climate is changing depends on how much they value living in safe surroundings. In other words, this is the only model which illustrates the expectation that the effect of a natural disaster depends on how important a certain human value is for the respondent.

5.4 Summary of the results

Since the results chapter is very extensive, this sub-chapter will provide a brief summary of the most important findings. Table 10 illustrates the general trends in the results of the models with the included control variables, age, gender, and education. The results of the control variables are not included in the model but have a similar trend in all models.

Table 10: Summary of the general results of the analyses

Variable	**General belief in climate change**	**Significance**
Heat wave	Higher	<0.001
Heat wave * Important to live in secure and safe surroundings	Higher	0.044
Heat wave * Important to be loyal to friends and devote to people close	Higher	0.01
Heat wave * Important to be successful and that people recognize achievements	-	Not significant
Drought	Lower	<0.001
Drought * Important to live in secure and safe surroundings	Lower	<0.001
Drought *Important to be loyal to friends and devote to people close	Lower	<0.001
Drought * Important to be successful and that people recognize achievements	Lower	<0.001
Wildfire	Higher	0.041
Wildfire * Important to live in secure and safe surroundings	Depending on how they value of safe surroundings	<0.001
Wildfire * Important to be loyal to friends and devote to people close	-	Not significant
Wildfire * Important to be successful and that people recognize achievements	-	Not significant

The first part of the analysis examined the effect of heat waves on trend sceptic tendencies. The analysis confirmed the expectation that an experience with a heat wave would reduce the likelihood of being a trend sceptic. The models with the interaction terms illustrated that individuals who value living in a safe and secure environment and value being loyal to friends have the highest probability of believing in climate change. In contrast, individuals who do not identify strongly with these values are more likely to be a trend sceptic.

The second part of the analysis examined the effect of droughts on the belief in climate change. Here the results are the most unexpected out of all three natural disasters, as it states that individuals who have experienced a drought period have a higher likelihood of being trend sceptic than individuals who have not experienced drought. Additionally, the three values interaction terms illustrate that no matter how much one values safe surroundings, friends, or success, when exposed to a drought period, there is a shift in belief towards more trend sceptic tendencies. Those who neither value safe surroundings, friends, or success are the most sceptic in all three models.

Finally, the last part of the analysis examined the effect of wildfires on the belief in climate change. Here the effect of wildfire is small but significant, but only when the three control variables, age, gender, and education, are added to the model. Nevertheless, this model shows that experiencing a wildfire makes the individual more likely to believe that the climate is changing. When examining wildfire, the only significant interaction term is with the value question of living in safe surroundings. This analysis illustrates that when exposed to a wildfire, individuals who highly value safe surroundings experience an increase in belief in climate change. On the contrary, individuals who do not value safe surroundings as strongly or not at all experience a shift towards higher values on the dependent variable when exposed to a wildfire. To summarise, the model illustrates that individuals who do not value safe surroundings are more likely to be trend sceptics, regardless of whether the person has experienced a wildfire or not.

Apart from drought, the results show that experiencing a natural disaster has a positive effect on believing in climate change. In addition, the results show that individuals who value safe surroundings and friends have a higher tendency to believe in climate change.

6. Discussion

The goal of this paper is to examine what effect natural disasters have on Europeans' belief in climate change. Additionally, in order to apply O'Brien & Wolf's (2010, p. 233) values-based approach for such research, the analysis also examines if there is a connection between an individual's values and the effect of a natural disaster on whether the person believes the climate is changing or not. The analysis itself is split into three sections, one for each natural disaster. This chapter, on the other hand, will discuss the two research questions separately. Further, the discussion will include some limitations to this research before providing some recommendations for decision-makers and future research.

If we address the first research question, which asks, "what effect do natural disasters have on Europeans' belief in climate change", the analysis result is somewhat unexpected when looking at the previous literature on the topic. Based on Marshall et al. (2019, p. 2) and Lee, Markowitz, Howe, Ko, & Leiserowitz' (2015, p. 1017) argument that personal experience with a natural hazard will open the eyes of individuals who doubt the existence of climate change, the expectations for the first research question were that all three of the natural disasters would have a negative effect on trend scepticism. By this, it is assumed that experiencing a natural disaster would make more individuals believe that the climate is changing. The fact that drought had a positive effect on individuals being trend sceptics is the most surprising result. However, the low effect of wildfires is also, to some extent, surprising.

One argument that can explain the results is the knowledge the public receives about the different natural disasters. As William Jr. (1979, p. 16) argues, what humans believe is linked with the knowledge they have of what is. In this context, the way to clarify the difference in belief based on their experience with different natural disasters can be explained by their knowledge of the natural disaster and the causation of it. In the media, heat waves are often discussed in connection with climate change, with assumptions like a "one-in-20-year hottest day will occur every second year" (Banholzer, Kossin, & Donner, 2014, p. 21) being highlighted. An example is the article from BBC that tries to explain why heat waves are occurring in Europe and quotes, "Heat waves are not uncommon, but according to weather experts, they are being amplified by a rise in global temperatures and are likely to become more frequent" (Siret, 2019). On the other hand, there is a smaller focus on media coverage of wildfires and droughts than heat waves. A quick Google search[6] shows that "heat wave Europe news" has approximately 11.5 million and 16 million more search results than drought and wildfire, respectively. This indicates that there is a vaster knowledge gap in the population when it comes to droughts and wildfires than heat waves, which could be one explanatory factor to the result of the analysis.

The second possible explanation for the opposite results between experiencing a heat wave and experiencing a drought can be linked to the temporal perception of humans (Pahl, Sheppard, Boomsma, & Groves, 2014, p. 376). A heat wave usually happens rapidly, and its consequences are evident quickly after the outburst of a heat wave. A drought, on the other hand, develops over time, making it more challenging to identify its consequences at first (CRED, 2023). Pahl, Sheppard, Boomsma, & Groves (2014, p. 376) also identify that the decrease in rural lifestyles makes it even harder for people to identify changes in natural conditions, which in this case could make it much trickier for people living in cities to identify and recognize the consequences of a drought. In contrast, the consequences of a heat wave could be even more substantial in urban settlements.

Continuing on the geographical trail, another possible reason for the difference in the effect of the three natural disasters may be country and political ideology specific, which Weber (2010, p. 332) highlights in her article. The low AIC for all models with the country dummies indicate that these models are the best fit for explaining the variation within the dependent variable. These results confirm Lee, Markowitz, Howe, Ko & Leiserowitz’ (2015, p. 1014) claims that location influences the characteristics of a climate sceptic. Nevertheless, this may be due to the political situation in the countries as Weber (2010, p. 332) emphasises.

The analysis of this paper has not dived into the political dimension of climate scepticism. However, due to the unexpected results from the analysis of drought, this should be addressed as a possible explanation. Although previous research has shown that there is a trend where conservative individuals tend to be more climate sceptic (Tranter & Booth, 2015, p. 162), some research has found that another essential political aspect is the salience of environmental concern within a country (McCright, Dunlap, & Marquart-Pyatt, 2016, p. 343), where countries that give less attention to climate change are less likely to be split politically on the topic. On the other hand, less salience and attention to the

[6] Conducted 02.05.2023 with the keywords «heat wave Europe news", "drought Europe news", and "wildfire Europe news".

topic will also result in a lower level of public knowledge about climate change, hence resulting in a higher number of climate sceptics (Williams Jr., 1979, p. 16). McCright, Dunlap, & Marquart-Pyatt (2016, p. 344) identify a trend among post-communist states where environmental issues have low political salience. Since two out of three countries that experienced a drought period are post-communist states, the political landscape and the fact that there is less attention to climate change and environmental policies within those countries may have a more prominent explanatory factor for the unexpected results than drought actually resulting in higher levels of trend scepticism.

Lastly, the final possible reason for heat waves having a higher effect than wildfires and an opposite effect than drought is evident in the previous explanation, which is poor sampling. The sampling done in this paper did not ensure that a high number of responders have experienced a wildfire or a drought period. This makes it less likely that the results from the two latter disasters are applicable for generalisation. Wildfires have a low effect which means that there is a likelihood of wildfire having a positive effect on believing in climate change. However, a recommendation for future research is to conduct an analysis of these disaster types, which includes a larger sample of people who have experienced the disasters, to examine if a larger sample deviates from the results of this analysis.

These results imply that at least an increase in heat waves will increase people's belief in climate change when they have experienced it. It also shows that there is a possible connection between other natural disasters and the belief in climate change, but this needs to be examined further before one can say it definitively.

When addressing the second research question, which aims to explore if there is a connection between an individual's values and the effect of a natural disaster on whether the person believes the climate is changing or not, the primarily focus will be on the results from the heat waves models, due to the inconclusive results from the models with drought and wildfire.

The variable that measures how important a respondent finds it to "live in safe and secure surroundings" has a larger effect on whether someone believes that climate is changing than the two other variables that measure values. The value variable with the second most effect on the dependent variable is the one that measures how important it is to be loyal to friends. Whereas the variable that measures how important success is is not significant in the heat wave analysis. These are interesting results and will be discussed further.

Despite "important to live in safe and secure surroundings" having the highest effect on the dependent variable, the results show that individuals who strongly value safe surroundings have the lowest change in belief when exposed to a heat wave. Unexpectedly the individuals who do not value safe surroundings have an increase in belief in climate change when exposed to a heat wave and have the steepest run towards lower values on the dependent variable. Using Maslow's hierarchy of needs, these results disprove the assumption that individuals who do not value safety needs will not be impacted when these needs are threatened or disrupted (Maslow, 1970, p. 61). However, the lower variance shows that the effect of this value on the dependent variable decreases when exposed to a heat wave. This shows that the heat wave variable has the most considerable effect on the belief in climate change and not the human value itself.

This speaks against O'Brien & Wolf (2010, p. 235), who emphasise that "the meaning and significance of climate change and the responses to it are embedded in values". Instead, these results exemplify the argument of Marshall et al. (2019, p. 2), which states that personal experience with the consequences of climate change is an important factor for believing in climate change.

The analyses indicate that individuals who believe that the climate is definitely changing, regardless of whether the respondent has experienced a natural disaster, often score high on valuing both living in safe surroundings and being loyal to friends. These findings can be used to build upon Hanley & Abell’s (2002, p. 38) critique of Maslow's disproportionate emphasis on values. The results show that two levels of values can simultaneously be important for an individual, especially when there are values concerning the "love and belonging" level.

Within the variables that are measuring the values of the respondent, a pattern that is evident is that the variable which examines how "important (it is) to live in safe and secure surroundings" has a larger effect on whether someone believes climate change than the two other variables. Where the importance of success has the least effect on the dependent variable. Although the significant interaction terms show that examining values like O'Brien & Wolf (2010, p. 235) argue to be necessary, the fact that some of the interaction terms are not significant can be interpreted as not being important in the context of believing in climate change. In other words, to counter O'Brien & Wolf’s (2010, p. 237) argument, this analysis shows that not all values are essential when it comes to climate change research.

Additionally, within the analysis of heat waves, all the responses of the value variables had the same directionality. A reason for this can be due to the temporal argument made by Pahl, Sheppard, Boomsma, & Groves (2014, p. 376). They argue that humans are only able to prioritize short-term consequences, which a heat wave is in the bigger picture of climate change. As this analysis has shown, such short-term consequences may make people more willing to accept that climate change is happening. These findings confirm Smit & Pilifosovas's (2001, p. 879) assumption that experienced climate stimuli will lead to adaptation, in this context, adaption in the belief in climate change. However, the fact that researchers convey that the big impact consequences of climate change will not be visible until 30 to 80 years, combined with humans' lack of ability to imagine the future (Tonn, Hemrick, & Conrad, 2006, p. 810) and the natural disaster experienced being over a short period of time, the likelihood of individuals shifting their fundamental values on the basis of one event is small. Which is illustrated in the analysis as they shift their belief but not necessarily their values when exposed to a heat wave.

Finally, the importance of success has the least effect on the belief in climate change and is not significant in the heat wave analysis. This may be due to how people define success. The question, which asks how "Important (is it) to be successful and that people recognize achievements", leaves room for multiple interpretations. If we use Inglehart's (1997, p. 4) concept of materialist and post-materialist values, the way success is understood may differ. Since post-materialists value abstract rights such as freedom of speech, the way individuals with this worldview define success may be based on increased freedom of speech or political participation. On the other hand, materialists value economic safety, which means that their understanding of success may be linked to economic growth or freedom to buy property or a car. This means that a post-materialist and a materialists can both value success. However, due to their likely different understanding of success, the effect of the success variable in connection with other variables, such as the belief in climate change, will result in an insignificant interaction. This can be argued due to Tranter & Booth (2015, p. 156) and Kvaløy, Finseraas & Listhaugs (2012, p. 16) findings which state that post-materialist are more likely to believe in climate change.

To summarise, there is a significant connection between values and experienced natural disasters in the belief in climate change. However, the emphasis that O'Brien & Wolf (2010, p. 239) put on the necessity of applying a value-based approach to climate change research may be more directed towards qualitative studies or focusing on other types of values. The values of an individual does indeed have an impact on how they perceive climate change. However, assuming that values are the only factors that have an impact on climate sceptic beliefs is a too simplistic conclusion.

By looking at the results of the analysis, one pattern that has been common for almost all the models run in this analysis is the results of the three control variables, age, gender, and education. This speaks against Lee, Markowitz, Howe, Ko, & Leiserowitz's (2015, p. 1014) argument, which states that identifying standard variables to recognise climate sceptics is close to impossible, as it varies from country to country. From this analysis, it is evident that in European countries, males are more likely to be trend sceptics than females. Additionally, it is possible to conclude that the older the responder is, the more likely it is that he or she has trend sceptic perceptions, although this trend is slightly small. Lastly, as William Jr. (1979, p. 16) emphasises, knowledge is highly connected to values and, in this case, an essential factor for believing that climate is changing, which the education variable illustrates, as the analyses show that when someone has a higher number of years with completed full-time education, they are less likely to be trend sceptics.

So far in the discussion, some of the limitations in this paper have been highlighted, like how only a small proportion of the sample has experienced a wildfire or a drought period and the fact that only using values as predictors for climate change belief is too simplistic. Additionally, two more limitations will be addressed in the paragraphs below.

The first limitation is due to time and space limitations which hindered the possibility of examining the effect of natural disasters on all the categories of climate scepticism identified in the theory chapter. Although including all types of climate sceptics could have made some interesting analyses, the focus of this paper was to examine the effect of natural disasters, and the weight has been put on including more natural disaster types. A possibility would have been to include multiple climate sceptic questions from the ESS8 and create a factor for all climate sceptic tendencies. However, due to the critique of Howarth & Sharman (2015, p. 244), which states that a flaw in climate change research is not acknowledging the difference within climate scepticism, this paper decided against creating a common dependent variable for all types of climate scepticism and opted for only examining one type of climate sceptics, namely the trend sceptics.

However, since the effect of the natural disaster on trend sceptics was relatively small, future research may benefit from examining the effect of natural disasters on the other climate sceptic types. It could be interesting to examine if there would have been a more considerable shift towards people believing that humans cause climate change, or if natural disasters of such type would have made people believe that humans can do something against climate change. An assumption would be that events such as these would make more people feel hopeless and that there would be a shift towards more people being implicatory sceptics[7] after a natural disaster. Lastly, it would be interesting to examine if impact sceptics see that climate change does not necessarily lead to positive consequences. However, as mentioned, this paper has not examined these dimensions due to time and space limitations. Nevertheless, to accommodate Howarth & Sharman's (2015, p. 244) critique, the paper examines one and strongly encourages future research to examine the other types of climate sceptics to see if they have different responses to natural hazard events.

The final limitation of this analysis is access to relevant data. Although it has been possible to conduct a proper analysis, there are several points that could have been improved if the data from the European Social Survey(ESS) and Emergency Events Database (EM-DAT) had been better. The EM-DAT data has, as highlighted previously, not many dry hazard events registered in Europe in the timeframe 2006-2016. A way this could have been solved would be to include even more natural disasters in the analysis. Yet, due to space limitations, the natural disasters were limited to the three dry hazards due to Sutanto, Vitolo, Di Napoli, D'Andrea, & Van Lanen (2020, p. 1) highlighting that these events are often examined together. A second challenge with the EM-DAT data are the multiple missing values within various variables, for instance, damages, injuries, or deaths. Information from this could give valuable insight into whether it was the natural disaster itself or the consequences of the disaster that encouraged more people to believe in climate change, or for drought, reduce the belief.

The final critique of the data is directed at the ESS. The research topic would have gotten a stronger analysis if the research design had been a longitudinal study. That way, it would have been possible to examine a population before and after they have experienced a natural disaster to examine if there are actual shifts towards less climate sceptic tendencies. However, since the ESS round 8 is the only round that includes specific climate change-related survey questions, there are no other ESS surveys that would be comparable for a longitudinal study. This is why this paper had to conduct a study comparing individuals within geographic regions that had and had not experienced a natural disaster. This may be why some of the results are inconclusive, as this research design does not necessarily give a picture of how the natural disasters have impacted the respondents, since cultural, political, and national factors might play a prominent role in the belief in climate change. I would therefore suggest incorporating data from the Eurobarometer in future research, as this can provide data on Europeans'[8] climate change beliefs and values over several years (EU, 2023).

Based on the discussion and the limitations highlighted, this paper would like to put forward some recommendations for politicians and future research.

For politicians and decision-makers, it is essential to acknowledge that public belief in climate change can foster public support for mitigation policies (Stern, Dietz, Abel, Guagnano, & Kalof, 1999, p. 81). The analysis shows that in order to engage the population and increase the belief in climate change, it is important to not exemplify with

[7] See theory chapter.
[8] In this context Europeans are citizens of the European Union.

events that will occur in the future due to humans' inability to imagine far into the future (Tonn, Hemrick, & Conrad, 2006, p. 810). It is wiser to use examples of existing events or consequences of climate change that people can see and experience themselves. However, according to Weber (2010, p. 332), it is important not to scare the population into believing in climate change but instead provide useful and accurate knowledge (Williams Jr., 1979, p. 16) in order for them to make up their own conclusions.

For future research, some aspect that should be kept in mind based on the findings in this analysis is to sample responders from countries with similar political landscapes as well as control for individuals' political alignment. Secondly, it would be wise to either widen the timeframe of collected natural hazards or include more natural hazards in order to get conclusive results. Lastly, including the other types of climate sceptics can lead to interesting results that might be beneficial in tackling climate scepticism and increasing public support for mitigation policies.

7. Conclusion

This paper has examined the effect of natural disasters and values on Europeans' belief in climate change. The two main research questions were:

1. What effect do natural disasters have on Europeans' belief in climate change?
2. Is there a connection between an individual's values and the effect of a natural disaster on whether the person believes the climate is changing or not?

Based on a quantitative analysis, it can be concluded that the natural disasters examined in this thesis do have an effect on people's belief in climate change. However, the results indicate that what type of natural disaster individuals experience will impact whether there is a positive or negative effect on trend sceptic beliefs. The results show that heat waves and wildfires will have a positive effect on the belief in climate change, as was expected. In contrast, experiencing a drought will have a negative effect. The expectations were somewhat confirmed as natural disasters impact climate sceptic tendencies in Europe. However, the fact that drought had a negative effect is an unexpected result. I would encourage other researchers to examine whether this phenomenon is similar in other parts of the world or if this is due to the political landscape of where the three drought events took place.

By including human values in the models with the different natural disasters, the thesis has illustrated how some values are more important and have a more significant effect than others when explaining changes in beliefs. Contrary to my expectation and O'Brien & Wolf's (2010) arguments, the individuals' values have a smaller effect than anticipated. On the other hand, it is possible to conclude that living in safe surroundings has the most significant effect on the dependent variable when interacting with a dry hazard. To summarise, there is a connection between an individual's values and the effect of a natural disaster on whether the person believes that the climate is changing. However, this research cannot provide a generalised statement of what effect these interactions will have. I encourage future research that wishes to incorporate O'Brien & Wolf's (2010) values-based approach to consider two things. First, ensure that the sampling of the respondents is appropriate. Second, include more human values, as this can help see a larger pattern within Marshall's levels of values.

By conducting this analysis, I have aimed to contribute to filling in the knowledge gap of climate sceptic research in Europe. Additionally, using a quantitative cross-national approach to the research questions, the analysis shows that some variables are significant across all countries, which can help future researchers create a more certain definition and characterisation of trend sceptics. The results suggest that applying a values-based approach to examine climate scepticism may be a too simplistic approach. I, therefore, suggest that future research include political aspects such as political affiliation, ideological belief, and an overview of the general political landscape in the studied countries in addition to the human values.

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Appendix

Appendix A: In this appendix two additional tables are presented which include the country variables in an ordered logistic regression analysis, as well as an overview of how many from each country have experienced the different natural disasters.

Appendix B: In this appendix, the figures presented for the significant interaction terms in the results chapter have been improved to make it easier to read the figures if this thesis is read in paper format.

Appendix C: This appendix presents the R-Script, which includes the data preparation and the data analysis.

Appendix A: Additional Tables

Table 11: Ordered logistic regression models with country dummies

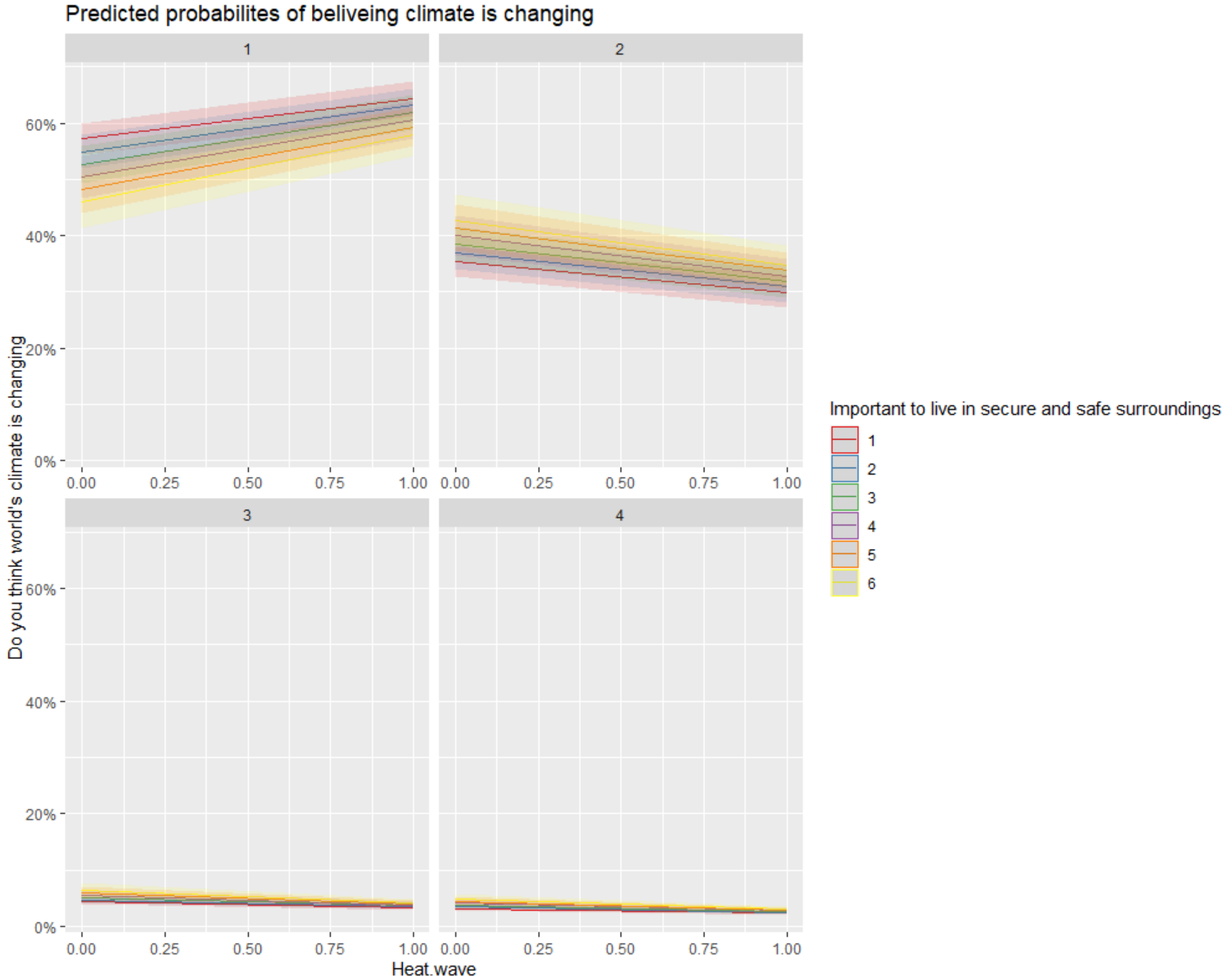
	Dependent variable: Do you think world's climate is changing											
	Model 16				**Model 17**				**Model 18**			
Variables	*Coeff. (OR)*	*Std. Error*	*t-value*	*p-value*	*Coeff. (OR)*	*Std. Error*	*t-value*	*p-value*	*Coeff. (OR)*	*Std. Error*	*t-value*	*p-value*
Heat wave	-0.038 (0.963)	0.031	-1.22	2.24e-01								
Drought					0.122 (1.13)	0.038	3.174	1.50e-03**				
Wildfire									-0.139 (0.87)	0.039	-3.59	3.3e-04***
Age	0.002 (1.002)	0.001	3.19	1.42e-03**	0.002 (1.002)	0.001	3.180	1.48e-03**	0.002 (1.002)	0.001	3.15	1.66e-03**
Male	0.157 (1.17)	0.022	7	2.61e-12***	0.157 (1.171)	0.022	7.032	2.04e-12***	0.157 (1.171)	0.022	7.03	2.04e-12***
Education	-0.052 (0.949)	0.003	-16.24	2.53e-59***	-0.052 (0.949)	0.003	-16.303	9.35e-60***	-0.053 (0.949)	0.003	-16.34	4.83e-60***
Countries (Ref. Austria)												
Belgium	-0.448 (0.639)	0.060	-7.53	5.17e-14***	-0.451 (0.637)	0.059	-7.578	3.52e-14***	-0.451 (0.637)	0.059	-7.58	3.57e-14***
Germany	-0.273 (0.761)	0.060	-4.57	5.0e-06***	-0.257 (0.773)	0.058	-4.405	1.06e-05***	-0.257 (0.773	0.058	-4.4	1.07e-05***
Spain	-0.989 (0.372)	0.066	-14.88	4.7e-50***	-0.973 (0.378)	0.065	-14.950	1.56e-50***	-0.895 (0.409)	0.068	-13.08	4.5e-39***
France	-0.422 (0.656)	0.055	-7.67	1.74e-14***	-0.434 (0.648)	0.054	-8.024	1.02e-15***	-0.429 (0.651)	0.054	-7.94	2.1e-15***
Hungary	0.159 (1.172)	0.067	2.38	1.73e-02*	0.145 (1.156)	0.066	2.202	2.76e-02*	0.145 (1.156)	0.066	2.2	2.77e-02*
Italy	-0.396 (0.673)	0.054	-7.32	2.5e-13***	-0.448 (0.639)	0.057	-7.864	3.72e-15***	-0.362 (0.696)	0.054	-6.76	1.37e-11***
Lithuania	0.305 (1.356)	0.065	4.72	2.38e-06***	0.207 (1.23)	0.073	2.850	4.37e-03**	0.329 (1.39)	0.062	5.35	8.92e-08***
Netherlands	-0.566 (0.568)	0.069	-8.15	3.68e-16***	-0.58 (0.56)	0.069	-8.462	2.63e-17***	-0.58 (0.56)	0.069	-8.46	2.68e-17***
Portugal	-1.273 (0.28)	0.076	-16.71	1.06e-62***	-1.278 (0.23)	0.076	-16.836	1.33e-63***	-1.252 (0.286)	0.076	-16.39	2.29e-60***
Russian Federation	0.689 (1.992)	0.053	12.95	2.49e-38***	0.639 (1.895)	0.055	11.545	7.85e-31***	0.75 (2.116)	0.052	14.34	1.24e-46***
United Kingdom	-0.228 (0.796)	0.065	-3.53	4.11e-04***	-0.237 (0.789)	0.064	-3.695	2.2e-04***	-0.237 (0.789)	0.064	-3.69	2.22e-04***
Observations	33 584				33 584				33 584			
AIC	59623.27				59614.67				59611.80			

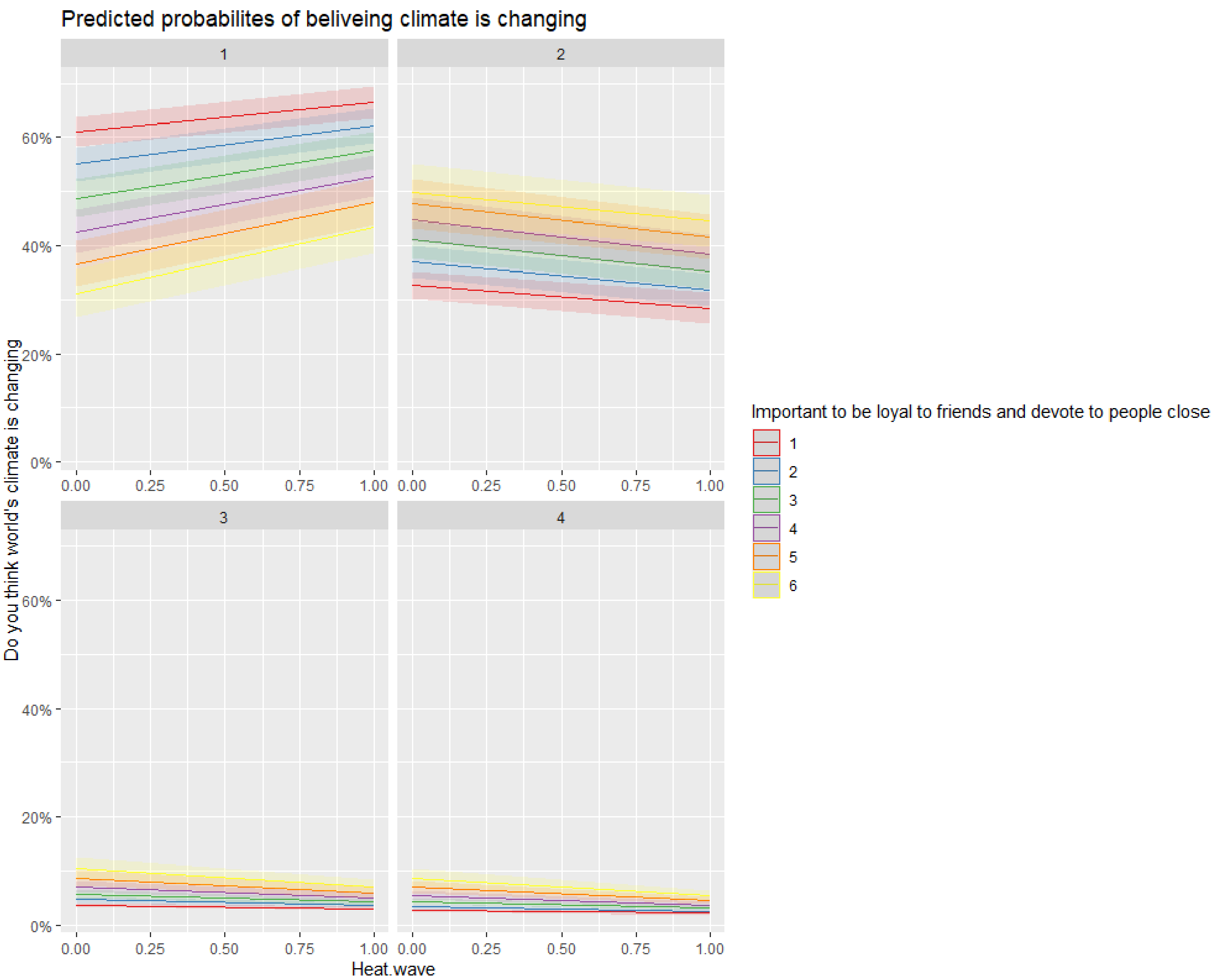
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Table 12: Descriptive statistics on how many people have experienced a natural disaster within 2006-2016

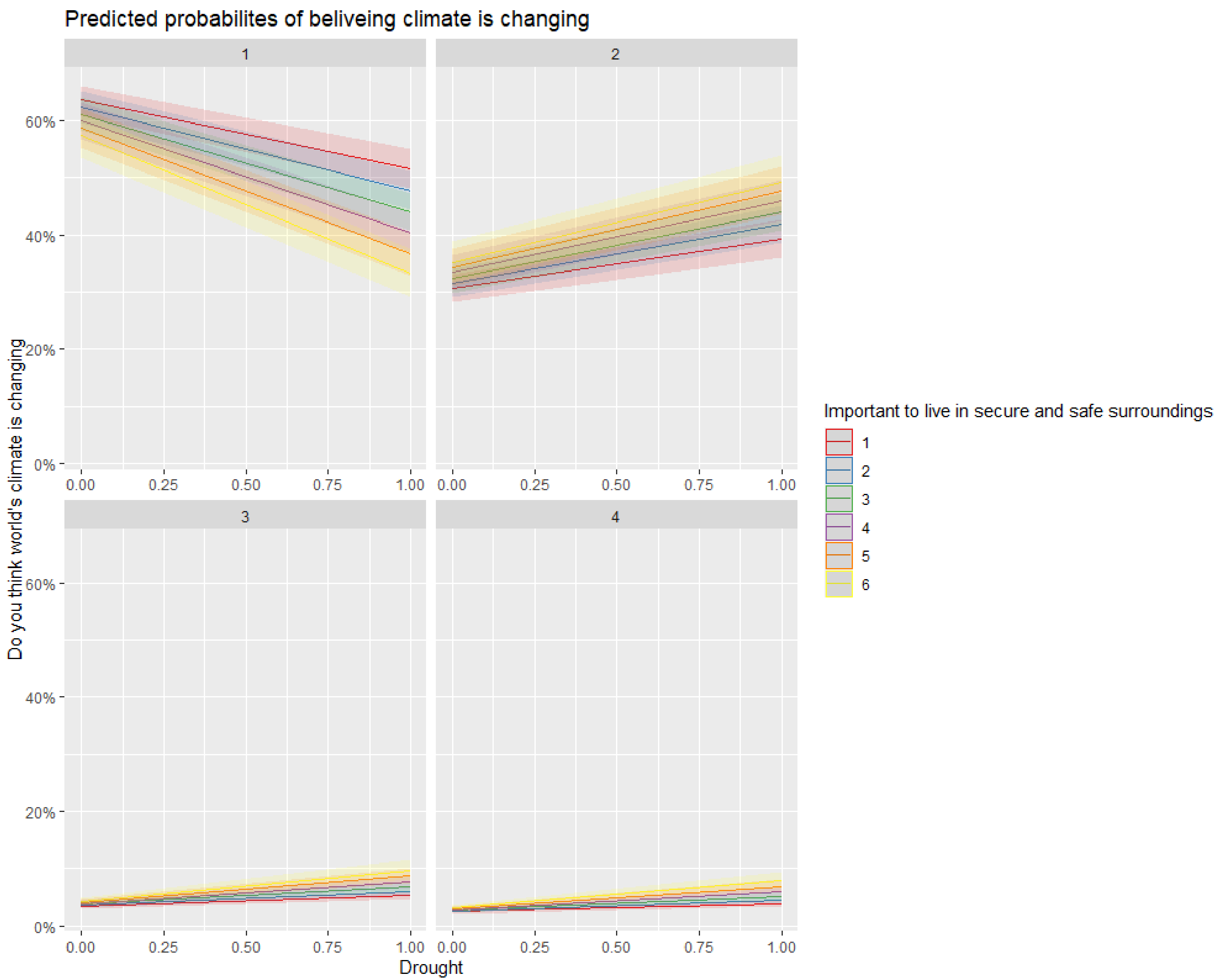
	Austria	**Belgium**	**Germany**	**France**	**Spain**	**Hungary**	**Italy**	**Lithuania**	**Netherlands**	**Portugal**	**Russian Federation**	**United Kingdom**
Heat wave	1268	1962	648	4140	475	1614	1658	0	1681	1270	884	1719
Drought	0	0	0	0	0	0	2607	2122	0	0	3564	0
Wildfire	0	0	0	153	1413	0	828	0	0	330	1904	0
No natural disaster	742	785	2204	209	614	0	19	0	0	0	0	240
N	2010	2747	2852	4349	2502	1614	5112	2122	1681	1600	6352	1959

Appendix B: Enhanced Figures

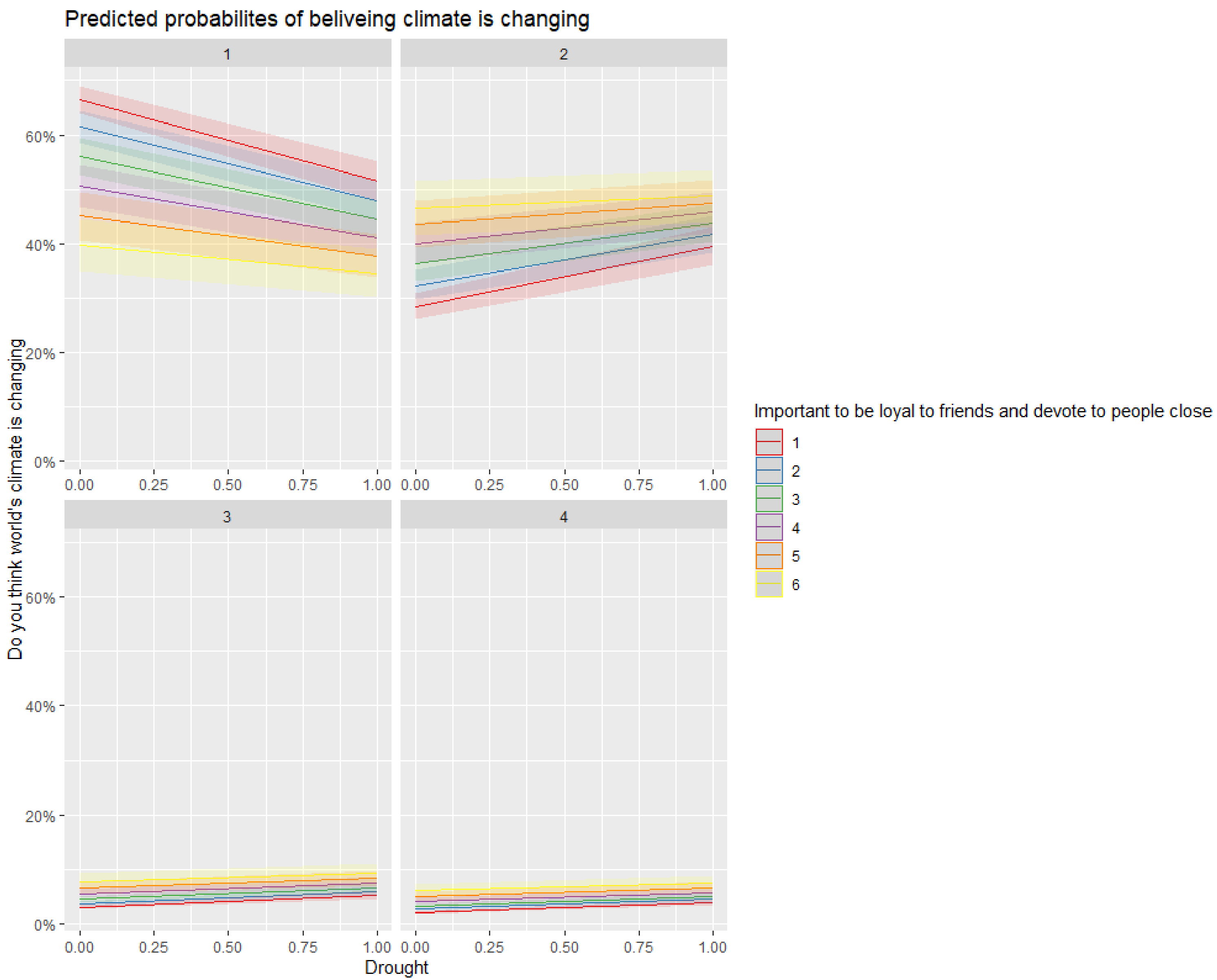


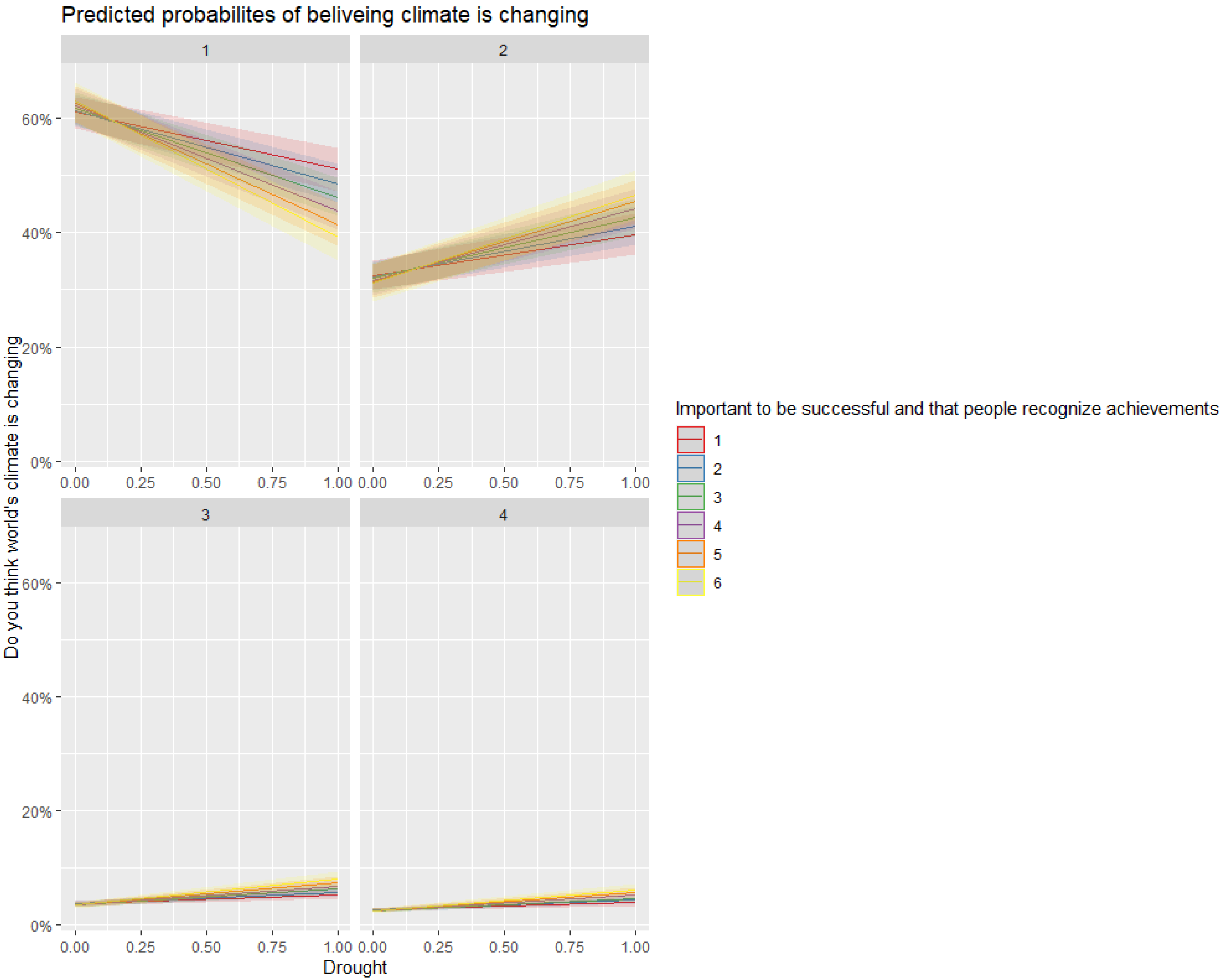


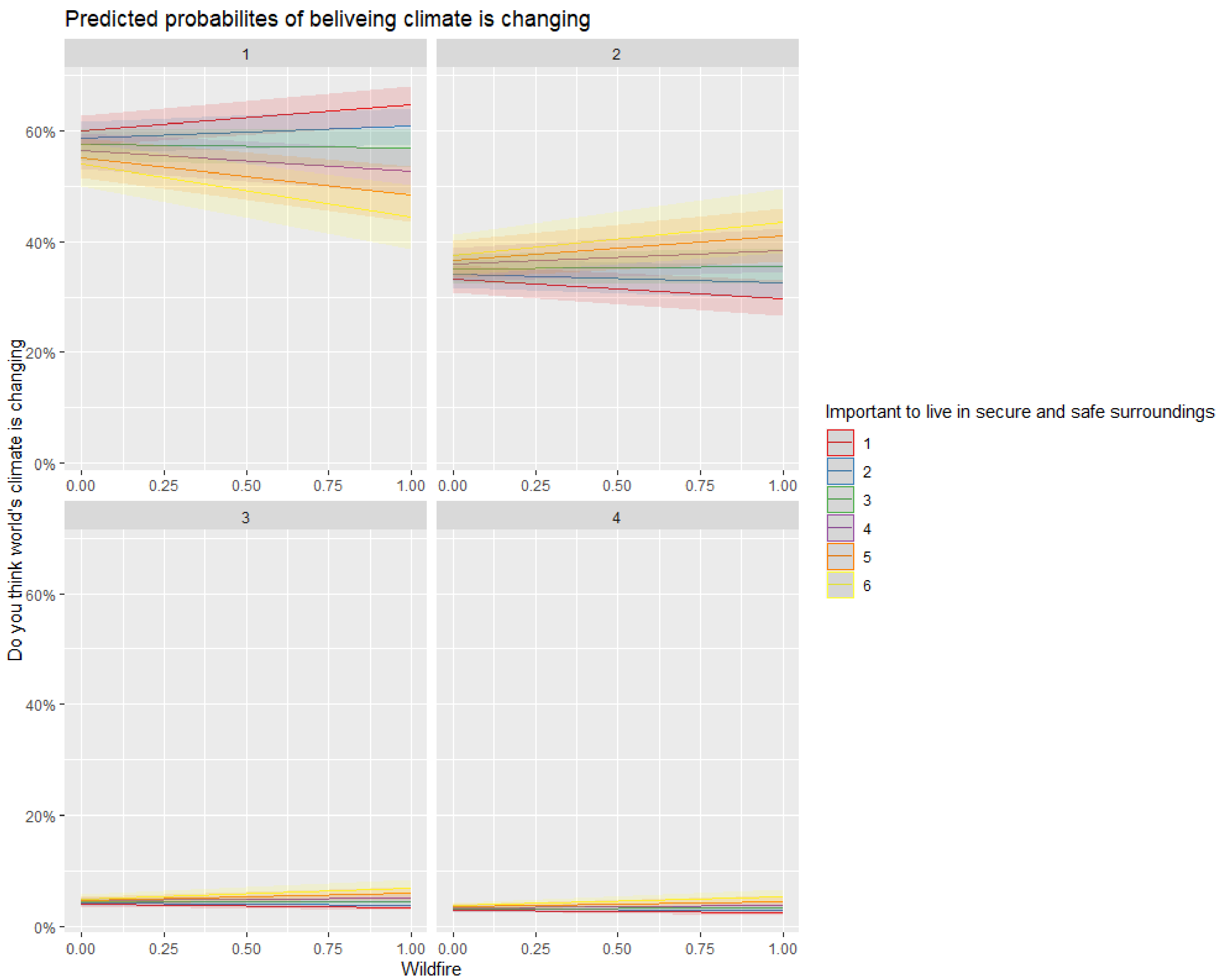
Predicted probabilites of beliveing climate is changing
1
2
3
4
Do you think world's climate is changing
0%
20%
40%
60%
0.00
0.25
0.50
0.75
1.00
Heat.wave
Important to be loyal to friends and devote to people close
1
2
3
4
5
6



Predicted probabilites of beliveing climate is changing
1
2
3
4
Do you think world's climate is changing
60%
40%
20%
0%
0.00
0.25
0.50
0.75
1.00
Drought
Important to live in secure and safe surroundings
1
2
3
4
5
6


Predicted probabilites of beliveing climate is changing
1
2
3
4
Do you think world's climate is changing
0%
20%
40%
60%
0.00
0.25
0.50
0.75
1.00
Drought
Important to be loyal to friends and devote to people close
1
2
3
4
5
6


Predicted probabilites of beliveing climate is changing
1
2
3
4
60%
40%
20%
0%
0.00
0.25
0.50
0.75
1.00
Do you think world's climate is changing
Drought
Important to be successful and that people recognize achievements
1
2
3
4
5
6


Predicted probabilites of beliveing climate is changing
1
2
3
4
Do you think world's climate is changing
60%
40%
20%
0%
0.00
0.25
0.50
0.75
1.00
Wildfire
Important to live in secure and safe surroundings
1
2
3
4
5
6

Appendix C: R-Script

```
#Script - Master thesis#

#Load libraries#
library(tidyverse)
library(ggplot2)
library(dplyr)
library(stargazer)
library(sjPlot)
library(tidyr)
library(lubridate)
library(naniar)
library(MASS)
library(epitools)
library(faraway)



#1. FIX THE ESS8#
ess <-read.csv("ESS8e02_2.csv")

View(ess)
unique(ess$cntry)

#1.1 Choose the variables#
ess_var <- ess%>%
  dplyr::select(country = cntry,
                think.climate.change = clmchng,
                imp.safe.surround = impsafe,
                imp.friends = iplylfr,
                imp.succsess = ipsuces,
                male = gndr,
                age = agea,
                education = eduyrs,
                region = region,
                st.day =inwdds,
```

```
                st.month =inwmms,
                st.year =inwyys,
                e.day =inwdde,
                e.month = inwmme,
                e.year = inwyye)%>%
  drop_na()

view(ess_var)
unique(ess_var$country)
unique(ess_var$region)

#1.2 Remove the countries that are not in the emdat/dataset#
ess_var.cntry <- ess_var %>%
  filter(grepl('BE|ES|FR|PT|HU|LT|RU|IT|DE|AT|GB|NL', country))

view(ess_var.cntry)
class(ess_var.cntry$country)
unique(ess_var.cntry$country)

#1.3 Dummy code the male variable, man =1, woman = 0#
ess.dummy.male <- ess_var.cntry %>%
  mutate("male" = recode(ess_var.cntry$male,
                         '1' = 1,
                         '2' = 0))

view(ess.dummy.male)



#1.3 Replace the missing values from the ESS data with NA#
ess.with.na <- ess.dummy.male%>%
  replace_with_na(replace = list(think.climate.change = c(7, 8, 9),
                                 imp.safe.surround = c(7, 8, 9),
                                 imp.friends = c(7, 8, 9),
                                 imp.succsess = c(7, 8, 9),
                                 age = c (999),
                                 education = c(77, 88, 99)))
```

```
view(ess.with.na)


#1.4 Rename final ess subset#
ess.done <- ess.with.na

view(ess.done)


#2. FIX THE EMDAT 2006-2016 DATASET#
emdat <- read.csv2("emdat_2006-2016.csv")

View(emdat)

#2.1 Choose the variables#
emdat.var <- emdat %>%
  dplyr::select(year = "Year",
              disaster = "Disaster.Type",
              country = "Country",
              place = "Location",
              st.year = "Start.Year",
              st.month = "Start.Month",
              st.day = "Start.Day",
              e.year = "End.Year",
              e.month = "End.Month",
              e.day = "End.Day",
              geo.loc = "Geo.Locations")


#2.2 Rename the countries values to mach the ESS values#
emdat.country <- emdat.var%>%
  mutate(country = recode (country, Belgium = "BE",
                           Spain = "ES",
                           'Canary Is' = "ES",
                           France = "FR",
```

```
                              Bulgaria = "BG",
                              Portugal = "PT",
                              Romania = "Ro",
                              Hungary = "HU",
                              Albania = "AL",
                              Denmark = "DK",
                              Greece = "GR",
                              Lithuania = "LT",
                              'Macedonia (the former Yugoslav Republic of)' =
"MK",
                              'Russian Federation (the)' = "RU",
                              Italy = "IT",
                              Croatia = "HR",
                              Ukraine = "UA",
                              Poland = "PL",
                              Slovakia = "SK",
                              Latvia = "LV",
                              Montenegro = "ME",
                              Sweden = "SE",
                              Austria = "AT",
                              Switzerland = "CH",
                              Germany = "DE",
                              'Czech Republic (the)' = "CZ",
                              'United Kingdom of Great Britain and Northern
Ireland (the)' = "GB",
                              Luxembourg = "LU",
                              Slovenia = "SL",
                              'Netherlands (the)' = "NL",
                              Serbia = "RS"))


view(emdat.country)


#2.3 Edit the regions#
#2.3.1 Duplicate the geo.loc variable#
emdat.dupli <- emdat.country %>%
```

```
  mutate("loc.regions" = geo.loc)

View(emdat.dupli)

#2.3.2 See which countries are in emdat AND ess#
unique(emdat.country$country)
unique(ess_var$country)

#2.3.3 Add the ESS codes to the loc.regions variables, for the countries that are both in ESS and EM-DAT#
emdat.region <-emdat.dupli%>%
  mutate(loc.regions = recode(loc.regions,
                              "Region de Bruxelles-Capitale / Brussels Hoofdstedelijk Gewes, Region wallonne, Vlaams Gewest (Adm1)." = 'BE10,BE21,BE31,BE32,BE33,BE34,BE35',
                              "Burgenland, Karnten, Niederosterreich, Steiermark, Wien (Adm1)." = 'AT11,AT21,AT12,AT22,AT13',
                              "Dresden, Mittelfranken (Adm2)." = 'DE2,DED',
                              "Galicia (Adm1)." = 'ES11',
                              "Las Palmas, Santa Cruz de Tenerife (Adm2)." = 'ES70',
                              "Almerea, Burgos, Cuenca, Tarragona, Teruel (Adm2)." = 'ES24,ES61,ES51,ES41,ES42',
                              "Cataluna/Catalunya, Comunitat Valenciana (Adm1)." = 'ES52,ES51',
                              "Girona (Adm2)." = 'ES51',
                              "Corse (Adm1). Bouches-du-Rhone (Adm2)." = 'FRL0',
                              "Alsace, Aquitaine, Auvergne, Basse-Normandie, Bourgogne, Bretagne, Centre, Champagne-Ardenne, Corse, Franche-Comte, Haute-Normandie, Ile-de-France, Languedoc-Rousillon, Limousin, Lorraine, Midi-Pyrenees, Nord-Pas-de-Calais, Pays-de-la-Loire, Picardie, Poitou-Charentes, Provence-Alpes-Cote-d'Azur, Rhone-Alpes (Adm1)." = 'FRF1,FRI1,FRK1,FRD1,FRC1,FRH0,FRB0,FRF2,FRC2,FRD2,FR10,FRJ1,FRI2,FRF3,FRE1,FRJ2,FRG0,FRE2,FRI3,FRL0,FRK2',
                              "England, Wales (Adm1)." = 'UKL,UKC,UKD,UKE,UKF,UKG,UKH,UKI,UKJ,UKK',
                              "Bacs-kiskun, Baranya, Bekes, Borsod-abauj-zemplen, Budapest, Csongrad, Fejer, Gyor-moson-sopron, Hajdu-bihar, Heves, Jasz-nagykun-szolnok, Komarom-esztergom, Nograd, Pest, Somogy, Szabolcs-szatmar-bereg, Tolna, Vas, Veszprem, Zala (Adm1)." = 'HU331,HU231,HU332,HU311,HU101,HU333,HU211,HU221,HU321,HU312,HU322,HU212,HU313,HU102,HU232,HU323,HU233,HU222,HU213,HU223',
                              "Abruzzi, Basilicata, Calabria, Campania, Emilia-romagna, Friuli-venezia Giulia, Lazio, Liguria, Lombardia, Marche,
```

Molise, Piemonte, Puglia, Sardegna, Sicilia, Toscana, Trentino-alto Adige, Umbria, Valle D'aosta, Veneto (Adm1)." = 'ITF1,ITF5,ITF6,ITF3,ITH5,ITH4,ITI4,ITC3,ITC4,ITI3,ITC1,ITF4,ITG2,ITG1,ITI1,ITH2,ITI2,ITC2,ITH3',

"Abruzzi, Calabria, Sardegna, Sicilia (Adm1). Napoli (Adm2)." = 'ITF1,ITG2,ITG1,ITF6,ITF3',

"Sardegna, Sicilia (Adm1)." = 'ITG1,ITG2',

"Calabria, Sicilia, Trentino-alto Adige (Adm1)." = 'ITG2,ITF6,ITH2',

"Messina, Milano, Napoli, Roma, Torino, Trieste, Verona (Adm2)." = 'ITC4,ITC1,ITH4,ITH3,ITG1,ITI4,ITF3',

"Alytaus, Kauno, Klaipedos, Marijampoles, Panevezio, Siauliu, Taurages, Telsiu, Utenos, Vilniaus (Adm1)." = 'LT001,LT002,LT003,LT004,LT005,LT006,LT007,LT008,LT009,LT00A',

"Drenthe, Flevoland, Friesland, Gelderland, Groningen, Limburg, Noord-brabant, Noord-holland, Overijssel, Utrecht, Zeeland, Zuid-holland (Adm1)." = 'NL13,NL23,NL12,NL22,NL11,NL42,NL41,NL32,NL21,NL31,NL34,NL33',

"Aveiro, Viseu (Adm1)." = 'PT16',

"Funchal, Silves (Adm2)." = 'PT15',

"Aveiro, Beja, Braga, Braganca, Castelo Branco, Coimbra, Evora, Faro, Guarda, Leiria, Lisboa, Portalegre, Porto, Santarem, Setubal, Viana Do Castelo, Vila Real, Viseu (Adm1)." = 'PT16,PT18,PT11,PT15,PT17',

"Adygeya Rep., Astrakhanskaya Oblast, Bashkortostan Rep., Belgorodskaya Oblast, Bryanskaya Oblast, Chelyabinskaya Oblast, Ivanovskaya Oblast, Kalmykiya Rep., Kaluzhskaya Oblast, Krasnodarskiy Kray, Kurskaya Oblast, Lipetskaya Oblast, Moskovskaya Oblast, Moskva, Name Unknown, Orenburgskaya Oblast, Orlovskaya Oblast, Penzenskaya Oblast, Rostovskaya Oblast, Ryazanskaya Oblast, Samarskaya Oblast, Saratovskaya Oblast, Smolenskaya Oblast, Stavropolskiy Kray, Tambovskaya Oblast, Tulskaya Oblast, Tverskaya Oblast, Ulyanovskaya Oblast, Vladimirskaya Oblast, Volgogradskaya Oblast, Voronezhskaya Oblast, Yaroslavskaya Oblast (Adm1)." = 'RU14, RU13, RU11, RU16, RU15',

"Adygeya Rep., Astrakhanskaya Oblast, Bashkortostan Rep., Belgorodskaya Oblast, Bryanskaya Oblast, Chelyabinskaya Oblast, Kalmykiya Rep., Krasnodarskiy Kray, Kurskaya Oblast, Lipetskaya Oblast, Name Unknown, Orenburgskaya Oblast, Orlovskaya Oblast, Penzenskaya Oblast, Rostovskaya Oblast, Samarskaya Oblast, Saratovskaya Oblast, Stavropolskiy Kray, Tambovskaya Oblast, Ulyanovskaya Oblast, Volgogradskaya Oblast, Voronezhskaya Oblast (Adm1)." = 'RU14,RU13,RU11,RU16,RU15',

"Volgogradskaya Oblast (Adm1)." = 'RU14',

"Lipetskaya Oblast, Moskovskaya Oblast, Moskva, Volgogradskaya Oblast, Voronezhskaya Oblast (Adm1)." = 'RU11, RU14',

"Belgorodskaya Oblast, Ivanovskaya Oblast, Lipetskaya Oblast, Moskovskaya Oblast, Moskva, Novgorodskaya Oblast, Voronezhskaya Oblast (Adm1)." = 'RU14, RU11, RU12',

"Amurskaya Oblast (Adm1)." = 'RU18',

```
                              "Aginskiy Buryatskiy A. Okrug, Chitinskaya
Oblast, Khakasiya Rep. (Adm1)." = 'RU17,RU18'))

View(emdat.region)


#2.4 Create an ID variable for each event#
emdat.id <- emdat.region %>%
  dplyr::mutate( ID = row_number())

view(emdat.id)


#2.5 Split the region in the long format#
emdat.region.split <- emdat.id%>%
  separate(col = (loc.regions), into = c("Reg1",
                                         "Reg2",
                                         "Reg3",
                                         "Reg4",
                                         "Reg5",
                                         "Reg6",
                                         "Reg7",
                                         "Reg8",
                                         "Reg9",
                                         "Reg10",
                                         "Reg11",
                                         "Reg12",
                                         "Reg13",
                                         "Reg14",
                                         "Reg15",
                                         "Reg16",
                                         "Reg17",
                                         "Reg18",
                                         "Reg19",
                                         "Reg20",
                                         "Reg21",
                                         "Reg22",
```

```
                                          "Reg23",
                                          "Reg24",
                                          "Reg25"), sep = ,)
view(emdat.region.split)


#2.6 Reg1-Reg25 colums to rows
emdat.split.long <- emdat.region.split %>%
  pivot_longer(cols = starts_with("Reg"),
               names_to = "reg",
               values_to = "region",
               values_drop_na = TRUE)

view(emdat.split.long)



#3. MERGE THE TWO DATASETS#
joint.dataset <-merge(emdat.split.long, ess.done, by = "region")

view(joint.dataset)



#4. CREATE DUMMY VARIABLES FOR THE DISASTER EVENTS#
disaster.dummies <- joint.dataset%>%
  mutate("Heat.wave" = recode(joint.dataset$disaster,
                              "Extreme temperature" = 1,
                              "Drought" = 0,
                              "Wildfire" = 0))%>%
  mutate("Drought" = recode(joint.dataset$disaster,
                            "Drought" = 1,
                            "Wildfire" = 0,
                            "Extreme temperature" = 0))%>%
  mutate("Wildfire" = recode(joint.dataset$disaster,
                             "Drought" = 0,
                             "Wildfire" = 1,
                             "Extreme temperature" = 0))
```

```
view(disaster.dummies)

#5 ADD OTHER REGIONS FROM ESS#
#5.1 Figure out which regions are included in the joint.dataset#
unique(joint.dataset$region)

#5.2 Create new ESS subset without the EM-DAT regions#
ess.region.subset <- subset(ess.done, ess.done$region != "AT11" &
                              ess.done$region != "AT12" &
                              ess.done$region != "AT13" &
                              ess.done$region != "AT21" &
                              ess.done$region != "AT22" &
                              ess.done$region != "BE10" &
                              ess.done$region != "BE21" &
                              ess.done$region != "BE31" &
                              ess.done$region != "BE32" &
                              ess.done$region != "BE33" &
                              ess.done$region != "BE34" &
                              ess.done$region != "BE35" &
                              ess.done$region != "DE2" &
                              ess.done$region != "DED" &
                              ess.done$region != "ES11" &
                              ess.done$region != "ES24" &
                              ess.done$region != "ES41" &
                              ess.done$region != "ES42" &
                              ess.done$region != "ES51" &
                              ess.done$region != "ES52" &
                              ess.done$region != "ES61" &
                              ess.done$region != "ES70" &
                              ess.done$region != "FR10" &
                              ess.done$region != "FRB0" &
                              ess.done$region != "FRC1" &
                              ess.done$region != "FRC2" &
                              ess.done$region != "FRD1" &
                              ess.done$region != "FFRD2" &
```

```
ess.done$region != "FRE1" &
ess.done$region != "FRE2" &
ess.done$region != "FRF1" &
ess.done$region != "FRF2" &
ess.done$region != "FRF3" &
ess.done$region != "FRG0" &
ess.done$region != "FRH0" &
ess.done$region != "FRI1" &
ess.done$region != "FRI2" &
ess.done$region != "FRI3" &
ess.done$region != "FRJ1" &
ess.done$region != "FRJ2" &
ess.done$region != "FRK1" &
ess.done$region != "FRK2" &
ess.done$region != "FRL0" &
ess.done$region != "HU101" &
ess.done$region != "HU102" &
ess.done$region != "HU211" &
ess.done$region != "HU212" &
ess.done$region != "HU213" &
ess.done$region != "HU221" &
ess.done$region != "HU222" &
ess.done$region != "HU223" &
ess.done$region != "HU231" &
ess.done$region != "HU232" &
ess.done$region != "HU233" &
ess.done$region != "HU311" &
ess.done$region != "HU312" &
ess.done$region != "HU313" &
ess.done$region != "HU321" &
ess.done$region != "HU322" &
ess.done$region != "HU323" &
ess.done$region != "HU331" &
ess.done$region != "HU332" &
ess.done$region != "HU333" &
ess.done$region != "ITC1" &
```

```
ess.done$region != "ITC2" &
ess.done$region != "ITC3" &
ess.done$region != "ITC4" &
ess.done$region != "ITF1" &
ess.done$region != "ITF3" &
ess.done$region != "ITF4" &
ess.done$region != "ITF5" &
ess.done$region != "ITF6" &
ess.done$region != "ITG1" &
ess.done$region != "ITG2" &
ess.done$region != "ITH2" &
ess.done$region != "ITH3" &
ess.done$region != "ITH4" &
ess.done$region != "ITH5" &
ess.done$region != "ITI1" &
ess.done$region != "ITI2" &
ess.done$region != "ITI3" &
ess.done$region != "ITI4" &
ess.done$region != "LT001" &
ess.done$region != "LT002" &
ess.done$region != "LT003" &
ess.done$region != "LT004" &
ess.done$region != "LT005" &
ess.done$region != "LT006" &
ess.done$region != "LT007" &
ess.done$region != "LT008" &
ess.done$region != "LT009" &
ess.done$region != "LT00A" &
ess.done$region != "NL11" &
ess.done$region != "NL12" &
ess.done$region != "NL13" &
ess.done$region != "NL21" &
ess.done$region != "NL22" &
ess.done$region != "NL23" &
ess.done$region != "NL31" &
ess.done$region != "NL32" &
```

```
                                 ess.done$region != "NL33" &
                                 ess.done$region != "NL34" &
                                 ess.done$region != "NL41" &
                                 ess.done$region != "NL42" &
                                 ess.done$region != "PT11" &
                                 ess.done$region != "PT15" &
                                 ess.done$region != "PT16" &
                                 ess.done$region != "PT17" &
                                 ess.done$region != "PT18" &
                                 ess.done$region != "RU11" &
                                 ess.done$region != "RU12" &
                                 ess.done$region != "RU13" &
                                 ess.done$region != "RU14" &
                                 ess.done$region != "RU15" &
                                 ess.done$region != "RU16" &
                                 ess.done$region != "RU17" &
                                 ess.done$region != "RU18" &
                                 ess.done$region != "UKC" &
                                 ess.done$region != "UKD" &
                                 ess.done$region != "UKE" &
                                 ess.done$region != "UKF" &
                                 ess.done$region != "UKG" &
                                 ess.done$region != "UKH" &
                                 ess.done$region != "UKI" &
                                 ess.done$region != "UKJ" &
                                 ess.done$region != "UKK" &
                                 ess.done$region != "UKL")


view(ess.region.subset)
unique(ess.region.subset$country)

#5.3 Create similar columns to the em-dat but with value 0#
Wildfire = c(0)
Drought = c(0)
Heat.wave = c(0)
```

```
ID = c(0)
reg = c(0)
e.day.x = c(0)
e.month.x = c(0)
e.year.x = c(0)
st.day.x = c(0)
st.month.x = c(0)
st.year.x = c(0)
year = c(0)
disaster = c(0)
country.x = c(0)
place = c(0)
geo.loc = c(0)

ess.region.emdat.var <-cbind (ess.region.subset ,
                              Wildfire,
                              Drought,
                              Heat.wave,
                              ID,
                              reg,
                              e.day.x,
                              e.month.x,
                              e.year.x,
                              st.day.x,
                              st.month.x,
                              st.year.x,
                              year,
                              disaster,
                              country.x,
                              place,
                              geo.loc)

View(ess.region.emdat.var)

#5.4 Rename variables to make them identical to the ones in the
disaster.dummies df#
```

```
ess.region.emdat.renamed <- rename(ess.region.emdat.var, country.y =
country,
                                   st.day.y = st.day,
                                   st.month.y = st.month,
                                   st.year.y = st.year,
                                   e.day.y = e.day,
                                   e.month.y = e.month,
                                   e.year.y = e.year)

view(ess.region.emdat.renamed)

#5.5 Add the ess.region.emdat.renamed to the disaster.dummies df.#
appended.df <- rbind(disaster.dummies, ess.region.emdat.renamed)

view(appended.df)




#6. REMOVE NON-NUMERIC/NON NECESSARY VARIABLES#
appended.var <- appended.df%>%
  dplyr::select(region = region,
                ID = ID,
                country.y = country.y,
                think.climate.change,
                male,
                age,
                education,
                imp.safe.surround,
                imp.friends,
                imp.succsess,
                Heat.wave,
                Drought,
                Wildfire)
view(appended.var)

#8. DUMMYCODE COUNTRIES#
unique(appended.var$country.y)
```

```
appended.country <- appended.var%>%
  mutate("Austria" = recode(appended.var$country.y,
                            "AT" = 1,
                            "BE" = 0,
                            "DE" = 0,
                            "ES" = 0,
                            "FR" = 0,
                            "GB" = 0,
                            "HU" = 0,
                            "IT" = 0,
                            "LT" = 0,
                            "NL" = 0,
                            "PT" = 0,
                            "RU" = 0))%>%
  mutate("Belgium" = recode(appended.var$country.y,
                            "AT" = 0,
                            "BE" = 1,
                            "DE" = 0,
                            "ES" = 0,
                            "FR" = 0,
                            "GB" = 0,
                            "HU" = 0,
                            "IT" = 0,
                            "LT" = 0,
                            "NL" = 0,
                            "PT" = 0,
                            "RU" = 0))%>%
  mutate("Germany" = recode(appended.var$country.y,
                            "AT" = 0,
                            "BE" = 0,
                            "DE" = 1,
                            "ES" = 0,
                            "FR" = 0,
                            "GB" = 0,
                            "HU" = 0,
                            "IT" = 0,
```

```
                          "LT" = 0,
                          "NL" = 0,
                          "PT" = 0,
                          "RU" = 0))%>%
mutate("Spain" = recode(appended.var$country.y,
                        "AT" = 0,
                        "BE" = 0,
                        "DE" = 0,
                        "ES" = 1,
                        "FR" = 0,
                        "GB" = 0,
                        "HU" = 0,
                        "IT" = 0,
                        "LT" = 0,
                        "NL" = 0,
                        "PT" = 0,
                        "RU" = 0))%>%
mutate("France" = recode(appended.var$country.y,
                         "AT" = 0,
                         "BE" = 0,
                         "DE" = 0,
                         "ES" = 0,
                         "FR" = 1,
                         "GB" = 0,
                         "HU" = 0,
                         "IT" = 0,
                         "LT" = 0,
                         "NL" = 0,
                         "PT" = 0,
                         "RU" = 0))%>%
mutate("United.Kingdom" = recode(appended.var$country.y,
                                 "AT" = 0,
                                 "BE" = 0,
                                 "DE" = 0,
                                 "ES" = 0,
                                 "FR" = 0,
```

```
                                 "GB" = 1,
                                 "HU" = 0,
                                 "IT" = 0,
                                 "LT" = 0,
                                 "NL" = 0,
                                 "PT" = 0,
                                 "RU" = 0))%>%
mutate("Hungary" = recode(appended.var$country.y,
                          "AT" = 0,
                          "BE" = 0,
                          "DE" = 0,
                          "ES" = 0,
                          "FR" = 0,
                          "GB" = 0,
                          "HU" = 1,
                          "IT" = 0,
                          "LT" = 0,
                          "NL" = 0,
                          "PT" = 0,
                          "RU" = 0))%>%
mutate("Italy" = recode(appended.var$country.y,
                        "AT" = 0,
                        "BE" = 0,
                        "DE" = 0,
                        "ES" = 0,
                        "FR" = 0,
                        "GB" = 0,
                        "HU" = 0,
                        "IT" = 1,
                        "LT" = 0,
                        "NL" = 0,
                        "PT" = 0,
                        "RU" = 0))%>%
mutate("Lithuania" = recode(appended.var$country.y,
                            "AT" = 0,
                            "BE" = 0,
```

```
                                    "DE" = 0,
                                    "ES" = 0,
                                    "FR" = 0,
                                    "GB" = 0,
                                    "HU" = 0,
                                    "IT" = 0,
                                    "LT" = 1,
                                    "NL" = 0,
                                    "PT" = 0,
                                    "RU" = 0))%>%
mutate("Netherlands" = recode(appended.var$country.y,
                                      "AT" = 0,
                                      "BE" = 0,
                                      "DE" = 0,
                                      "ES" = 0,
                                      "FR" = 0,
                                      "GB" = 0,
                                      "HU" = 0,
                                      "IT" = 0,
                                      "LT" = 0,
                                      "NL" = 1,
                                      "PT" = 0,
                                      "RU" = 0))%>%
mutate("Portugal" = recode(appended.var$country.y,
                                   "AT" = 0,
                                   "BE" = 0,
                                   "DE" = 0,
                                   "ES" = 0,
                                   "FR" = 0,
                                   "GB" = 0,
                                   "HU" = 0,
                                   "IT" = 0,
                                   "LT" = 0,
                                   "NL" = 0,
                                   "PT" = 1,
                                   "RU" = 0))%>%
```

```
  mutate("Russian.Federation" = recode(appended.var$country.y,
                                       "AT" = 0,
                                       "BE" = 0,
                                       "DE" = 0,
                                       "ES" = 0,
                                       "FR" = 0,
                                       "GB" = 0,
                                       "HU" = 0,
                                       "IT" = 0,
                                       "LT" = 0,
                                       "NL" = 0,
                                       "PT" = 0,
                                       "RU" = 1))


View(appended.country)

#9. RENAME FINISHED SUBSET#
data.done <- appended.country
view(data.done)

#10. DESCRIPTIVE STATISTICS#
descriptive.age <- data.done %>%
  summarise(mean_age= mean(age, na.rm = TRUE),
            min_age = min(age, na.rm = TRUE),
            max_age = max(age, na.rm = TRUE),
            sd_age = sd(age, na.rm = TRUE),
            num_missing = sum (is.na (age)),
            n = n())
view(descriptive.age)

descriptive.edu <- data.done %>%
  summarise(mean_edu= mean(education, na.rm = TRUE),
            min_edu = min(education, na.rm = TRUE),
            max_edu = max(education, na.rm = TRUE),
            sd_edu = sd(education, na.rm = TRUE),
```

```
            num_missing = sum (is.na (education)),
            n = n())
view(descriptive.edu)


table(data.done$male)
table1 <- table(data.done$male)
prop.table(table1)

table(data.done$Heat.wave)
table2 <- table(data.done$Heat.wave)
prop.table(table2)

table(data.done$Drought)
table3 <- table(data.done$Drought)
prop.table(table3)

table(data.done$Wildfire)
table4 <- table(data.done$Wildfire)
prop.table(table4)

table(data.done$Austria)
tableAT <- table(data.done$Austria)
prop.table(tableAT)

table(data.done$Belgium)
tableBE <- table(data.done$Belgium)
prop.table(tableBE)

table(data.done$Germany)
tableDE <- table(data.done$Germany)
prop.table(tableDE)

table(data.done$Spain)
tableES <- table(data.done$Spain)
prop.table(tableES)
```

```
table(data.done$France)
tableFR <- table(data.done$France)
prop.table(tableFR)

table(data.done$`United Kingdom`)
tableGB <- table(data.done$`United Kingdom`)
prop.table(tableGB)

table(data.done$Hungary)
tableHU <- table(data.done$Hungary)
prop.table(tableHU)

table(data.done$Italy)
tableIT <- table(data.done$Italy)
prop.table(tableIT)

table(data.done$Lithuania)
tableLT <- table(data.done$Lithuania)
prop.table(tableLT)

table(data.done$Netherlands)
tableNL <- table(data.done$Netherlands)
prop.table(tableNL)

table(data.done$Portugal)
tablePT <- table(data.done$Portugal)
prop.table(tablePT)

table(data.done$`Russian Federation`)
tableRU <- table(data.done$`Russian Federation`)
prop.table(tableRU)

table(data.done$think.climate.change)
table.tcc <- table(data.done$think.climate.change)
prop.table(table.tcc)
```

```
table(data.done$imp.safe.surround)
table.i.s.s <- table(data.done$imp.safe.surround)
prop.table(table.i.s.s)

table(data.done$imp.friends)
table.i.f <- table(data.done$imp.friends)
prop.table(table.i.f)

table(data.done$imp.succsess)
table.i.s <- table(data.done$imp.succsess)
prop.table(table.i.s)

table(data.done$Wildfire, data.done$country.y)
table(data.done$Drought, data.done$country.y)
table(data.done$Heat.wave, data.done$country.y)



#11. CREATE MODELS#
#11.1 Models on trend sceptics and heat waves#
#11.1.1 Simple models#
mod.heat.1 <- polr(as.factor (think.climate.change) ~ Heat.wave,
                   data = data.done, Hess = TRUE, method = c("logistic"))
summary(mod.heat.1)
exp(coefficients(mod.heat.1))

sum.cof.mod.heat.1 <- coef(summary(mod.heat.1))
pval.mod.heat.1 <- pnorm (abs(sum.cof.mod.heat.1[,"t value"]), lower.tail =
FALSE)*2
table.w.pval.mod.heat.1 <- cbind(sum.cof.mod.heat.1, "p value" =
pval.mod.heat.1)

mod.heat.int.1 <- polr(as.factor(think.climate.change)~
Heat.wave*imp.safe.surround,
                       data = data.done, Hess = TRUE, method = c
("logistic"))
summary(mod.heat.int.1)
exp(coefficients(mod.heat.int.1))
```

```
mod.heat.int.2 <- polr(as.factor(think.climate.change)~
Heat.wave*imp.friends,
                       data = data.done, Hess = TRUE, method = c
("logistic"))

summary(mod.heat.int.2)

exp(coefficients(mod.heat.int.2))


mod.heat.int.3 <- polr(as.factor(think.climate.change)~
Heat.wave*imp.succsess,
                       data = data.done, Hess = TRUE, method = c
("logistic"))

summary(mod.heat.int.3)

exp(coefficients(mod.heat.int.3))


#11.1.2 Models with controlvariables#


mod.heat.2 <- polr(as.factor (think.climate.change) ~ Heat.wave + age +
male + education,
                   data = data.done, Hess = TRUE, method = c("logistic"))

summary(mod.heat.2)

exp(coefficients(mod.heat.2))

sum.cof.mod.heat.2 <- coef(summary(mod.heat.2))

pval.mod.heat.2 <- pnorm (abs(sum.cof.mod.heat.2[,"t value"]), lower.tail =
FALSE)*2

table.w.pval.mod.heat.2 <- cbind(sum.cof.mod.heat.2, "p value" =
pval.mod.heat.2)




mod.heat.3 <- polr(as.factor (think.climate.change) ~ Heat.wave + age +
male + education + Belgium + Germany + Spain + France + Hungary + Italy +
Lithuania + Netherlands + United.Kingdom + Russian.Federation + Portugal,
                   data = data.done, Hess = TRUE, method = c("logistic"))

summary(mod.heat.3)

exp(coefficients(mod.heat.3))

sum.cof.mod.heat.3 <- coef(summary(mod.heat.3))

pval.mod.heat.3 <- pnorm (abs(sum.cof.mod.heat.3[,"t value"]), lower.tail =
FALSE)*2

table.w.pval.mod.heat.3 <- cbind(sum.cof.mod.heat.3, "p value" =
pval.mod.heat.3)
```

```
mod.heat.int.4 <- polr(as.factor(think.climate.change)~
Heat.wave*imp.safe.surround + age + male + education,
                       data = data.done, Hess = TRUE, method = c
("logistic"))

summary(mod.heat.int.4)

exp(coefficients(mod.heat.int.4))

sum.cof.mod.heat.int.4 <- coef(summary(mod.heat.int.4))

pval.mod.heat.int.4 <- pnorm (abs(sum.cof.mod.heat.int.4[,"t value"]),
lower.tail = FALSE)*2

table.w.pval.mod.heat.int.4 <- cbind(sum.cof.mod.heat.int.4, "p value" =
pval.mod.heat.int.4)



mod.heat.int.5 <- polr(as.factor(think.climate.change)~
Heat.wave*imp.friends + age + male + education,
                       data = data.done, Hess = TRUE, method = c
("logistic"))

summary(mod.heat.int.5)

exp(coefficients(mod.heat.int.5))

sum.cof.mod.heat.int.5 <- coef(summary(mod.heat.int.5))

pval.mod.heat.int.5 <- pnorm (abs(sum.cof.mod.heat.int.5[,"t value"]),
lower.tail = FALSE)*2

table.w.pval.mod.heat.int.5 <- cbind(sum.cof.mod.heat.int.5, "p value" =
pval.mod.heat.int.5)



mod.heat.int.6 <- polr(as.factor(think.climate.change)~
Heat.wave*imp.succsess + age + male + education,
                       data = data.done, Hess = TRUE, method = c
("logistic"))

summary(mod.heat.int.6)

exp(coefficients(mod.heat.int.6))

sum.cof.mod.heat.int.6 <- coef(summary(mod.heat.int.6))

pval.mod.heat.int.6 <- pnorm (abs(sum.cof.mod.heat.int.6[,"t value"]),
lower.tail = FALSE)*2

table.w.pval.mod.heat.int.6 <- cbind(sum.cof.mod.heat.int.6, "p value" =
pval.mod.heat.int.6)


#11.1.3 Create plots and predictions for heatwaves
```

```
ilogit(mod.heat.1$zeta)


cumsum(
  prop.table(
    table(data.done$think.climate.change[data.done$Heat.wave == 1])))
cumsum(
  prop.table(
    table(data.done$think.climate.change[data.done$Heat.wave == 0])))



ggplot(data.done, aes(x = Heat.wave, y = think.climate.change))+
  geom_jitter(size= 0.5, colour = "#e6550d")+
  labs(title = "Believe climate is changing",
       x= "Experienced heat wave",
       y= "Do you think climate is changeing")+
  theme(panel.grid.major = element_blank(), panel.grid.minor = 
element_blank())



plot_model(mod.heat.int.4, type = "pred", terms = c("Heat.wave", 
"imp.safe.surround"),
           axis.title = "Do you think world's climate is changing",
           title = "Predicted probabilites of beliveing climate is 
changing",
           legend.title ="Important to live in secure and safe 
surroundings")




plot_model(mod.heat.int.5, type = "pred", terms = c("Heat.wave", 
"imp.friends"),
           axis.title = "Do you think world's climate is changing",
           title = "Predicted probabilites of beliveing climate is 
changing",
           legend.title ="Important to be loyal to friends and devote to 
people close")
```

```
#11.2 Models on trend sceptics and drought#

#11.2.1 Simple models#


mod.drought.1 <- polr(as.factor (think.climate.change) ~ Drought,
                      data = data.done, Hess = TRUE, method =
c("logistic"))

summary(mod.drought.1)

exp(coefficients(mod.drought.1))

sum.cof.mod.drought.1 <- coef(summary(mod.drought.1))

pval.mod.drought.1 <- pnorm (abs(sum.cof.mod.drought.1[,"t value"]),
lower.tail = FALSE)*2

table.w.pval.mod.drought.1 <- cbind(sum.cof.mod.drought.1, "p value" =
pval.mod.drought.1)




mod.drought.int.1<- polr(as.factor(think.climate.change)~
Drought*imp.safe.surround,
                         data = data.done, Hess = TRUE, method = c
("logistic"))

summary(mod.drought.int.1)

exp(coefficients(mod.drought.int.1))


mod.drought.int.2<- polr(as.factor(think.climate.change)~
Drought*imp.friends,
                         data = data.done, Hess = TRUE, method = c
("logistic"))

summary(mod.drought.int.2)

exp(coefficients(mod.drought.int.2))


mod.drought.int.3<- polr(as.factor(think.climate.change)~
Drought*imp.succsess,
                         data = data.done, Hess = TRUE, method = c
("logistic"))

summary(mod.drought.int.3)

exp(coefficients(mod.drought.int.3))


#11.2.2 Models with controlvariables#


mod.drought.2 <- polr(as.factor (think.climate.change) ~ Drought + age +
male + education,
```

```
                      data = data.done, Hess = TRUE, method =
c("logistic"))

summary(mod.drought.2)

exp(coefficients(mod.drought.2))

sum.cof.mod.drought.2 <- coef(summary(mod.drought.2))

pval.mod.drought.2 <- pnorm (abs(sum.cof.mod.drought.2[,"t value"]),
lower.tail = FALSE)*2

table.w.pval.mod.drought.2 <- cbind(sum.cof.mod.drought.2, "p value" =
pval.mod.drought.2)


mod.drought.3 <- polr(as.factor (think.climate.change) ~ Drought + age +
male + education + Belgium + Germany + Spain + France + Hungary + Italy +
Lithuania + Netherlands + United.Kingdom + Russian.Federation + Portugal,

                      data = data.done, Hess = TRUE, method =
c("logistic"))

summary(mod.drought.3)

exp(coefficients(mod.drought.3))

sum.cof.mod.drought.3 <- coef(summary(mod.drought.3))

pval.mod.drought.3 <- pnorm (abs(sum.cof.mod.drought.3[,"t value"]),
lower.tail = FALSE)*2

table.w.pval.mod.drought.3 <- cbind(sum.cof.mod.drought.3, "p value" =
pval.mod.drought.3)



mod.drought.int.4 <- polr(as.factor(think.climate.change)~
Drought*imp.safe.surround + age + male + education,

                          data = data.done, Hess = TRUE, method = c
("logistic"))

summary(mod.drought.int.4)

exp(coefficients(mod.drought.int.4))

sum.cof.mod.drought.int.4 <- coef(summary(mod.drought.int.4))

pval.mod.drought.int.4 <- pnorm (abs(sum.cof.mod.drought.int.4[,"t
value"]), lower.tail = FALSE)*2

table.w.pval.mod.drought.int.4 <- cbind(sum.cof.mod.drought.int.4, "p
value" = pval.mod.drought.int.4)


mod.drought.int.5 <- polr(as.factor(think.climate.change)~
Drought*imp.friends + age + male + education,

                          data = data.done, Hess = TRUE, method = c
("logistic"))

summary(mod.drought.int.5)

exp(coefficients(mod.drought.int.5))
```

```
sum.cof.mod.drought.int.5 <- coef(summary(mod.drought.int.5))

pval.mod.drought.int.5 <- pnorm (abs(sum.cof.mod.drought.int.5[,"t
value"]), lower.tail = FALSE)*2

table.w.pval.mod.drought.int.5 <- cbind(sum.cof.mod.drought.int.5, "p
value" = pval.mod.drought.int.5)


mod.drought.int.6 <- polr(as.factor(think.climate.change)~
Drought*imp.succsess + age + male + education,

                          data = data.done, Hess = TRUE, method = c
("logistic"))

summary(mod.drought.int.6)

exp(coefficients(mod.drought.int.6))

sum.cof.mod.drought.int.6 <- coef(summary(mod.drought.int.6))

pval.mod.drought.int.6 <- pnorm (abs(sum.cof.mod.drought.int.6[,"t
value"]), lower.tail = FALSE)*2

table.w.pval.mod.drought.int.6 <- cbind(sum.cof.mod.drought.int.6, "p
value" = pval.mod.drought.int.6)



#11.2.1 Plots and predictions for drought#


ilogit(mod.drought.1$zeta)


cumsum(

  prop.table(

    table(data.done$think.climate.change[data.done$Drought == 1])))

cumsum(

  prop.table(

    table(data.done$think.climate.change[data.done$Drought == 0])))



ggplot(data.done, aes(x = Drought, y = think.climate.change))+

  geom_jitter(size= 0.5, colour = "#AC9362")+

  labs(title = "Believe climate is changing",

       x= "Experienced drought",

       y= "Do you think climate is changeing")+

  theme(panel.grid.major = element_blank(), panel.grid.minor =
element_blank())
```

```
plot_model(mod.drought.int.4, type = "pred", terms = c("Drought", "imp.safe.surround"),
           axis.title = "Do you think world's climate is changing",
           title = "Predicted probabilites of beliveing climate is changing",
           legend.title ="Important to live in secure and safe surroundings")


plot_model(mod.drought.int.5, type = "pred", terms = c("Drought", "imp.friends"),
           axis.title = "Do you think world's climate is changing",
           title = "Predicted probabilites of beliveing climate is changing",
           legend.title ="Important to be loyal to friends and devote to people close")


plot_model(mod.drought.int.6, type = "pred", terms = c("Drought", "imp.succsess"),
           axis.title = "Do you think world's climate is changing",
           title = "Predicted probabilites of beliveing climate is changing",
           legend.title ="Important to be successful and that people recognize achievements")



#11.3 Models on trend sceptics and wildfire#
#11.3.1 Simple models#


mod.fire.1 <- polr(as.factor (think.climate.change) ~ Wildfire,
                   data = data.done, Hess = TRUE, method = c("logistic"))
summary(mod.fire.1)
exp(coefficients(mod.fire.1))
sum.cof.mod.fire.1 <- coef(summary(mod.fire.1))
pval.mod.fire.1 <- pnorm (abs(sum.cof.mod.fire.1[,"t value"]), lower.tail = FALSE)*2
table.w.pval.mod.fire.1 <- cbind(sum.cof.mod.fire.1, "p value" = pval.mod.fire.1)


mod.fire.int.1 <- polr(as.factor(think.climate.change)~ Wildfire*imp.safe.surround,
```

```
                       data = data.done, Hess = TRUE, method = c
("logistic"))
summary(mod.fire.int.1)
exp(coefficients(mod.fire.int.1))

mod.fire.int.2 <- polr(as.factor(think.climate.change)~
Wildfire*imp.friends,
                       data = data.done, Hess = TRUE, method = c
("logistic"))
summary(mod.fire.int.2)
exp(coefficients(mod.fire.int.2))

mod.fire.int.3 <- polr(as.factor(think.climate.change)~
Wildfire*imp.succsess,
                       data = data.done, Hess = TRUE, method = c
("logistic"))
summary(mod.fire.int.3)
exp(coefficients(mod.fire.int.3))


#11.3.2 Modles with controlvariables#

mod.fire.2 <- polr(as.factor (think.climate.change) ~ Wildfire + age + male
+ education,
                   data = data.done, Hess = TRUE, method = c("logistic"))
summary(mod.fire.2)
exp(coefficients(mod.fire.2))
sum.cof.mod.fire.2 <- coef(summary(mod.fire.2))
pval.mod.fire.2 <- pnorm (abs(sum.cof.mod.fire.2[,"t value"]), lower.tail =
FALSE)*2
table.w.pval.mod.fire.2 <- cbind(sum.cof.mod.fire.2, "p value" =
pval.mod.fire.2)

mod.fire.3<- polr(as.factor (think.climate.change) ~ Wildfire + age + male
+ education  + Belgium + Germany + Spain + France + Hungary + Italy +
Lithuania + Netherlands + United.Kingdom + Russian.Federation + Portugal,
                  data = data.done, Hess = TRUE, method = c("logistic"))
summary(mod.fire.3)
exp(coefficients(mod.fire.3))
sum.cof.mod.fire.3 <- coef(summary(mod.fire.3))
```

```
pval.mod.fire.3 <- pnorm (abs(sum.cof.mod.fire.3[,"t value"]), lower.tail =
FALSE)*2

table.w.pval.mod.fire.3 <- cbind(sum.cof.mod.fire.3, "p value" =
pval.mod.fire.3)



mod.fire.int.4 <- polr(as.factor(think.climate.change)~
Wildfire*imp.safe.surround + age + male + education,

                       data = data.done, Hess = TRUE, method = c
("logistic"))

summary(mod.fire.int.4)

exp(coefficients(mod.fire.int.4))

sum.cof.mod.fire.int.4 <- coef(summary(mod.fire.int.4))

pval.mod.fire.int.4 <- pnorm (abs(sum.cof.mod.fire.int.4[,"t value"]),
lower.tail = FALSE)*2

table.w.pval.mod.fire.int.4 <- cbind(sum.cof.mod.fire.int.4, "p value" =
pval.mod.fire.int.4)


mod.fire.int.5 <- polr(as.factor(think.climate.change)~
Wildfire*imp.friends + age + male + education,

                       data = data.done, Hess = TRUE, method = c
("logistic"))

summary(mod.fire.int.5)

exp(coefficients(mod.fire.int.5))

sum.cof.mod.fire.int.5 <- coef(summary(mod.fire.int.5))

pval.mod.fire.int.5 <- pnorm (abs(sum.cof.mod.fire.int.5[,"t value"]),
lower.tail = FALSE)*2

table.w.pval.mod.fire.int.5 <- cbind(sum.cof.mod.fire.int.5, "p value" =
pval.mod.fire.int.5)


mod.fire.int.6 <- polr(as.factor(think.climate.change)~
Wildfire*imp.succsess + age + male + education,

                       data = data.done, Hess = TRUE, method = c
("logistic"))

summary(mod.fire.int.6)

exp(coefficients(mod.fire.int.6))

sum.cof.mod.fire.int.6 <- coef(summary(mod.fire.int.6))

pval.mod.fire.int.6 <- pnorm (abs(sum.cof.mod.fire.int.6[,"t value"]),
lower.tail = FALSE)*2

table.w.pval.mod.fire.int.6 <- cbind(sum.cof.mod.fire.int.6, "p value" =
pval.mod.fire.int.6)
```

```
#11.3.3 Plots and predictions for wildfire


plot_model(mod.fire.int.4, type = "pred", terms = c("Wildfire", 
"imp.safe.surround"),

           axis.title = "Do you think world's climate is changing",

           title = "Predicted probabilites of beliveing climate is 
changing",

           legend.title ="Important to live in secure and safe 
surroundings")
```

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