# End of the World vs. End of the Month: A cross-national multilevel study of climate concern

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# Abstract

The aim of this thesis is to assess some of the factors that might influence concern about climate change among people in different countries and over time. As part of this, I have analyzed whether the "finite pool of worry" theory can explain some of the variation in climate concern. This theory states that worry about one issue, for example climate change, will decrease as concern about other global issues increases due to external shocks. The two global shocks that I will test for are the financial crisis, and the outbreak of corona. The question is whether the financial crisis led to a decrease in climate concern in the European countries analyzed in the thesis, and whether the coronavirus outbreak led to a reduction in climate concern in Norway.

To answer the research questions, I have utilized multilevel modeling on a dataset consisting of 26 European countries from the Eurobarometer dataset and data from the Norwegian Citizen Panel. The European dataset is measured from 2008 to 2017, while the Norwegian data consists of 18 650 individuals surveyed from 2013 to 2021.

The results give support to the theoretical explanations presented in the thesis. I find that both the coronavirus outbreak and the financial crisis seem to have led to a decrease in climate concern. The results show that climate concern in Europe decreased as the financial crisis impacted European countries and increased as the effects of the crises wore off. As for the corona epidemic, the analysis show that climate concern decreased in Norway in the period after the outbreak.

In the thesis I also look into other factors that might affect people's climate concern. In Europe the results indicate that physical variables, like climate vulnerability and macro variables like Co2-emissions per capita, unemployment, and GDP per capita, when lagged by one year have a bigger effect than micro variables, like education and age . In Norway, the results show that there is a clear ideological divide in concern with left-wing voters displaying higher levels of concern. Other factors that are tested for seems to have little effect.

As mentioned, the results support the finite pool of worry theory. Given that coronavirus outbreak was an external shock with consequences worldwide, this pandemic presents a unique opportunity for further testing of this theory. Since my data from Europe (except for Norway) does not cover the post-covid period, I have not been able to do this, Further research on this theory, its application om the coronavirus outbreak, and the consequences for peoples worry for climate change, is a task worthwhile undertaking

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# Chapter 1: Introduction

On the 9th of August 2021, the UN Intergovernmental Panel on Climate Change, IPCC, released the first part of its sixth report on climate change. As in previous reports, the UN Panel paints a bleak picture of the current state of the climate. They warn that the world faces unavoidable hazards over the next years because of climate change and that global temperature rise will by 1,5 °C before the end of 2040. The report underlines that even temporarily exceeding this warming level will result in additional severe impacts, some of them being irreversible. The report also states that the increase in greenhouse gases like CO2 the last hundred years are unequivocally caused by human activities (IPCC Press report of 28th February 2022) .

The long-term IPCC scenarios from 2021 range from an increase in temperature between 1.1 °C and up to 5.7°C, with the most probable increase based on the current trend in emissions being a rise of 1.5°C already in 2030. (In all the IPCC scenarios, the temperature will rise by at least 1.1°C.) The consequences for the world include, among other things, changing weather patterns with more storms, floods and drought, loss of biodiversity, sea-level rise, changes in the global ecosystem, global retreat of glaciers, including the polar ice, heatwaves, and wildfires (IPCC 2022, 3).

In light of this gloomy report, one would assume that concern about climate change would be at an all-time high and rising as the consequences of global warming become more apparent. Despite this, there are several examples to the contrary. A yellow vest protester expressed that "the elites are talking about the end of the world; we are talking about the end of the month" when discussing France's policies towards a sustainable transition (Martin and Islar 2020, 602).

This thesis aims to investigate which factors that influence concern about climate change and to what extent this varies across Europe and over time. The research question is as follows:

*Which factors influence concern about climate change, and to what extent does concern vary between countries and over time.*

Specifically, I will study how competing concerns – related to other matters in a country – affect people's worry about climate change. Using a multilevel model, I investigate this in 26 European countries in the period from 2008 to 2017 and more extensively in Norway in the

period from 2013 to 2021. I find that, on average, there has been a decrease in concern about climate change in the European countries in my dataset. The relationship between concern and time is U-shaped, with concern decreasing from 2008 to 2015 and increasing from 2015 to 2017. I also find large differences in concern between European countries. In Norway, I find few significant factors that can explain the variation in concern about climate change between individuals, apart from party affiliation, which has a large effect.

### 1.1 Why study concern about climate change?

The first question to answer is why concern about climate change matters. If concern about global warming is not manifested in concrete action to mitigate the consequences of climate change, one could ask whether it is worth analyzing.

Climate research shows that emotions and concern can motivate both climate engagement and climate action. People's concern about global warming has implications for climate policy and is essential for both public and individual efforts to prevent climate change and mitigate the effects of it (Capstick et al. 2015, 36). This is one of the reasons why it is essential to understand which factors that can lead to changes in concern (Weber 2010, 340).

To stop the ongoing development of increasing climate change, actions need to be taken both on the public and individual levels. To implement changes on the public level, some degree of support is required. Understanding the factors that shape climate change concern can lead to more effective climate policies with broader support from the population.

### 1.2 Contributions to the field

Earlier literature on the field has often focused on climate change skepticism, as well as the effects of economic factors on concern about climate change (Capstick et al. 2015; Dunlap 2013; Wang and Kim 2018). To the extent that concern about climate change has been studied, the focus has been on the relationship between concern and support for climate change policies. Less attention seems to have been paid to the factors shaping such concern (Capstick et al. 2015, 54).

Many works about which factors shape concern for global warming have been single case studies in a particular country (Berry and Peel 2015; Brulle, Carmichael and Jenkins 2012), or studies that don’t cover changes over time (Akerlof et al. 2010). Therefore, studying the factors that influence climate concern both over time and between countries seems to have been somewhat rare.

The research on climate change concern includes several different methodological approaches. A minority of the studies have used individual-level panel data (Capstick et al 2015, 35). In this thesis I run two separate analyses. The European data is measured by using time-series-cross-sectional (TSCS) data at the country level, while the Norwegian data is analyzed by using panel analysis at the individual level. By utilizing such data in the analysis of climate change concern in Norway, I can identify how the concern among the respondents have changed over time. In analyzing the attitudes toward climate change in Europe, it has been unusual to run a country-level time-series cross-sectional analysis. This method allows me to identify the factors that seems to shape climate change concern and the differences in concern over time and between countries. Utilizing multilevel modeling, allows me to check how both factors on the individual level and factors on the societal level affect such concerns.

### 1.3 Structure of the thesis

The thesis is structured as follows:

In chapter 2, I account for the delimitations of the study. I also present the central concepts in the thesis and the definition of climate change concern that I will use.

In chapter 3, I present some of the previous research on the topic and factors that might affect concern about climate change.

In chapter 4, I present the theoretical framework on which the thesis is based. This is primarily the so-called “finite pool of worry” theory. Based on the theoretical framework and previous research, I then present the hypotheses that the thesis seeks to answer.

Chapter 5 describes the data used in the thesis and discusses the issues with the data and the potential problems related to measurement. I also discuss the limitations of the data and the consequences this has for the interpretation of the results.

In chapter 6, I describe the method used in the study. I outline the strengths and weaknesses of multilevel methods and discuss random and fixed effects.

In chapter 7, I present the results from the European analysis.

In Chapter 8, I present the results from the Norwegian analysis.

In chapter 9, I use the results from the analysis to evaluate the hypothesis and answer the research question. I discuss how to explain the results and their possible implications. I check

whether the results are consistent with previous research and explain eventual discrepancies between my results and previous research. The thesis concludes with a discussion of some potential avenues for future research on this topic.

# Chapter 2: Delimitations and definitions

## 2.1 Structure of the chapter

This chapter begins with an overview of the delimitations of the thesis and explains why I have delimited the thesis in the way I have done. In the second part of the chapter, I define the central concepts of the thesis.

## 2.2 Delimitation

There is an endless list of factors that might affect concern about climate change. It is impossible to investigate all these factors. The variables that will be looked at in this thesis are the factors that previous studies have found to have the largest impact on such concern, and the variables where good and reliable data are available.

In addition to analyzing the factors that shape climate concern, the task of the thesis is to explore differences between countries and within countries over time. The scope of the study is limited to Europe, with a particular focus on Norway. Capstick et al. suggest that there has been a bias towards studying developed countries, with far less attention being paid to other regions in the world (2015, 54). The reason why I – despite this – have chosen to study European countries is because of the rich amount of time-series cross-sectional data on these countries. Unfortunately, the same cannot be said about less developed countries. Future research and data collection on concern about climate change will do well to focus on less developed countries, not least because these are the countries that will be most affected by climate change.

At the European level, concern will be measured from 2008 to 2017. This is the time period where comparable time-series cross-sectional data were available for the countries I study.

For Norway, the time period investigated is 2013 – 2021. This is because the Norwegian citizen panel (NCP) has survey data from this period. Ideally, I would have utilized all the available rounds from NCP in the analysis. Each NCP survey – which is conducted several times a year, is presented in rounds. Unfortunately, the dependent variable – the question of climate concern – is not asked in every round, limiting the number of rounds I can use.

### 2.3 Concern about climate change

In the thesis, concern about climate change is operationalized in two different ways. In the analysis at the European level, concern is operationalized by the following question gathered from the Eurobarometer dataset:

*"And how serious a problem do you think climate change is at this moment? Please use a scale from 1 to 10, with '1' meaning it is "not at all a serious problem" and '10' meaning it is "an extremely serious problem."*

In the Norwegian analysis, concern is operationalized by the question: *"How worried are you about climate change?"*. The question is measured on a 5-point scale, with 5 being "very worried" and 1 being "not worried at all."

### 2.4 Climate change

Climate change is a concept that is hard to define precisely. The UN framework convention on climate change defines it as «A change in climate which is directly or indirectly attributed to human activities which changes the composition of the global atmosphere, and which is in addition to natural climate variability over comparable time periods» (Pielke 2005, 5). This is a narrow definition, which only includes climate change caused by human activities and does not include natural changes in climate. Given that the thesis is concerned with man-made climate change, this definition will be utilized.

The UN's climate panel defines climate change as "any change in climate over time, which is either caused by natural variation or as a result of human activities" (Pielke 2005, 6). This is a broader definition, which includes both climate change caused by human activities and change because of natural variation in climate.

The data I use is survey data. The results are based on the respondents' answers. None of the data sets used include a definition of climate change. It is therefore not possible to say which exact definition of climate change is the basis for the thesis, because it is not known which definition of climate change the respondents themselves have had in mind when answering the survey questions.

It might however be that respondents intuitively understands that the meaning of a survey question about climate change refers to climate change caused by human activities. This

somewhat mitigates the problem of not knowing which exact definitions the respondents use when answering the survey question.

### 2.5 Global Warming

Climate change is a broader and more general term than global warming. While climate change refers to changes in a broad range of climate conditions over time, global warming only refers to increasing global temperatures (Weber 2016, 127).

Even though there is an important difference between climate change and global warming, the definitions just presented are the scientific definitions of the terms. Most individuals use these terms interchangeably. Given that my data is based on answers from regular individuals, the responses likely reflect this. Based on this, I will use both the terms in the thesis as synonyms for climate change and its consequences.

### 2.6 Finite pool of worry

The finite pool of worry is a theory that states that concern about one issue diminishes as worries about other issues rise in prominence (Evensen et al. 2020). The theory is especially used to explain decrease in concern in the wake of large global "shocks". The theory is used to explain decrease in concern about political issues generally. However, in my thesis I will look at whether increased concern about one issue, affects climate concern specifically. This theory has been used to explain the decline in climate concern after significant events such as the terror attack on 9/11 and the 2008 financial crisis (Botzen et. al 2020, 2). In these situations, worry about national security and the economic situation increased, and concern about climate change decreased (Botzen et al. 2021). More recently, the "finite pool of worry" theory would suggest that Covid-19 has shifted the concern from climate change toward pandemics, unemployment and other negative consequences that followed in the wake of the pandemic (Botzen et al. 2021).

# Chapter 3: Previous research

## 3.1 Structure of the chapter

In this chapter, I present previous research in the field. The chapter begins by looking at research about the factors that influence skepticism toward climate change.

The second part of the chapter examines earlier research about the factors that shape climate concern. This part will mainly concentrate on five factors — the economy, education, gender, vulnerability to climate change and political ideology.

The third part of the chapter is dedicated to research that examine how climate concern varies between countries and the factors that may explain these differences.

In the fourth part of the chapter, I turn my attention to Norway and give a brief overview of studies about the factors that influence climate concern in Norway.

The chapter finishes with a brief discussion of prerequisites for people's willingness to act.

Although I present the most relevant research about factors influencing climate change attention in this chapter, I will revisit this and other studies in other parts of the thesis, where this is relevant.

## 3.2 Skepticism toward climate change

To understand the concern about climate change, a natural starting point is to examine skepticism toward climate change. It is natural to assume that people who don't believe that climate change is a big threat and/or are skeptical that human activities cause global warming, are less likely to be worried about such change.

Skepticism towards climate change is low in most European countries. A clear majority of the European population thinks that climate change is happening, and that human activities at least partly cause it. Even though skepticism is generally relatively low, there are noticeable differences between countries. One study found that skepticism ranges from 2,3% in Iceland to 16.4% in Russia (Poortinga et al. 2019, 29).

The aforementioned study found that skepticism in Norway was comparatively high. Skepticism was measured by the question "Do you think that climate change is caused by

natural processes, human activity, or both?". Of the respondents, 12% answered that they did not think climate change was caused by human activities. This is relatively high compared to other developed nations. The study also found that trend skepticism was fairly high in Norway. This was measured by the question "You may have heard the idea that the world's climate is changing due to increases in temperature over the past 100 years. What is your personal opinion on this? Do you think the world's climate is changing?". In total, 7% of Norwegians answered that they did not think that the climate is changing. On the other hand, the study also found that the level of climate concern in Norway was above average compared to other developed countries worldwide (Poortinga et al. 2019, 29). This might indicate that, at least in Norway, there is no clear correlation between climate skepticism and climate concern.

A study from 2016, conducted in Europe suggests that a change in the general public's climate change beliefs seems to have little effect on people's willingness to act. The authors suggest that there is a benefit to moving beyond the question of "who" believes in climate change and moving on to the psychological factors that explain "why" people hold the beliefs they do about climate change (Hornsey et al. 2016, 625). In the next part of the chapter, I will point out some of the factors that seems to explain "why" individuals believe what they do about climate change.

## 3.3 Concern about climate change in general

### *3.3.1 Introduction*

One of the pillars in the literature about attitudes towards climate change is the article "What shapes perceptions of climate change" (Weber 2010, 332). The study found a divide in concern between the general public and the scientific community. Despite four unanimous and urgent reports by IPCC on climate change, the public debate did not seem to converge to a common opinion and reach a consensus about the need for climate action.

Weber argues that this is explained by the fact that climate scientists have more knowledge about climate change and a better grasp of the possible consequences of global warming. Even though it is not surprising that there is such a gap between the scientific community and the general public, the size of the gap might be surprising, with people's concern well below the scientific consensus (Weber 2010, 336).

The topic of concern about climate change was revisited in a later article by Weber. He identifies that one of the key reasons why it is hard to transfer warnings from the scientific

community into public concern and climate mitigation policies, is that climate change is a slow and gradual process. It is hard to assess the impacts of the change based only on personal experience. He argues that this is one of the key reasons behind the gap in concern between the general public and the scientific community. Weber also points out that people tend to resort to wishful thinking when encountering a massive problem without any obvious solution. This can lead to a decreased concern about climate change and may act as a barrier to action (Weber 2016, 125).

One meta-analysis set out to summarize the factors that shape belief in climate change. Based on twenty-seven variables, the study synthesized twenty-five polls and 171 academic studies across fifty-six nations. The authors reached two broad conclusions. The first is that many factors that might seem intuitively appealing, like education, gender, subjective knowledge, and experience of extreme weather, proved to be less important than expected. What mattered was people's values, ideologies, worldviews, and political orientation. The second conclusion was that beliefs about climate change only have a small to moderate effect on people's willingness to act in climate-friendly ways. The authors found that structural, social, cultural, and psychological factors were among the many factors that play a role. The study suggests that scientific evidence often is less important than personal ideology in shaping climate concern (Hornsey et al. 2016, 622).

A study from 2015 measures climate change perceptions and concern from 1980 to 2015. The authors argue that previous research has not painted a clear picture of the factors and patterns that have shaped climate change concern for the last 40 years. While it is hard to identify all the factors that shape people's attitudes, they managed to uncover some general trends. The study found an increase in knowledge, awareness, and concern about climate change from the 1980s to the early 1990s. The time period from around 1995 to around 2005 was marked by growing public concern and increased variation in opinions. The years from 2005 to the late-2000s were characterized by a decline in public concern, increased skepticism and increasing polarization. It is worth noting that this trend was true for many policy areas, not only climate policy The authors point out that there is a bias toward western nations in the field. This means that although these general trends might be true for developed, western countries, they might not apply to less developed countries, which have been studied far less (Capstick et al. 2015, 35).

In the next part of the chapter, I will take a more comprehensive look at the factors that previous research has found to affect climate change concern. These factors will be the basis for the variables used in the Norwegian and European analysis.

### *3.3.2 Economy and concern*

Earlier research has found that economic factors influence climate concern. A US study from 2012, found that economic factors, as well as the quantity of media coverage and political cues from the leading US parties were the three factors that had the biggest effect on climate change concern (Brulle, Carmichael, and Jenkins 2012, 169). However, it should be mentioned that it might be the *consequences* of these economic factors, rather than the economic factors themselves, that cause reduced concern. For example, a decrease in GDP per capita might lead to increased unemployment. Previous research has found that higher unemployment in a country leads to lower climate concern. This might indicate that it is the rise in unemployment due to an economic downturn that leads to reduced concern, not the economic downturn in itself (Bengal 2017; Shum 2012; Scruggs and Bengal 2012; Brulle et al. 2012; Kahn and Kotchen 2011).

A study from 2015 found that climate concern decreased following the financial crisis in 2008 (Capstick et al. 2015, 48). However, there are some studies which have found differing results. A study based on data from the World Values survey found that concern about global warming has a wide array of sources. The economic situation in a country plays a minor role compared to other factors (Dunlap and York 2008, 528).

A study conducted in the US investigated how local effects of climate change and level of personal income influenced climate concern. The study found that the local impacts of climate change were perceived as less severe by individuals with higher income (Hamilton and Keim 2009, 2351). Another study, conducted in 2012, found similar results, with higher income corresponding with reduced concern. The authors argued that individuals with higher income have the financial resources to tackle the impact of climate change, which in turn leads to lower concern (Semenza et al. 2008, 481).

A study of European countries found that decrease in quarterly GDP growth rates lead to diminished concern about climate change. Concern decreased as GDP growth rates decreased (Capstick et al. 2015, 51). This study supports the hypothesis that economic hardship can take attention away from other problems and lead to less worry about global warming and its effects.

The results are consistent with previous research, with one study from 2008 finding that public concern about climate change was negatively associated with GDP per capita, with climate concern being lower in wealthier countries (Knight 2016, 2).

Ronald Inglehart's postmaterialist theory states that as countries become wealthier, there is a shift from "materialist" to "postmaterialist" values. "Materialist" values include survival and security, while "postmaterialist" values include freedom, quality of life and concern about the environment (Inglehart 1990, 215). He argues that this is true both for individuals as well as for countries. Individuals with "postmaterialist" values are more concerned about protecting the environment, and countries with postmaterialist publics are more ready to act for environmental protection (Inglehart 1995, 57).

### *3.3.3 Education and concern*

Previous research has found a positive correlation between length of education and worry about climate change. A survey from 2013 conducted in Australia, Ecuador, Fiji, New Zealand, UK, and the US found that respondents with higher education were more worried about climate change. Education was the factor with the biggest impact on individuals' concern (Crona et al. 2013, 527). In a study from 2012, based on the 2005-2008 World Values Survey, the author argues that this is based on the fact that the understanding of climate change, to some degree, relies on the ability to understand and comprehend technical, scientific claims, and that individuals with higher education are more able to understand the complex nature of climate change (Running 2013). A study from 2016 argues that education does not only have a positive effect on the individual level, but also on the country level. The study found that the average level of climate concern among the inhabitants was higher in countries with a higher average education level (Knight 2016, 1). This suggests that not only are individuals with higher education more concerned, but also that the average level of concern is higher in countries with a more highly educated public.

A study from 2019 set out to remedy the fact that most of the research in the field are single-country studies or conducted in a small number of countries. This study investigated the individual-level factors that affected such concern. It utilized data from the European Social Survey to examine concern in 22 European countries and Israel (Poortinga et al. 2019, 25). The results showed that most individuals thought that the effects of climate change would be harmful to their country, but that the impact would not be large. The study also found that

individuals with higher education thought that the effects of climate change would be more damaging than individuals with lower education (Poortinga et al. 2019, 29).

Previous studies have also found that respondents with more education view climate change as a bigger and more severe risk and are more likely to believe that temperatures will continue to rise (Savage 1993; Midden 2007).

There is however no consensus in the research. An analysis from 1988 conducted in Europe found that a higher level of education leads to decreased concern about climate change. The same is true for a study from the U.S. conducted in 1999 (Pilisuk and Acredolo 1988; O'Connor 1999).

A survey from 2012 found that higher income correlates with an increase in concern (Brulle et al. 2012, 185). Higher education often leads to higher income. This means that the real driver between the positive correlation between education and climate concern might be income. However, several studies have also suggested that higher income leads to decreased concern about climate change (Sandvik 2008, 335; Hamilton and Keim 2009; Semenza et al. 2008). This suggest that it is somewhat unlikely that the connection between education and climate concern is exclusively driven by increased income.

### *3.3.4 Gender and concern*

A US study conducted between 2001 and 2008 found that women were more concerned about climate change than men. Overall, 35 % of women worry about climate change a great deal, compared to 29% of men. 37% of women believe that global warming will threaten their way of life, compared to 28% of men, and 35% of women believe that the seriousness of climate change is underestimated, compared to 28% of men (McCright 2010, 78 – 79).

Surveys from UK, Australia and the US have come to the same results (Crona et al. 2013, 527). Studies also find that women tend to agree more with the scientific consensus, as well as the notion that greenhouse gas emissions lead to a rise in temperature (Crona et al. 2013, 528). Overall, there seems to be some consensus in the literature that woman tend to be more concerned about climate change than men (McCright 2010; Crona et al. 2013).

### *3.3.5 Vulnerability to climate change and concern*

Climate change vulnerability has often been overlooked as a factor influencing people's climate concern. This is especially true in the social sciences, where the tradition has been that a social

attributes like concern must be explained by other social facts like age, gender, and education. Therefore, physical attributes like climate vulnerability, are often overlooked as a predictor of climate concern (Zahran et al. 2006, 776).

There are some studies that have looked at the link between vulnerability to climate change and concern. Qualitative studies conducted in U.S. have shown that grass-root environmental movements are more likely to appear in environmentally distressed communities. The authors argue that this is due to higher levels of concern in these communities (Bullard and Wright 1993, 836).

A study of three municipalities in Israel and Palestine found that environmental concern was greater in municipalities with higher vulnerability to climate change (Drori and Yuchtman-Yaar 2002, 55). Studies done in San Antonio, British Columbia, and Los Angeles also find a correlation between environmental vulnerability and environmental concern (Blake 2001, 708).

Research from the United States found that respondents who stated that they had experienced the effect of climate change, were more likely to support climate mitigation policies. The same was true for respondents living in areas that had undergone a more significant temperature change. Even though the rise in temperature to a large extent have been the same in different regions, there have been some small variations. The research indicates that these small variations have an effect on concern. Temperature change had the same explanatory power as education, a more classic variable used to explain differences in concern. The study also found that individuals living in areas more prone to extreme weather events and natural hazards were more likely to support climate mitigation policies (Zahran et al. 2006, 782).

A study conducted in southern England in 2003 found that the perceived risk of climate change was higher among those who suffered from health problems due to air pollution than among those not suffering from such conditions (Whitmarsh 2005). The number of health problems caused by climate change will naturally be felt more dramatically for people who are already negatively affected by air pollution.

Results from a survey conducted in 10 European countries in the period from 2005 to 2007 found that individuals who thought that it was likely that they would be personally affected by climate change, were more concerned. In 2005, 36% of the respondents found it “very likely” that they would be personally affected by climate change. By 2007, this number had risen to 55%. As would be expected, the respondents who found it “very likely” that they would be

personally affected by climate change displayed higher level of climate concern (Capstick et al. 2015, 35).

Research conducted in 2016 by the Pew Global Attitudes Project found that individuals were more concerned about environmental degradation than climate change, and that individuals living in areas more prone to environmental degradation were more concerned. The argument put forth in the studies is that individuals are more concerned about environmental changes they can observe, like environmental degradation and less concerned about more abstract changes in climate (Knight 2016, 2; Brechin and Bandari 2011, 875).

Increased climate vulnerability will lead to more climate disasters. Previous studies have found that disasters affect how individuals view climate change. Two studies found that there was a shift in the public's concern about climate change following the disaster at the Fukushima nuclear power complex in Japan in 2011. Although there isn't a direct link between climate change and the Fukushima accident, many people might associate the tsunami and the earthquake that led to the accident with climate change, as well as associating nuclear power with climate change. The studies found a noticeable increase in climate concern in countries not affected by the accident. One study found that concern about climate change increased immediately after the accident in Australia, while another study found the same in the UK (Bird et al. 2014; Capstick et al. 2015). Somewhat surprisingly, the effect of the Fukushima accident did not impact climate change concern in Japan, where the accident took place. In Japan, such concern remained at the same level as before the accident (Capstick et al. 2015, 49).

There is no unambiguous support in the literature for the notion that climate change vulnerability leads to heightened concern for climate change. Research from 2012 found that climate concern was greater in countries that were less vulnerable to the impact of climate change (Kvaløy et al. 2012, 11).

Another study from 2012 found no evidence that physical vulnerability led to increased concern. The study surveyed ranchers and farmers in Nevada. To measure their sensitivity toward climate change, the authors estimated the proportion of their household income originating from highly scarce water-dependent agriculture (Safi, Smith, and Liu 2012, 1041). However, it is worth noting that this study was done on a relatively small sample of ranchers and farmers in Nevada in USA, and the findings might not be generalizable to other areas and countries.

### *3.3.6 Political ideology and concern*

Previous research has found that left-leaning voters in general demonstrate greater concern about climate change (Running 2012). A cross-national quantitative study from 2016 found that left-leaning parties got a higher degree of votes in countries where a greater share of the population perceived climate change as a severe threat (Knight 2016, 7).

Research from the US has found a large gap in climate concern between Democrats and Republicans, with Democrats being far more concerned. In 2010, 69% of Democrats believed that climate change was real and that it was happening currently, while only 41% of Republicans believed the same (Dunlap, McCright and Yarosh 2016, 1046) The US is more polarized than many other countries, so the ideological gap is likely more pronounced in the US than in other countries (McCright and Dunlap 2011, 1163).

It is not only in the United States where it is an ideological gap in concern. A study of 14 Western European countries conducted in 2008 found that individuals on the left of the political spectrum consistently reported a higher level of such concern than individuals on the right side (McCright, Dunlap and Marquart-Pyatt 2015, 338).

### *3.3.7 The effect of other factors*

Previous studies have found an urban-rural divide in climate concern. A 2009 study found that individuals living in urban areas are more concerned than individuals living in rural areas (Hamilton and Keim 2009, 2348).

Other factors that earlier research have found to influence climate change is age, where younger people are more concerned (Cvetkovic and Grbic 2021, 50), and CO2 emissions per capita, where individuals living in countries with higher CO2 emissions per capita are more concerned (Luis et al. 2018, 74).

## 3.4 Differences in climate concern between countries

Previous studies have identified some general trends in concern about climate change. Even though it is possible to identify these broad trends, it would be an erroneous conclusion to suggest that concern about climate change is universal. There are noticeable differences between countries.

The Pew Global Attitudes Project, which is an international representative opinion poll, measured the level of climate concern in several countries in 2006. They found large variations

between countries. 75% of Americans viewed global warming as a “very” or “somewhat” serious problem. In Russia, the level of concern was nearly the same, at 73%. Concern was significantly higher in countries such as Canada (87%), Mexico (81%), France (95%), China (88%), Japan (97%), Brazil (96%) and India (94%). The results show that even though the general public’s concern does not match the worry of climate scientists, the general level of concern was relatively high in 2006. The survey also found that the level of concern does not appear to be stable or committed (Weber 2010, 336; Pew research center 2006). Several later studies have found that there has been a decrease in climate change concern since this study was done, even if the scientific warnings have grown stronger in the same period (Capstick et al. 2015, 37).

A study from 2019, cross-national study from Europe and Israel also explored differences in concern between countries. To measure climate concern, the study used a scale from 1 to 4. Concern ranged from 2.64 in Israel to 3.48 in Portugal. The average level of concern in all countries was around 3, or “somewhat worried” (Poortinga et al. 2019, 29).

### 3.5 Concern in Norway

A study of 46 countries from 2008 found that concern was lower in wealthier countries. Based on these findings, the expectation would be that climate change concern would be lower in Norway than in other countries, given the high level of GDP per capita in Norway (Sandvik 2009, 334).

A survey from 2009 showed an ideological divide in climate concern in Norway. The study looked at gender differences and ideology. The authors found that 63% of conservative men did not believe in anthropogenic climate change in Norway. Among men in the rest of the population, this number was 36% (Krange, Kaltenborn, and Hultman 2019, 1).

A study based on the Norwegian Citizen panel data, conducted in 2022, found that Miljøpartiet De Grønne (MdG) voters exhibit the greatest concern about climate change. This party is a green party, with climate change as their most important political issue, so that result is not surprising. The second most concerned voters belonged to Sosialistisk Venstreparti (SV). This party is left of the political center in Norway. Voters from Høyre and Fremskrittspartiet (FrP), which are parties to the right of the political spectrum, displayed the lowest levels of concern (Gregersen 2022).

Previous research suggests that right-wing populist voters are among those least satisfied with how democracy works in their country (Bowler et al. 2016, 76). National ideology and right-wing populism are also strong predictors of climate change attitudes and concern (Aasen and Sælen 2022, 12). Therefore, it seems likely that there is a negative correlation between satisfaction with democracy and climate change concern, which means that the less satisfied a person is with democracy, the less worried he is about climate change.

Few studies have investigated the link between climate change concern and where in Norway you live. Studies indicate that southeastern Norway will be less affected by climate change compared to southwestern and northern Norway. Since previous studies have linked climate vulnerability to concern, it is possible to assume that concern is higher in these regions of Norway (O`Brien, Sygna, and Haugen 2004, 221).

A study from 2020 found that older people in Norway were more concerned about climate change (Lujala and Lein 2020, 148). These results are inconsistent with earlier studies (Lujala, Lein, and Rød 2015, 489). Because the results contradict previous studies, the authors suggest that there might be a curvilinear relationship between age and concern. Older people are more concerned about climate change, but that this is only true up to a certain age, and after reaching this age climate concern decrease.

Previous studies have found that men are more skeptical about climate change. This relationship is true in Norway as well as in Europe in general (Krange, Kaltenborn and Hultman 2019, 7).

A Norwegian study from 2017 found that individuals with higher education were more likely to support environmental policies and to believe that climate change was a severe problem. However, the study also found that educational level was insignificant when controlling for ideology. This might suggest that education does have some effect, but that the effect disappears when accounting for ideological differences (Gullberg and Aardal 2017, 72).

Earlier studies have found that individuals with higher income in Norway were more likely to be concerned about the personal consequences of climate change. But the same individuals did not express heightened concern about climate change as a collective threat to Norway (Lujala and Lein 2020, 146).

### 3.6 Previous research on prerequisites for people's willingness to act

A fundamental question is whether it is possible to use the research about climate change concern to increase the public's concern about climate change, which in turn might be translated into climate mitigation policies.

Some level of concern is necessary for climate mitigation actions to be taken, both on the country level and the individual level. Behavioral research from the past 30 years suggests that attention-catching and emotionally engaging information may be required to activate the public's concern about climate change (Weber 2010, 339).

The research suggests that events that only have consequences in the future do not receive the same level of attention or concern as events with immediate consequences. To raise concern about climate change, it might be necessary to concretize its impacts and consequences (Weber 2010, 339).

Findings also suggest that information about the causes and consequences of the change must be more accessible to raise climate concern. One way to achieve this is through better statistical and environmental science education (Weber 2010, 339). Another way is to simplify the information about climate change and its consequences.

In addition to a greater understanding of climate change, personal evidence of climate change can act as an effective teacher and motivator. This can only happen if these consequences are recognized as a result of human activity. A problem is that these potentially devastating consequences may be recognized as a result of human activities too late to reverse the actions leading to this change (Weber 2010, 340).

# Chapter 4: Finite pool of worry

## 4.1 Structure of the chapter

The chapter begins with a brief explanation of the finite pool of worry, as well as a presentation of previous research which have studied this theory.

I then turn my attention to factors that affect the finite pool of worry. I will first look at global events, which according to the finite pool of worry should lead to a reduction in climate concern. Then I will explain how the economy generally and the financial crisis specifically might have influenced concern. Subsequently, I will look at whether Covid-19 might have had an effect on the attention and concern about climate change. Lastly, I present the two exogenous events which I based on the finite pool of worry theory expect have influenced climate concern: the financial crisis and the coronavirus pandemic.

The chapter concludes with a presentation of the hypotheses which I seek to answer in the thesis. These hypotheses will be based on the research I present in this chapter, and the research presented in chapter 3.

## 4.2 The finite pool of worry - introduction

The "finite pool of worry" theory states that as concern about one issue increases, concern about other issues decreases. This implies that climate change concern will decrease when other big societal problems occur (Evensen 2021, 1).

A study done in 2012 found that climate concern decreased in the U.S. as the wars in Iraq and Afghanistan became more prominent issues in the public debate. The authors argue that the decrease was a consequence of the limited "issue space" in the public debate and that the reduction in concern was due to the increase in attention and worry about the wars in Iraq and Afghanistan (Brulle, Carmichael and Jenkins 2012).

A study of Argentinian farmers set out to answer whether concern about other political issues decreased as concern about climate change increased. In the study, the farmers were asked if they were concerned about a) the political situation in Argentina and its effects on taxes, b) weather and climate, c) prices of input variables and d) prices of crops at the harvest. They were presented with two scenarios. The only difference between the two scenarios was that in

one scenario, they were given a provisional seasonal forecast that indicated unfavorable weather conditions for the upcoming growing season. Unsurprisingly, the farmers were far more worried about weather and climate in the scenario that included unfavorable weather conditions. However, concern about the political situation in Argentine decreased from the first scenario to the second scenario, even though there had been no change in political risk between these two scenarios. Even within each of the two scenarios, there seemed to be an indication that worry, and concern were a finite resource. Farmers who worried more about the political situation tended to worry less about climate change. The same was true the other way around: Farmers who worried more about climate change tended to worry less about the political situation (Weber 2010, 338).

### 4.3 Global events and finite pool of worry

To test whether external shocks have had an effect on climate, the first question that is essential to answer is what events constitute an external shock. This is a hard question to answer, and what events that should be counted as global external shocks can be hard to define precisely. Given the imprecise nature of the term, I will lay out some conditions that have to be met for an event to be regarded as a global external shock.

The first condition is that it has to be an event that has an impact globally. The effect can be perceived as negative or positive by the population, but its impact has to be felt worldwide. National crises might lead to decreased concern in the affected country, but since the thesis is concerned with how concern varies between countries, I will confine my study to the impact of global shocks. For example, the election of right-wing politician Rodrigo Duterte was a significant event in the Philippines. It might have led to a decrease in concern about climate change in the Philippines. It is nevertheless not a global event, and it is rather unlikely that it would affect a country like Germany. To test whether global events have led to a decrease in climate change concern, it is not enough that the impact is felt in a couple of countries.

Because the countries looked at in the thesis are exclusively European countries, I will constrain myself to global shocks that have had an effect all across Europe. This entails that major events affecting regions outside Europe will not be analyzed. Examples of such events include the Ebola outbreak in West Africa in 2014 and the Arab spring in 2011.

The second condition is that there has to be lasting impacts of the event. It is hard to imagine that there was a high degree of concern about climate change, or anything else for that matter,

on the 15th of July 2018 in France, the day they won the World Cup in football. However, it is equally unlikely that the celebrations lead to a persistent decrease in climate concern.

The third condition is that the impacts, to at least some extent have to affect a majority of the population. It is not enough that one sector or subgroup of the European population are affected. One could imagine that concern about climate change decreased among those involved in the Panama papers scandal after the story of tax evasion broke. However, this is a small subgroup of the population and does not count as an external shock.

My data also limits the events that can be studied in the analysis. The European data is measured from 2008 to 2017, while the Norwegian data is measured from 2013 to 2021. For example, previous research points to the 9/11 terrorist attacks as an external shock that led to decrease in climate change concern. This event happened in 2001, which means that I will not be able to assess the impacts of this event. The same is true for the terrorist attack on the 22nd of July in Norway.

Some events are more challenging to assess, and it can be discussed whether they constitute an external shock or not. The foremost example of such an event is when Donald Trump was elected president in 2016. The election of Trump as president of the U.S. was not a global event, in the sense that it occurred exclusively in the US. The election also happened outside Europe, which makes it more unlikely that it would affect climate concern in Europe.

On the other hand, it is possible to argue that it constitutes an external shock, felt in Europe as well as in the U.S. Firstly, the election received an unprecedented amount of media coverage, both in the U.S. and Europe. Secondly, the U.S. is a global superpower and a leading western country with close ties to a large number of European countries. Thirdly, the elections had huge ramifications for the U.S. as well as Europe. And fourthly, the election turned the political order in one of the leading countries in the world upside down (Silva 2019, 1). But as I don't have data from the U.S. and thus can't compare with the development in attitudes there, I have not included this event in my thesis.

In the same way as the election of Donald Trump, Brexit is a national event. Nonetheless, there are some critical differences between Brexit and the election of Donald Trump.

The first difference is that Brexit happened in Europe, which is within the geographic scope of my study. The second difference was that while the consequences of Trumps election were felt worldwide, Brexit specifically affected Europe. Britain was, after all, one of the major EU

countries. The third difference was that it represented an unprecedented event in the sense that Britain was the first country to leave the EU. It is worth noting that a case could be made for the election of Trump also being an unprecedent event, however while the U.S. has elected presidents before, no country had left the European union before Brexit (Gastinger 2021, 567). As a consequence of Brexit, many people questioned the future of the entire union. Given these reasons, I would argue that Brexit, to some extent, might represent an external shock in Europe.

Another event that might constitute an external shock is the European refugee crisis. It is hard to pinpoint an exact start or end date for this event, but it reached its peak in 2015, with 1.3 million individuals requesting asylum in Europe (Vandervoort and Verschraegen 2019, 48). Although it impacted the southern European countries by the Mediterranean Sea the most, the consequences were felt more or less all over Europe.

An event that definitely was global was the 2008 financial crisis and the subsequent European debt crisis. Even though the crisis started in the US, the impact was noticeable worldwide, with several European countries strongly hit.

The corona crisis is another external shock. The spread of the virus and the subsequent attempts to mitigate the damage was felt, at least to some extent in virtually every corner of the world. Since the European data is measured from 2008 to 2017, I will not be able to analyze how it affected climate concern in Europe. However, I will explore how it affected concern in Norway, given that the Norwegian data is measured from 2013 to 2021.

I would argue that the two events which most clearly meet the conditions presented earlier in the chapter are the financial crises and the corona crisis. These events were felt in all of Europe, they had a lasting effect and they impacted, at least to some extent a majority of the population. In the following chapters, I will take a more in-depth look at these two events, which I hypothesize will have the most considerable effect on concern about climate change.

### 4.4 The financial crisis and the finite pool of worry

Based on “the finite pool of worry”, the expectation would be due to the limited “issue space” in the general public, big external shocks like the 2008 financial crisis would presumably lead to a sharp decrease in climate change concern. However, there is not unambiguous support for this in the literature. While I look at the general link between the economy and concern in part 3.3.1 in the thesis, this part is concerned with whether the financial crisis specifically influenced climate concern.

Previous research has found that climate change concern decreased in the United States in the second part of the 2000s. There could be several reasons for this. There seems to have been an increase in media coverage that is skeptical of climate change. Another reason might be increased skepticism towards climate change from the Republican party and other conservative groups might be one reason for this. Another explanation, in line with the "finite pool of worry" hypothesis, is that competing issues, especially the financial crisis in 2008, led to this decrease (Capstick et al. 2015, 48).

A 2012 study investigated which factors were behind the decrease in climate change concern in the late 2000s. They found that economic factors were the driving force, both in the U.S. and in Europe. They argue that the decrease in climate change concern came as a result of the 2008 financial crisis. As concern about the economy increased, climate concern decreased. It is worth noting that this study only tested the effect of economic factors on climate change concern against a limited number of alternative hypotheses (Scruggs and Benegal 2012).

A report from the Pew Research center found a sharp decrease in climate concern from April 2008 to October 2009 in the United States. In April 2008, 47% of American citizens reported that climate change was a "very serious" problem. In October 2009, this had dropped to 35%. In 18 months, the number of people who thought that climate change was a very serious problem dropped by 16.45%. Prior to this decrease, climate concern had been relatively stable in the US. The sharp decrease came after the 2008 financial crisis. These results are consistent with the "finite pool of worry" theory (Pew research center 2010).

### 4.5 Covid-19 and finite pool of worry

In this part, I will examine whether the coronavirus pandemic was an "external shock" that led to reduced worry about climate change. The coronavirus is a relatively recent event. This limits the number of studies that have been conducted on the relationship between corona and climate change concern. There is especially a limited number of studies about the link between corona and concern in Norway. Still, given that the impacts to some extent were homogeneous across countries, it is reasonable to assume that the findings from studies conducted in other countries, at least to some extent, are generalizable to Norway.

There is not universal support for the theory that the coronavirus pandemic lead to a decrease in climate concern. Like climate change, it is possible to view the pandemic as an environmental threat. There has rarely been a time in history where humanity has faced two powerful

environmental threats simultaneously. This might affect the individuals' support for the two different threats in question. On the one hand, it might lead to a "crowding-in" phenomenon where the recognition that one of these threats needs a strong policy response also leads to the realization that the other threat needs support. Similarly, individuals who are concerned about either climate change or the coronavirus pandemic would likely view these events as systemic threats which need institutional responses. The fact that strong governmental responses to the corona crisis mitigated the impact of the pandemic, this might lead to the realization that the same is necessary with climate change (Bostrom et al. 2020, 2).

On the other hand, the coronavirus pandemic might lead to a "crowding-out" effect. Increased concern about the pandemic might lead to decreased concern about climate change. This would be consistent with the "finite pool of worry" theory (Bostrom et al. 2020, 5).

A study from the U.S. found support for the "crowding out" effect. In the study, respondents were given three different surveys. The first survey only contained questions about climate concern. The second survey only included questions about corona and the third survey contained questions about corona and climate change. Climate concern was higher in the survey where respondents only were asked about climate change, than in the survey where they were asked about climate change and corona. The same was true the other way around. The authors argue that this effect is due to a limited issue space. In the survey where respondents only were asked about one issue, they gave this issue all their attention, and this led to increased concern about this specific issue. In the survey where respondents were asked about two different issues, they had to "divide" their concern between the two issues which led to decreased concern about both issues. This line of argumentation is consistent with the "finite pool of worry" (Bostrom et al. 2020, 1).

In the same U.S. study, respondents viewed the coronavirus as a bigger threat than climate change. They viewed it as a significant threat to themselves, as well as to humanity in general. This support the theory that individuals are more concerned about concrete events with an impact in the short term than more abstract threats, with only long-term impact (Bostrom et al. 2020, 6). It is worth noting that this study was conducted in the US. I will later test the coronavirus-effect on concern about climate change in Norway and assess whether the findings from the U.S. study are similar to those from Norway.

Contrary to the findings from the U.S. study, a study from the UK found no evidence that the pandemic led to reduced concern about climate change. The authors argue that these findings

don’t refute the “finite pool of worry.” Instead, they argue that climate change has become a permanent member of individuals' “pool of worry,” which means that major events don’t affect climate concern. They argue that concern about other political issues might decrease due to major events, such as the pandemic, but that this is not the case for climate concern (Evensen et al. 2021, 1).

### 4.6 Hypotheses

Based on previous research, there seems to be a link between higher climate vulnerability and increased climate concern (Bullard and Wright 1993; Capstick et al. 2015; Whitmarsh 2005; Zahran et al. 2006; Drori and Yuchtman-Yaar 2002; Blake 2001). The first hypothesis is therefore as follows:

**H1:** *Higher climate vulnerability lead to increased concern about climate change.*

The second expectation is based on the “finite pool of worry” and previous research on the effect of global economic shocks on concern about climate change (Pew research center 2010; Scruggs and Benegal 2012; Capstick et al. 2015). The second hypothesis is, therefore, as follows:

**H2:** *The financial crisis led to decreased concern about climate change.*

The third hypothesis is also grounded in the “finite pool of worry” theory (Evensen 2021, 1). The expectation is that global external shocks like the corona crisis will have a negative effect on concern. The third hypothesis is as follows:

**H3:** *The coronavirus pandemic led to decreased concern about climate change in Norway.*

The fourth hypothesis is based on previous research which has found a clear ideological divide in concern about climate change (Krange, Kaltenborn, and Hultman 2019; Gregersen 2022; Aasen and Sælen 2022). I expect my results to be consistent with this research. The fourth hypothesis is, therefore:

**H4:** *There is a clear left-right divide in concern about climate change in Norway, with left-wing voters displaying higher levels of concern.*

# Chapter 5: Data and variables

## 5.1 Structure of the Chapter

In this chapter, I will describe the data and variables used in the thesis.

The first part of the chapter is dedicated to describing the data used to analyze climate concern at the European level. Then, I will describe the data used to analyze the Norwegian citizen panel.

In the second part of the chapter, I will describe the variables used in this thesis. I will explain how the variables are measured, as well as how they are operationalized. I begin by describing the variables used in the European analysis. I first describe the dependent variable, secondly, I describe the micro variables and thirdly, I describe the macro variables. Then, I turn my attention to the variables used in the analysis of the Norwegian Citizen Panel. I begin by describing the dependent variable, then I describe the explanatory and control variables

The chapter finishes with descriptive statistics for the Norwegian and European analysis.

## 5.2 European data

The European data is gathered from a wide array of sources. The data is collected from Eurobarometer, Eurostat, The World Bank, and Germanwatch.

The time period analyzed is 2008 to 2017. The dependent variable is gathered from Eurobarometer. The Eurobarometer is a European public opinion survey conducted yearly since 1974. Each public opinion survey is presented as a round (Eurobarometer 2022). The rounds used in this analysis are round 69.2, which was measured in 2008, round 71.1, which was measured from January 2009 to February 2009, round 72.1, which was measured from August 2009 to September 2009, round 75.4, which was measured in 2011, round 80.2, which was measured in 2013, round 83.4, which was measured in 2015 and round 87.1, which was measured in 2017. The education and age variable are also gathered from Eurobarometer. The reason I have chosen these rounds is that these were the only rounds that included a question about climate concern.

The analysis includes data from 26 European countries. The number of countries included in the Eurobarometer dataset limits how many countries it is possible to look at in the analysis.

All variables used in my analysis are measured in each country at every time point. The phrasing of the questions that the variables are based on is the same in all countries. This makes the results comparable, both over time and across countries.

The explanatory and control variables are gathered from The World Bank, Eurostat, and Germanwatch. GDP per capita, level of unemployment, CO2 emissions in kiloton, percentage of individuals living in urban areas, and inflation are the variables gathered from the World Bank and Eurostat. The World Bank is the common name for five international organizations which provide financial support and counseling to promote growth and contribute to the reduction of poverty in developing countries. The World Bank also collects data about several global development indicators (World Bank 2022, 1). Eurostat is the European Union's statistical organ. The goal of Eurostat is to collect comparable statistics for the European Union (Eurostat 2022, 1).

The climate vulnerability variable is gathered from the Münchener Rück NatCatService, which is one of the world's most comprehensive databases for analyzing and evaluating losses caused by natural disasters (Germanwatch 2020).

I have constructed my own dataset based on the data from these various sources. This dataset is then utilized in my analysis. All the variables are measured at the country-level and not at the individual level.

### 5.3 Norwegian Data

To analyze climate concern in Norway I have utilized data from the Norwegian Citizen Panel (NCP)[1]. NCP is an internet-based survey that looks at Norwegian attitudes towards societal issues. The panel is run by researchers at the University of Bergen and NORCE. The participants in the panel represent a cross-section of the Norwegian population (Medborgerpanelet 2022).

The Norwegian Citizen panel has been gathering data from 2013 until today. The data is presented in rounds. In 2013 there was one round with data. From 2014 to 2016, there were two rounds per year, and from 2017 until today, there have been three rounds every year. The data

[1] (Some of) the data applied in the analysis in this thesis are based on "Norwegian Citizen Panel [wave 2, 3, 4, 5, 6, 7, 8, 10, 11, 14, 17 and 20]". These surveys were financed by the University of Bergen (UIB). The data are provided by UIB, prepared and made available by Ideas2Evidence, and distributed by Norwegian Centre for Research Data (NSD). Neither UIB nor NSD are responsible for the analyses/interpretation of the data presented here.

includes questions about various societal themes, with each round focusing on specific societal themes. The main themes in the surveys are political behavior, democracy, political communication, climate and the environment, migration, extremism and diversity, health, territorial democracy, and reforms (Medborgerpanelet 2022). Each round represents a specific time point, with most data being gathered over a period of one month.

In my analysis, I have used rounds 2, 3, 4, 5, 6, 7, 8, 10, 11, 14, 17 and 20. The reason some rounds are omitted is because they did not include questions about climate concern.

The Norwegian citizen panel is in part panel data. Panel data refers to data containing time-series observations of a number of individuals which involve at least two dimensions: A cross-sectional dimension and a time-series dimension. Panel data is a subset of longitudinal data, where observations are for the same subjects each time (Hsiao 2007, 17).

Recruitment to the citizen panel was done in November 2013, October 2014, March 2017, March 2018, January 2019, November 2019, and June 2020. From 2020 recruitment to the panel is done every year. Each round constitutes a representative cross-section of the Norwegian population. In addition to the special questions included in each round, some questions are being asked regularly to the same respondents to make the data into panel data.

There are several reasons why it is beneficial to use data from the NCP. The first reason is data availability, with the Norwegian Citizen panel being a large dataset containing relevant questions about the topic I seek to explain. The second reason is that it is in part panel data. This type of data has a greater capacity for explaining the complexity of human behavior than cross-sectional data or time-series "only" data. With panel data, it is possible to observe the "before" and "after" effects on individuals since it is the same individuals measured over an extended period of time. Panel data also allows the researcher to look at how the same individuals change over time (Hsiao 2017, 19).

Most panel datasets contain data measured over a relatively short time period due to the fact that it is difficult to get the same respondents to answer the same questions over an extended period. Therefore, the NCP provides a quite unique opportunity as it is unusual to have panel datasets measured over such an extended time period as the NCP data are.

## 5.4 Variables

### 5.4.1 Variables used in the European analysis

Below I will explain the variables I have used in the analysis, and how these variables are coded. The variables are included in the analysis based on the research presented in chapters 3 and 4.

### 5.4.2 Dependent variable

The dependent variable is concern about climate change. This is measured by the question "how serious a problem do you think climate change is at the moment." The answering alternatives ranges from 1 to 10, with 10 being an "extremely serious problem" and 1 being "not a serious problem at all."

The dependent variable was originally coded from 1 to 10, with 1 being "an extremely serious problem" and 10 being "not a serious problem at all." To make the interpretation of the results more intuitive, I have reverse-recoded the variable with 1 being "not a serious problem at all" and 10 being "an extremely serious problem."

### 5.4.3 Explanatory variables

The explanatory variables are directly linked to the hypotheses presented in chapter 4. These factor

The two variables that will be used to directly test the hypotheses presented in chapter 4 are climate vulnerability and change over time.

Climate vulnerability is measured based on a climate risk indicator. This indicator is based on four parameters: 1) the number of deaths due to climate-related weather events. 2) number of deaths per 100 000 inhabitants due to climate-related weather events, 3) sum of losses in US$ in purchasing power parity, 4) losses per unit of GDP. The variable is measured from 2000 to 2019, and each country is given an average vulnerability score for this period. The lower the score is, the more vulnerable countries are to climate change (Eckstein et al. 2021, 30).

Year is included in the analysis to test whether concern about climate change has changed over time. Year is also included as a quadratic term to test whether there has been a U-shaped development in concern over time. Countries are included in the analysis to test whether there are differences in concern between countries.

### *5.4.4 Micro variables – age and education*

Climate concern is affected by both factors on the individual level and on the societal level. To capture how both factors on the individual and the societal level affect climate concern, the control variables are divided into micro and macro variables. The micro variables are factors related to the individual respondent. The micro variables are gathered from Eurobarometer. Unfortunately, there is a lack of time-series-cross-sectional microdata available. For example, some micro variables are measured in 2008 and 2009 but not in any other years. Therefore, the number of micro variables used in the analysis is limited.

The micro variables used in the analysis are age and education. Education is measured by the question "how old were you when you stopped full-time education." Ideally, the education variable would be measured as "highest level of education attained." An example of the problem with this variable is that it only measures that an individual stopped studying at a given age, not which education level was attained by that age. Unfortunately, this education variable was the only TSCS variable that was available. Age is measured by the question, "How old are you."

### *5.4.5 Macro variables*

Macro variables are societal variables that affect a person's concern. The macro variables used in the analysis are the different countries gross domestic product (GDP) per capita, unemployment rate, CO2 emissions per capita, rate of urban population, inflation, and climate vulnerability.

GDP per capita is measured in U.S. dollars. The variable is scaled to make the effect comparable to the effects of the other variables. By scaling, i mean that the variable is standardized. As an example, the highest value of GDP per capita is 119 932$. After scaling the variable, it ranges from 1 to 4. Without scaling the variable, it makes it hard to compare the effect of this variable to the effect of a variable like unemployment, which has a scale that goes from 1 to 100. Unemployment is measured as the percentage of the labor force currently unemployed.

CO2 emissions are measured as a country's total CO2 emissions in kilotons per capita. After scaling, the variable ranges from 0 to 4. The variable is scaled to make the effects comparable to the effects of other variables.

Urban population is measured as the proportion of the population living in urban areas. Inflation is measured as annual consumer price growth in percent.

The macro variables are measured in two different ways. They are measured as normal variables (non-lagged), and as lagged variables. The variables are lagged by one year. This means that a change in an explanatory variable in year 1 will have an effect on the dependent variable in year 2. There are mainly two reasons why I have lagged the macro variables.

Firstly, some of the macro variables might have a delayed effect on the dependent variable. For example, a change in the average GDP per capita in a country in 2008 might not evoke a change in climate concern immediately. But it might be that this change in GDP per capita affect climate concern in 2009, a year after the decrease happened. To check whether there are such a dynamic, it is necessary to lag the variables.

Secondly, the Eurobarometer surveys are conducted at different times of the year in different countries. The surveys are conducted earlier in the year in some countries and later in the year in other countries. For example, in round 69.2 of the Eurobarometer, the survey was conducted between 27th March 2008 to 27th April 2008 in France (Eurobarometer 2022, 8). However, the GDP per capita variable was measured midyear in France (Worldbank 2022). This means that the climate concern variable was measured before the change in the GDP per capita variable. This violates the second requirement for establishing causal relationships, namely that the explanatory variable X must come before the dependent variable Y in time. It is not possible to predict current concern with future values on the explanatory variables. To remedy this possible measurement error, it is necessary to lag the explanatory macro-variables by one year. The same problem is not present with the micro variables because these variables are gathered from Eurobarometer.

## 5.5 Variables used in the Norwegian analysis

### *5.5.1 Dependent variable*

The dependent variable is concern with climate change. This is measured by the question, "how worried are you about climate change." The alternative answers ranges from 1 to 5, where 1 equals "very worried," 2 equals "worried," 3 equals "somewhat worried," 4 equals "a little worried," and 5 equals "not at all worried." The variable has been reverse-recoded to 1 being "not worried at all" and 5 being "very worried." This is to make the interpretation of the results more intuitive.

### *5.5.2 Explanatory variables*

The explanatory variables are the variables that are linked directly to the hypotheses presented in chapter 4. These variables are included to test the expectations presented in the hypotheses.

The first explanatory variable is party affiliation. This variable is measured by the question "Which party would you vote for if there was an election tomorrow". The variable is included to test H4, which states that there is a left-right divide in climate concern in Norway.

The second explanatory variable is round. This is included as a time variable. The variable is included to test whether climate concern has changed over time in Norway, and to test H3, which states that the corona crisis led to a decrease in climate concern in Norway.

### *5.5.3 Control variables*

There are several other factors that might explain climate concern. The variables presented below are not directly linked to the hypotheses but are variables that previous literature have found to have an effect on climate concern. These variables might explain some of the variation in climate concern and might also help answer which factors influence the concern. The control variables are county, gender, education, satisfaction with the economy, satisfaction with the government and satisfaction with democracy.

County is measured as which county the respondents live in. The counties included in the analysis are the 11 counties after the county amalgamation in Norway. Gender is measured by the question, "Which gender are you?".

Education is measured as highest level of education obtained. The variable is measured on a scale from 1 to 14, with 1 equaling "no formal education" and 14 equaling "education at a PhD-level".

Economy is measured as satisfaction with the economic situation in Norway. The variable is measured on a 7-point scale, where 1 equals a perception of the economic situation in Norway as "very bad" and 7 equals a perception of the economic situation in Norway as "very good".

Government satisfaction is measured by the question, "how satisfied are you with the current government." The variable is measured on a 5-point scale, with 1 being "not satisfied at all" and 5 being "very satisfied."

Democracy is measured by the question, "how satisfied are you with the Norwegian democracy." The variable is measured on a 5-point scale, with 5 being "very satisfied with the Norwegian democracy" and 1 being "not satisfied at all."

The full theoretical expectations of the variables in the Norwegian and European analyses are presented in chapters 3 and 4.

### 5.6 Descriptive statistics

**Table 1: Descriptive statistics for the European analysis**

| | Mean | Standard deviation | Min | Max |
|---|---|---|---|---|
| **Microvariables** | | | | |
| *Education* | 25.26 | 2.99 | 19.77 | 35.66 |
| Age | 49 | 3.65 | 18 | 82 |
| **Macrovariables** | | | | |
| *Climate concern* | 7.843 | .661 | 5.574 | 9.074 |
| *GDP per capita* | 2.231 | .876 | 1.124 | 3.938 |
| *Unemployment* | .089 | .044 | .028 | .274 |
| *CO2-emissions* | .079 | .045 | .023 | 3.710 |
| *Urban population* | .740 | .120 | .522 | .976 |
| *Inflation* | 2.171 | .089 | .171 | 5.550 |
| *Climate vulnerability* | 5.678 | 1.673 | 2.368 | 8.792 |
| **Lagged variables** | | | | |
| *GDP per capita* | 2.134 | .876 | 1.124 | 3.938 |
| *Unemployment* | .089 | .044 | .036 | .274 |
| *Urban population* | .740 | .120 | .522 | .976 |
| *CO2-emissions* | .078 | .045 | .023 | 3.710 |
| *Inflation* | 2.171 | .089 | .171 | 5.550 |

Source: Eurobarometer 2022, Eurostat 2022, Worldbank 2022, Eckstein et al. 2021.

**Table 2: Descriptive statistics for the Norwegian analysis**

| | Mean | Standard deviation | Min | Max |
|---|---|---|---|---|
| *Education* | 5.796 | 2.452 | 1 | 15 |
| *Age* | 32 | 2.34 | 18 | 87 |
| *Gender* | 1.49 | .499 | 1 | 2 |
| *Climate Concern* | 3.357 | 1.053 | 1 | 5 |
| *Satisfaction with the economy* | 5.825 | 1.036 | 1 | 7 |
| *Satisfaction with the government* | 3.003 | 1.063 | 1 | 5 |
| *Satisfaction with democracy* | 3.734 | .831 | 1 | 5 |

Source: Norwegian citizen panel 2022

# Chapter 6: Methodology

## 6.1 Structure of the chapter

In this chapter, I will present the methodological approach used in the thesis. The chapter begins with a broad description of causal relationships.

In the second part of the chapter, I describe multilevel models. To describe multilevel models, I explain intraclass correlation, fixed effects, random effects, AIC/BIC, and some of the pitfalls of ignoring a multilevel data structure.

In the third part of the chapter, I discuss why I have chosen to use multilevel models, as well as some of the more general reasons for using multilevel models.

In the fourth part of the chapter, I briefly discuss the weighing of data.

In the last part of the chapter, I explain which assumptions that needs to be justified when using multilevel model. I also explain how I have tested these assumptions, and the results I got when running these tests. In this part I test for autocorrelation, intraclass correlation and multicollinearity.

## 6.2 Causal relationships

Before launching into an explanation of multilevel models, some remarks on causal relationships are imperative. At least three requirements are needed for establishing causal relationships between the dependent variable(s) (Y) and the explanatory variable(s) (X) (Kellstedt and Whitten 2008, 60).

The first requirement is that there must be covariation between X and Y. Covariation is used to describe situations where variables vary together. Variables covary if for example higher values of variable X generally lead to higher values on variable Y (Kellstedt and Whitten 2008, 61).

The second requirement is that the explanatory variable X must come before the dependent variable Y in time. The third requirement is that any alternative explanations for the covariation must be ruled out (Kellstedt and Whitten 2008, 61).

The first requirement is the easiest to fulfill. The only requirement is that the variables correlate. Given the nature of the data, the second requirement is also relatively easy to fulfill. Both the

European and Norwegian data used in the thesis, have a time component. This makes it easy to point out that a change in X happened before a change in Y. The third requirement is the hardest to fulfill. The only way to rule out all possible alternative explanations is to use randomized experiments. Even though randomized experiments are seen as the "gold standard" in science, it is too time-consuming and resource-intensive to be utilized in a master thesis. In addition, one would need funding to buy questions in a national survey like the Norwegian Citizen Panel. This means that it is not possible to rule out that the effects observed in the analysis are caused by alternative explanations.

The analysis fulfills two of the three requirements needed to build a causal relationship. Concerning alternative explanations, I can rule out the factors I adjust for. Nonetheless, there will obviously be factors that influence the dependent variable which I don't test for. There are several reasons for this. There might be variables that I deemed not to be relevant that have an effect and there might be variables that are not included due to data limitations that have an effect.

It might also be relevant variables that are not recorded and not included in the models. If this is the case, it can lead to omitted variable bias. This means that the effect of variables not included in the model are attributed to the variables included in the model (Kellstedt and Whitten 2008, 229). As an example, if one were to study the factors that affects the height of an individual, a natural variable to include in the model would be gender, since men, on average are taller than woman. If gender is not included in the model, it might be that some of the effect of the variables that are included in the model in reality are explained by height. This would lead to biased results.

To mitigate this problem, I have chosen variables based on previous research in the field. I will also discuss possible causes and alternative explanations for the observed mechanisms.

## 6.3 Multilevel models

### *6.3.1 Introduction*

The method utilized in the analysis of the data is a multilevel method. This is a method most commonly used on clustered or grouped data (Steele 2007, 1).

In regular linear models, a necessary assumption is that there are no relationships among individuals in the sample for the dependent variable once the independent variables in the

analysis are accounted for (Finch, Bolin, and Kelley 2019, 23). This assumption is only valid if individuals are randomly selected from the general population (Finch, Bolin, and Kelley 2019, 23).

Sometimes, this assumption is not valid, and the selection process creates correlated responses among individuals. As an example, the results of pupils might be correlated within a school since some schools perform better than other schools. The results might also be correlated within classes in a school, since some teachers are better than other, so the pupils of one teacher might correlate more than pupils of different teachers. If one used a regular linear model to analyze the results of these pupils, it would violate the assumption that there is no relationship among individuals in the sample for the dependent variable once the independent variables are accounted for. A factor beyond the explanatory variables, in this case, the school or the class would have an additional effect on the dependent variable (Finch, Bolin, and Kelley 2019, 23).

The data structure above is called nested or hierarchical data, meaning that the data have a nested structure. Using the example described above, individual data points at one level, for example, pupil, appear in only one level of a higher-level variable, for example, schools. Pupils at level 1 is nested within schools at level 2 (Finch, Bolin, and Kelley 2019, 24). The data used in the thesis is nested data. In the data used to measure concern in European countries, countries at level 1 are nested within country-years at level 2. In the data used to measure concern on the Norwegian level, individuals at level 1 are nested within rounds at level 2. Given that the data have a nested structure, it is necessary to use a multilevel design.

A benefit of using multilevel models is that it makes it possible to identify changes over time, as well as differences between countries. Concern about climate change in Europe generally or Norway specifically is, of course, not constant over time or between countries. To capture the full variation of the dependent variable, it is necessary to use multilevel models.

### *6.3.2 Intraclass correlation*

A necessary assumption in multilevel models is that observations at level 1 are correlated within groups at level 2. To measure this, it is normal to use the Intra-Class Correlation Coefficient (ICC). ICC measures the proportion of the variation in the dependent variable between groups versus the total variance. ICC ranges from 0 (no variance between clusters) to 1 (variance between clusters, but no variance within clusters) (Finch, Bolin, and Kelley 2019, 24).

In the analysis of the European data, ICC can be used to test whether climate concern is similar within countries. A higher degree of similarity among people within countries would indicate more variation between countries. An ICC of 1 would mean that all people within the same country in the same year had the same level of concern and that the only factor affecting concern is which country you lived in. In the analysis of the Norwegian data, an ICC of 1 would mean that the only thing that affected concern where which round concern were measured in.

Raudenbush and Liu (2000) suggest that ICC values of 0.05, 0.10, and 0.15 could be viewed as small, medium, and large variances. However, there is no rule of thumb for how big ICC needs to be to justify using multilevel models (Raudenbush and Liu 2000, 351). Huang suggests that as long as the data have a nested structure, it is reasonable to use multilevel models, no matter how low the ICC is (Huang 2018, 493).

### *6.3.3 Fixed effects*

In standard linear regression models, there is one common intercept for all individuals in the population. When individuals are clustered within groups, like they are in multilevel models, each cluster may have separate intercepts. If there is no cluster effect, a single intercept will suffice (Finch, Bolin, and Kelley 2019, 30).

It is normal to distinguish between fixed and random effects in multilevel models. Fixed effect is modeling possible sources of variation with dummy variables. In fixed effect models there are always only one intercept. Variables that change at a constant rate over time have a fixed effect. As an example, a variable like age would have a fixed effect, the change they cause to an individual is constant over time and across individuals (Finch, Bolin, and Kelley 2019, 31).

### *6.3.4 Random effects*

A critique often directed at general quantitative approaches in social science is that they don't consider causal heterogeneity (Mahoney 2001). Explanations might differ from one case to another, which may be missed by only looking at the mean effects. In my analysis, the explanatory variables may have different effects in different countries.

To mitigate this problem, one can use random effects. Random effects vary from cluster to cluster (Finch, Bolin, and Kelley 2019, 31). Like fixed-effect models, random-effects models assume that the independent variables have a fixed effect on the dependent variable across all observations. However, unlike fixed-effect models, random effect models consider that this

effect may vary from cluster to cluster. Random effect models measure variation both within and between units (DerSimonian and Kacker 2007, 106).

### *6.3.5 AIC/BIC*

In regular linear regression models, adjusted r-squared to measure explained variation. This is not an option in multilevel models and there is no method for measuring explained variation. However, there are two indicators that measure how well the model fits the data. These are Akaike's Information Criterion (AIC) and the Schwarz Bayesian Information Criterion (BIC) (Wind and Komproe 2012, 1717).

When models are fitted on the same dataset and with the same estimation method, lower AIC-values indicate a better model fit. There is no rule for how much lower AIC should be for model 1 compared to model 2 to justify choosing model 1 (Vallejo et al. 2014, 48)

The Schwarz Bayesian Information Criterion (BIC) also measures model fit. The difference between AIC and BIC is that BIC more harshly penalizes more complex models (Lorah and Womack 2019, 440). In the analysis, I will report both the AIC and BIC values to give an indication of model fit.

### *6.3.6 Pitfalls of ignoring multilevel data structure*

In their book about multilevel methods, Finch, Bolin, and Kelley identify some pitfalls when using standard statistical methods on multilevel data. The first pitfall is that the assumption that the standard errors are independent is violated (Finch, Bolin, and Kelley 2019, 29).

For example, suppose a researcher has test results from a sample of students who attend different schools. In that case, it is natural to assume that the students who attend the same school will have test results that are more highly correlated. This within-school correlation will lead to inappropriate estimations of standard errors if regular statistical methods are used instead of multilevel models. In turn, the inappropriate standard errors would lead to inaccurate statistical inference, where p-values are smaller than they should be. This might lead to type 1 error, where hypotheses that should be rejected instead are kept (Finch, Bolin, and Kelley 2019, 29).

Another problem with ignoring the multilevel structure is that important relationships involving each level in the data might be missed. Using the school example, not including information

about the specific schools might lead to essential variables that explain student performance being omitted from the analysis (Finch, Bolin, and Kelley 2019. 29).

### 6.4 Reasons for using multilevel analysis

Concern about climate change can be explained by characteristics of the individual level like age, education, and gender, as well as characteristics on the country level like GDP per capita, number of people living in urban areas, and unemployment rates. To test both the variables at the individual and the country level, it is necessary to use multilevel modeling.

The rule of thumb is that if the dependent variable is dichotomous, then the best method to use is logistic regression. If the variable is continuous, the best method to use is linear regression. Since my dependent variable is continuous, I will utilize linear multilevel regression. Linear models also have the advantage of being more easily explainable.

In the analysis of the European data, I include the variable year as a quadratic term in the linear model. This is based on the theory presented in chapters 3 and 4, where I expect the concern of climate change to decrease following the 2008 financial crisis, reach the bottom as the impacts of the financial crisis are felt, and then increase as the effects of the financial crises wear off.

In my data, a possible measurement error could be that the distance between each answering alternative is not the same. As an example, if climate concern instead was measured by the question “how worried are you about climate change on a scale from 1-10”, one would know that the distance between each answering alternative was equally large. The distance between 1 and 2 is as large as the distance between 2 and 3. In the Norwegian analysis the answering alternatives instead ranges from “not worried at all” to “very worried”. This makes it harder to judge whether the distance between each answering alternatives is equally large. It is not given that the distance between “not worried at all” and “little worried” is as large as the distance between “worried” and “very worried”.

To control for this, an ordered logit model is used in the analysis of concern in Norway. These models are used when the dependent variable is ordinal and not continuous. This means that the relative ordering of the dependent variable is known, but the exact distance between the values is not known (Grilli and Rampichini 2012, 1).

## 6.5 Weighing

Given that the data used in the thesis are survey data, it is necessary to utilize weights to correct any possible biases there might be in the sample. In the European analysis, the weight variable is a population weight. The weight corrects the fact that most samples from the data are of almost identical size, even if the population size of the countries are different (Eurobarometer 2022). Using this weight ensures that the results from each country are represented in proportion to its population size.

In the Norwegian analysis, a weight variable is also included to correct for eventual biases in the sample. The weight used in the analysis of the Norwegian citizen panel is a weight that combines the demographic variables with educational level. This is the weight that the Norwegian citizen panel recommends using in statistical analysis (Medborgerpanelet 2022, 1). The weights in both the European and Norwegian analyses are included in all the analyses.

## 6.6 Tests

### *6.6.1 Introduction*

There are some assumptions that needs to be fulfilled to justify running multilevel models. In the next part I test whether these assumptions are fulfilled. To check whether this is the case, I run tests for autocorrelation, intraclass correlation and multicollinearity.

### *6.6.1 Autocorrelation*

Autocorrelation is a statistical term used to describe covariation in an observation of a variable from one point in time to the next point in time. It can be defined as the property of random variables taking values at pairs of locations a certain distance apart that are more similar (positive autocorrelation) or less similar (negative autocorrelation) than expected for randomly associated pairs of observations. Autocorrelation is a property of ecological variables and of all variables along time series or across geographical space (Legendre 1993, 1659).

In this analysis, one would expect that a value at one time is correlated with the value for the same variable at a later time. For example, one would expect that GDP per capita in one country in 2008 correlates with GDP per capita in the same country in 2009. This also influences the level of concern related to climate change. Because of this, one would expect some degree of autocorrelation in the data. However, it is necessary to avoid very high levels of autocorrelation, as it may prevent the data analysis from being accurate.

One of the most common tests for autocorrelation is the Durbin-Watson test. The test is reliable and easy to compute (Dufour and Dagenais 1985, 371). If there is no autocorrelation in the data, the test should be between 1.5 and 2.5 with a p-value below 0.10 (Dufour and Dagenais 1985, 371).

To use the test, it is first necessary to fit a regression model and then use the test to check whether there is autocorrelation in the data (Bartels and Goodhew 1981, 138).

The Durbin-Watson test ranges from 0 to 4, with 2 indicating no autocorrelation, below 2 indicating positive autocorrelation, and above 2 indicating negative autocorrelation (Longhi and Nijkamp 2007, 107).

All the models report an autocorrelation coefficient close to 2, which suggests there are no problematic levels of autocorrelation in the sample. This suggests that the observations are independent of each other[2].

*6.6.2 Intraclass correlation*

Intraclass correlation (ICC) is utilized when quantitative measures are used on units that are clustered within groups. ICC describes to what extent there is a resemblance between units in the same groups (Bliese 1998, 354).

ICC is used in data where there are hierarchical data structures. Hierarchical data structures are structures where lower-level units are part of higher-level units (Musca et al. 2011, 1). As an example, the individuals (lower level) are part of rounds (higher level) in the NCP data. There needs to be some extent of ICC to justify using multilevel models. If there is no clustering within groups, it does not make sense to group individuals within higher-level units.

In the European data, I expect country-years to be clustered within countries, and individuals to be clustered within rounds in the Norwegian data.

ICC is measured in percent, on a scale ranging from 0 to 1. Therefore, it is advantageous to adopt traditional conventions to measure effect sizes when interpreting ICC values. A value of .01 constitutes a small effect, a value of .10 constitutes a medium effect, and a value of .25 might be considered a large effect (LeBreton and Senter 2007, 838).

[2] Full autocorrelation tests for the European analysis available in section C in the appendix. Full autocorrelation tests for the Norwegian analysis available in section G in the appendix.

To measure intraclass correlation, I have used the "misty" package from R (Yanagida 2022). This package allows a test of the proportion of the total variance that is explained by the grouping structure. Utilizing this package allows me to check whether there is clustering within groups in the data. If there is no such clustering, the data is not suitable for multilevel models.

In the European analysis, the intraclass correlation is at 0.637 or 63,7%. This means that 63,7% of the variance in concern about climate change between individuals is explained by the grouping structure, which in the European analysis is country-year. This is a large effect and suggests that there is a high level of intraclass correlation in the data. This means that the data is suitable for multilevel modeling.

The intraclass correlation in the Norwegian data is at .726, which means that 72.6% of the variance in the climate concern is explained by the clusters, which in my case are individual-round. Both these results suggest that there is intraclass correlation in the data and that it is beneficial to use multilevel modeling.

### *6.6.3 Multicollinearity*

Multicollinearity can be defined as the linear relationship between two or more variables. If there is multicollinearity in the data, this may cause difficulty with the reliability of the estimates of the parameters of the model. If there is multicollinearity within the model, the signs may be wrong, and they may differ from the signs of correlation between the corresponding explanatory variable and the response variable (Alin 2010, 374).

I have used the model Variance Inflation Factors (VIF) to measure multicollinearity in the models. VIF tests are used to measure the induced collinearity in the effects. Variance inflation factors report how much the variance of the estimated coefficients increase is due to colinear independent variables. Specifically, they report how much of a regressor's variability is explained by the rest of the regressors in the model, due to correlation among those regressors. The variance inflation factor goes from 0 to 100. A rule of thumb when using VIF-tests is that multicollinearity above five might indicate problematic multicollinearity (Craney and Surles 2002, 392). Therefore, I utilize five as a cutoff point in the analysis.

The VIF-test is included to ensure that the results are reliable and not influenced by multicollinearity. For example, in the Norwegian analysis one could hypothesize that the variables "satisfaction with democracy" and "satisfaction with the government" affect each other, which might lead to multicollinearity in the models.

In the full model (model 4), the lagged and normal variables are included together. This is unusual, as one would expect that this would lead to a high degree of multicollinearity as the normal and the lagged variables correlate. There are several reasons why I have chosen to include lagged and non-lagged variables together. The main reason is that it is not given that it is necessary to lag the macro variables. It might be that the effect of the macro variables on climate concern is immediate, but it might also be that the effect only is noticeable after one year. Some of the variables are measured at different times in the year, so it might also be that it is necessary to lag the macro variables for some countries, while it is not necessary for other countries. Even though it is quite unusual, there are several examples of studies that utilize cross-lagged models, which are models where both normal and lagged variables are included (Schuurman, Grasman and Hamaker 2016; Schuurman et al. 2016; Mund and Nestler 2019). The VIF-tests show that there are no problematic levels of multicollinearity in the model which includes both non-lagged and lagged variables. I have also run separate models with non-lagged and lagged variables, and there is no dramatic change in the coefficients from these models to the model which includes both non-lagged and lagged variables. All these factors indicate that the results from the full model are not affected by multicollinearity to a problematic extent.

The VIF-tests show that there are no problematic levels of multicollinearity, with none of the variables reporting a multicollinearity of above 5 [3]. The highest level of multicollinearity in any of the models is in model 9 in the Norwegian analysis, where the party affiliation variable of Høyre report a multicollinearity of 4.556. This is below the cutoff point of 5.

[3] All multicollinearity tests for the Norwegian analysis are available in section D and E in the appendix. All multicollinearity tests for the European analysis are available in section H in the appendix.

# Chapter 7: European Analysis

## 7.1 Structure of the analysis

The subject of the analysis is to discuss which factors that affect climate concern, how climate concern varies between countries, and how concern has changed over time in European countries.

The analysis of the European data is done in two parts. The first part is concerned with answering the two first hypotheses presented in chapter 4; H1 and H2.

Through these hypotheses I seek to answer the first part of the research question, namely: *Which factors influence concern about climate change?*

The analysis begins with explaining how the explanatory variables, which are the variables directly linked to the hypothesis, affect climate concern. The explanatory variables will be used to evaluate H1 and H2.

In the second part of the analysis, I present the effect of the control variables. These are not directly linked to the hypothesis but might help explain variation in climate concern.

The third part of the analysis seeks to answer the second part of the research question, namely: *To what extent does concern vary across countries and over time?* To answer this question, I have utilized three models.

The first model illustrates the differences in the average level of concern between the countries in the dataset. The second model illustrates the average change in concern over time. The third and final model demonstrates the average change in concern over time, both between and within countries. These models will also be used to evaluate H1 and H2.

The results will be discussed briefly in this chapter, and more extensively in chapter 9 of the thesis.

## 7.2 Which factors shape concern?

Table 3 (see below) shows the results for models 1, 2, 3 and 4. Model 1 only includes microvariables, model 2 only includes macrovariables, model 3 includes lagged variables and model 4 includes all the variables. If there are contrasting results between the models, model 4 will be used to test the hypothesis. There are mainly two reasons for this. Firstly, the model

includes the most control variables and is the most robust model. Secondly, AIC is lowest in model 4, which indicates that this model is the best fit for the data.

It is worth noting that BIC is lower in model 2 than in model 4. However, BIC more harshly penalizes more complex models, and since model 4 is a more complex model than model 2, this may to some extent explain this.

**Table 3: Multilevel models with micro, macro, and lagged variables**

| | **Model 1: Microvariables** | | **Model 2: Macrovariables** | | **Model 3: Lagged variables** | | **Model 4: Full model** | |
|---|---|---|---|---|---|---|---|---|
| | Coefficient | SE | Coefficient | SE | Coefficient. | SE | Coefficient | SE |
| *Education* | .131 | .018 | | | | | .016 | .024 |
| *Age* | -.005 | .013 | | | | | .006 | .026 |
| *GDP per capita* | | | -.108 | .128 | | | -.033 | .128 |
| *Unemployment* | | | .034 | 1.278 | | | .452 | 2.150 |
| *Urban population* | | | -.416 | .100 | | | -1.638 | 1.142 |
| *Inflation* | | | .209*** | 1.057 | | | .162*** | .062 |
| *CRI* | | | -.132 | .005 | | | -.224* | .135 |
| *CO2 emmisions* | | | .004 | .129 | | | .068 | .117 |
| *Urban population **(L1)*** | | | | | 1.297* | .516 | -.517*** | .092 |
| *CO2-emissions **(L1)*** | | | | | -.156*** | .051 | .069*** | .013 |
| *Unemployment **L(1)*** | | | | | -1.235 | .966 | 1.467* | .594 |
| *GDP per capita **L(1)*** | | | | | -.140* | .740 | -.153** | .061 |
| *Inflation **L(1)*** | | | | | -.068 | .064 | .246 | 1.890 |
| *Year* | | | | | | | -.517*** | .092 |
| *Year^2* | | | | | | | .069** | .013 |
| $\sigma^2$ | .229 | .479 | .214 | .462 | .220 | .470 | .220 | .470 |
| *Intercept* | 7.376*** | .816 | 6.731 | .061 | 7.117 | .426 | 6.977 | .064 |
| *AIC* | 244.180 | | 191.793 | | 239.203 | | 188.643 | |
| *BIC* | 254.129 | | 220.771 | | 252.491 | | 232.432 | |
| *ICC* | .637 | | .689 | | .690 | | .831 | |
| *Log likelihood* | -85.986 | | -1447.41 | | -78.332 | | -78.332 | |
| *Observations* | 156 | | 156 | | 156 | | 156 | |
| *Number of groups.* | 26 | | 26 | | 26 | | 26 | |

*Notes*: Results from multilevel model with fixed effects, where countries are defined as the upper level (n=26) and country-years defined as the lower level (n=156). Coefficients and standard errors displayed; ***p<.001, **p<.05, *p<.01. The significance-level used in the model is at 10%. Source: Eurobarometer 2022, Eurostat 2022, Worldbank 2022, Eckstein et al. 2021.

## 7.3 Explanatory variables

### *7.3.1 Introduction*

The explanatory variables are the variables directly linked to the hypothesis presented at the end of chapter 4. The first hypothesis (H1) states that: *Higher climate vulnerability will lead to an increase in concern about climate change.*

The climate vulnerability variable (CRI) will be used to test this hypothesis. Based on the literature presented in chapter 3, I expect that higher climate vulnerability leads to increased climate concern.

The second hypothesis (H2) states that: *The financial crisis led to decreased concern about climate change.* This hypothesis will be evaluated based on whether climate concern increased as the impacts of the financial crisis became clear and decreased as the effects wore off. This hypothesis will be evaluated based on change in concern on the country-level over time. This will be presented in part 7.6 of this chapter. Even though the results from table 3 does not directly answer H2, some of the variables might give an indication as to whether the hypothesis is correct.

The first variable that might indicate whether H2 is correct, is the GDP per capita variable. If the financial crisis led to a decrease in concern, it is natural to assume that there would be a positive relationship between GDP per capita and climate concern, where a decrease in GDP per capita lead to a decrease in climate concern and vice versa.

The second variable used to evaluate whether the financial crisis led to decreased concern about climate change, is inflation. One would expect that increased inflation might suggest increased economic instability. This increased economic instability might in turn lead to decreased climate concern. It is also natural to assume that the economic instability increased following the financial crisis.

The third variable used to evaluate H2 is unemployment. The expectation is that the financial crisis led to increased unemployment, which in turn, based on the research presented in chapters 3 and 4 and the finite pool of worry theory, led to increased climate concern. Therefore, I expect a positive relationship between unemployment and climate concern.

*7.3.2 The effect of climate vulnerability*

Model 2, which only includes macro variables, shows no clear connection between the climate vulnerability of a country and the concern about climate change among the inhabitants of that country.

In model 4, which includes all the variables, climate vulnerability has a negative effect. However, in this model, the variable is significant at a 10% - level, which is the significance level used in the model. Lower scores on the climate vulnerability index, indicates higher climate vulnerability. The results from model 4 therefore suggest that the level of concern is higher in countries more vulnerable to climate change. These results are consistent with previous research (Zahran et al. 2006; Bullard and Wright 1993; Drori and Yuchtman-Yaar 2002; Blake 2001; Whitmarsh 2005).

Given that the variable is not significant in model 2, the result gives no unequivocal support for the notion that higher climate vulnerability leads to increased concern. The analysis shows that the variable becomes significant in model 4. Since I use model 4 to evaluate the hypothesis, the results give some support for H1, and indicate that higher climate vulnerability in a country will lead to increased climate concern.

*7.3.3 The effect of GDP per capita*

The normal (non-lagged) GDP per capita variable is not significant in any of the models where the variable is included. This suggest that there is no immediate correlation between GDP per capita and the perceived seriousness of climate change.

Model 3 shows the lagged effect of GDP per capita. Here, the variable is significant and negative. The results indicate that an increase in GDP per capita in year 1 leads to a decrease in climate concern in year 2 – or in other words – that increased wealth gives less worry about climate change a year later. The variable is also negative and significant in model 4.

The results are consistent with Hanno Sandvik's research, that found that public concern over global warming negatively correlates with national wealth (Sandvik 2008, 333). The results are also consistent with a study from 2015 (Lo and Chow 2015,1). One possible explanation for the results is that richer countries have a greater capacity to engage in climate adaptation. This might lead to the overall level of concern decreasing in these countries. However, the results stand in contrast to other previous research that has found that a decrease in GDP per capita leads to decreased concern (Knight 2016, 103). It is worth noting that all these studies

investigate the immediate effect of such changes in GDP per capita on climate concern, not the lagged effect.

The results might seem to contrast the expectation presented in H2, namely that the financial crisis led to decreased concern about climate change. It is natural to assume that if the financial crisis led to a decrease in concern, one would also observe that a reduction in GDP per capita led to decreased concern. Based on the "finite pool of worry" theory, the expectation would be that as worry about the economy increased due to the financial crisis, climate concern decreased. My results suggest that the normal GDP per capita variable is insignificant and that the effect goes the opposite way when the variable is lagged by one year. However, the "finite pool of worry" also states that "external shocks" leads to decreased climate concern. It might be that it is the "shock" of a global event like the financial crisis in itself that leads to decreased concern, not the reduction in GDP per capita.

*7.3.4 The effect of inflation*

The results from model 2 indicates that a rise in inflation leads to increased climate change concern. The variable is significant at every level.

The normal inflation variable has a significant positive effect on climate concern also in model 4. The effect of inflation is smaller in model 4 than in model 2, but the change is quite marginal.

Given that increased inflation might lead to increased economic instability in some instances, the results might suggest that climate concern is higher in financially unstable countries.

However, when measuring the lagged inflation variable, I find no significant effect of the variable at any level. This is the same both in model 3 and 4. The results contradicts the theory that there is a significant negative correlation between inflation and concern about climate change (Panarello 2021, 2). The significance of the normal inflation variable indicates that inflation has an immediate negative effect on climate concern. But the insignificance of the lagged inflation variable suggests that the variable has no time-delayed effect.

*7.3.5 The effect of unemployment*

The normal unemployment variable is not significant at any level in either model 2 or model 4.

Neither the lagged unemployment variable is significant in any of the models where it is included. These findings are in contrast to Bengal's findings that there is a significant negative relationship between unemployment and concern about global warming (Bengal 2017, 305).

The results of both the normal and lagged unemployment variable indicate that unemployment does not affect concern about climate change. This somewhat weakens H2. The expectation presented in H2 is that the financial crisis, which in turn would give rise to an increase in unemployment, would lead to decreased climate concern. The results find no support for this mechanism.

### 7.4 Control variables

Education, age, percentage of urban population in a country and CO2 emissions per capita are included as control variables. These variables are not directly linked to the hypotheses. However, this does not mean that these variables are unimportant. They are included based on previous research, accounted for in chapters 3 and 4 in the thesis, which has found that these variables might influence climate concern. These variables might therefore help explain the research question, even though they are not directly linked to the hypotheses. They are also included to test whether the effects of the explanatory variables are significant when controlling for other factors.

The two micro variables included in the analysis are age and education. None of these variables are significant at any level. The main reason why the education variable is not significant, might be because of a measurement error. As previously mentioned, it should ideally have been measured as "highest level of education attained", instead of the age at which one finished one's education.

The results do not substantiate previous research that has suggested that there is a positive correlation between education and climate concern (Running 2012, 78).

The age variable is not significant at any level in any model. The results diverge from a previous study by Cvetkovic and Grbic, that found a positive correlation between age and concern about global warming (Cvetkovic and Grbic 2021, 50).

The normal CO2 emission per capita variable is not significant in any of the models. The effect is quite stable across the models, with the change in coefficient being quite small from model 2 to model 4. The results indicate that there is no immediate correlation between the level of CO2 emissions per capita in a country and climate concern. This stands in contrast to findings from a 2018 study which found a positive relationship between CO2 emissions and the perceived seriousness of global warming in a country (Luis et al. 2018, 74).

The lagged CO2 emissions per capita variable is significant in model 3. The results show that – somewhat surprisingly – a rise in CO2 emissions in year 1 leads to a decrease in climate concern in year 2.

The lagged CO2 variable is also significant and negative in model 4. The results from models 3 and 4 indicate that CO2 emissions per capita do not have an immediate effect, but that the effect becomes noticeable after a year. The results are consistent with the research done by Luis et al., which found that as CO2 emissions in a country rise, the perceived seriousness of global warming increases (Luis et al. 2018, 74).

The normal urban population variable is neither significant in model 2 nor in model 4. The results suggest that the number of people living in urban areas has no immediate correlation with climate concern. The results do not match the findings by Hamilton and Keim that there is a significant positive relationship between the percentage of people living in urban areas and the perceived seriousness of global warming (Hamilton and Keim 2009, 2348).

In model 3, the lagged urban population variable has a positive effect on the dependent variable and is significant. This suggests that there is a positive relationship between the share of people living in urban areas in a country and the perceived seriousness of global warming.

The lagged urban population variable is also significant in model 4. This is consistent with the results from model 3. However, while the variable had a positive effect on climate concern in model 3, the variable has a negative effect in model 4. The results suggest that as urbanization increases, climate concern decreases. The results indicate that urban population has no immediate effect on climate concern, but that it does have a delayed effect. It is nonetheless hard to say if the relationship is positive or negative, given the differing results in models 3 and 4. The results are consistent with the aforementioned study by Hamilton and Keim (2009, 2348).

### 7.5 The effect of time

In the full model (model 4), a year variable and a year^2 variable is included. These are not explanatory or control variables, but rather variables to measure how concern has changed over time. The year variable is negative and significant. This indicates that the dependent variable has a negative trend over time and that concern about climate change has decreased from 2008 to 2017.

Based on the finite pool of worry, I expect a U-shaped relationship between time and concern about climate change. To measure the quadratic relationship between time and concern, year^2 is included in the model. Year^2 has a coefficient of .069 and is significant at every level. The year-variable changes from being negative when not squared to positive when squared. This suggests that while there is a negative relationship between time and concern, the relationship is not linear, and the quadratic relationship between year and concern is positive.

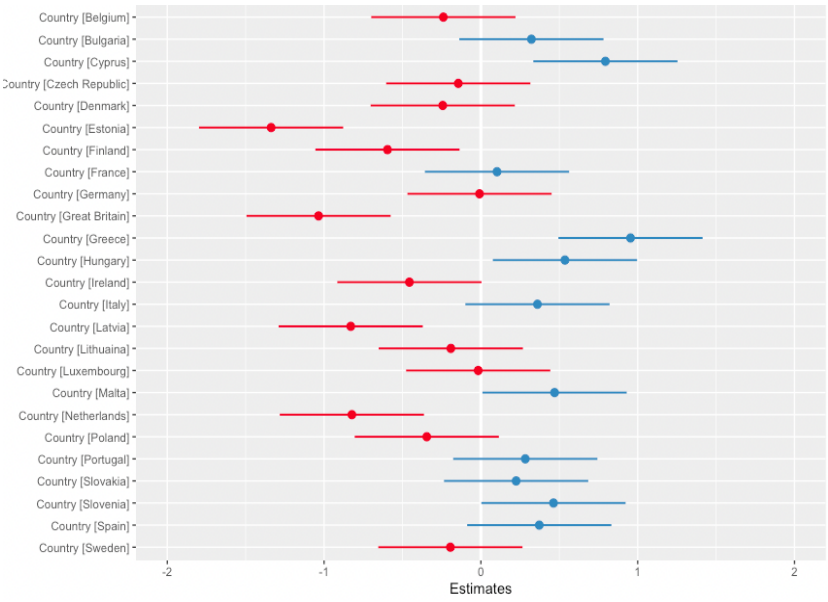
## 7.6 Concern over time and between countries

### *7.6.1 Introduction*

The countries chosen are all European countries. There are several reasons why I have looked at European countries. Firstly, and perhaps the most important reason, is that more data is available for these countries, making the construction of a TSCS data set possible. The construction of a TSCS dataset allows me to analyze changes in concern over time and between countries. Secondly, European countries are similar with regard to several background variables. This might help rule out alternative explanations.

*7.6.2 Average country-level concern*

**Figure 1: Predicted concern in each country**




*Notes:* Results from OLS model. (N = 156). Coefficients and standard errors are displayed. Austria used as the reference country. The dots in the model represents coefficients, while the lines represent confidence intervals. Blue lines indicate positive values and red negative values. Full model estimates available in section A in the appendix. 10%-significance level used. Source: Eurobarometer 2022, Eurostat 2022, Worldbank 2022.

Figure 1 displays the differences in concern between the countries in the Eurobarometer dataset. Several of the country effects are insignificant. A total of 15 of the 26 (57,6%) of the countries are not significant at any level. Four of the countries are significant at a 10%-level, while six of the countries are significant at every level.

The differences between some of the countries in the dataset are quite striking. The largest difference in concern is between Greece, where predicted concern is highest and Great Britain where the predicted level of concern based on the model is lowest. Predicted concern is 22.85% higher in Greece than in Great Britain[4].

Previous research has found a positive relationship between climate change vulnerability in a country and increased concern (Zahran et al. 2005, 771). Based on this, the expectation presented in H1 was that concern would be higher in countries more vulnerable to climate

[4] Exact coefficients for each country are available in section A in the appendix.

change. Apart from Slovenia and Hungary, the results paint a clear picture. Concern is high in islands and Mediterranean countries like Cyprus, Greece, and Malta, while it is lower in Northern and Baltic countries like Estonia, Finland, Netherland, and Latvia. This indicates that the results to some extent strengthens H1.

This effect is especially clear in Cyprus and Greece. These are the two countries where the predicted level of concern is highest. Both countries are located by the Mediterranean Sea and are more prone to the effects of climate change. Cyprus also suffers from water shortage, and the effects of drought are more dire here than in other European countries (Nachmani 2000, 76). These findings are consistent with the findings in model 4, which showed that concern about climate change is higher in countries more vulnerable to the impacts of climate change.

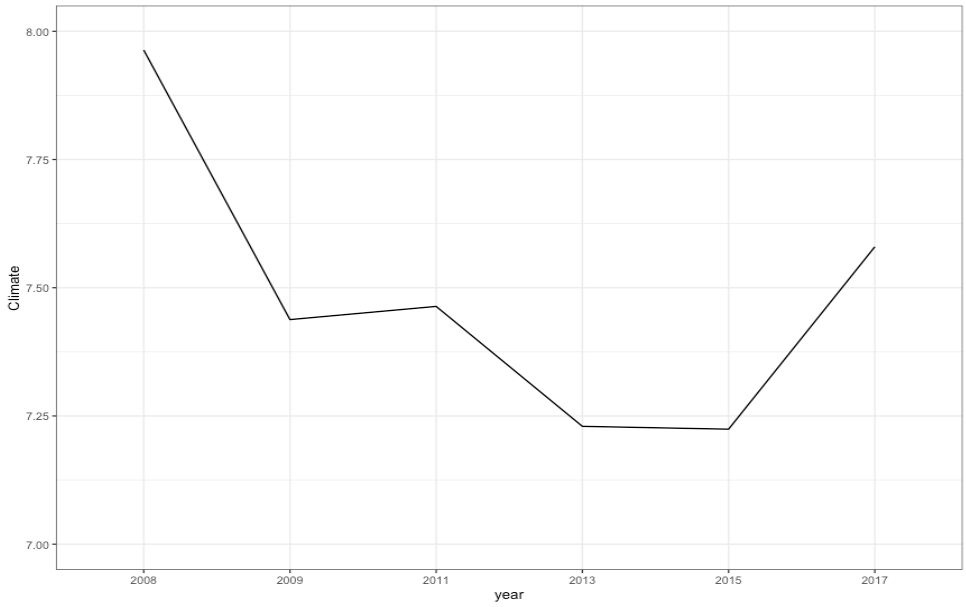
However, not all the results in the model support the theory that vulnerability to climate change leads to increased worry. The Netherlands is extremely prone to the consequences of rising sea levels, with most of the country being flat and one-third of the country located below average sea level (Egmond 2019, 1). In the global climate risk index developed by Germanwatch, which looks at which countries are most prone to climate change, the Netherlands ranks 7$^{th}$ out of the 26 countries included in my data (Eckstein et al. 2021, 41). Despite this, concern in the Netherland is among the lowest in the dataset. Denmark, another country prone to climate change, also reports insignificant results, even though Denmark ranks 10$^{th}$ in the global climate risk index.

There are several possible explanations for the lack of perceived seriousness in the Netherlands and Denmark. Both countries are relatively wealthy, with financial resources that might mitigate the consequences of climate change. In the case of the Netherlands, another explanation might be that they are used to the threats from rising sea levels. Water governing boards are regional governing bodies responsible for the administration of surface water in the environment. They were among the first democratic institution in the Netherlands. This illustrates the Netherlands' long experience with environmental concern (VanKoningsveld et al. 2008, 367).

Overall, with some notable exceptions, the findings seem to lend support to H1. Concern seems to be higher in countries more vulnerable to climate change.

*7.6.3 Change in concern over time*

**Figure 2: Yearly change in climate concern**




*Notes:* Yearly average change in climate concern in the countries included in the analysis. (N=156). Average concern for each year displayed. X-axis represents year, while Y-axis average level of climate concern. Full model estimates available in section B of the appendix. *Source: Eurobarometer 2022, Eurostat 2022, Worldbank 2022.*

Figure 2 illustrates change over time in climate concern. Figure 1 gives a broad overview of the average level of concern in each country, but to fully understand climate concern it is necessary to model how it changes over time. This is because climate concern is not a constant phenomenon, and the level of concern fluctuates over time.

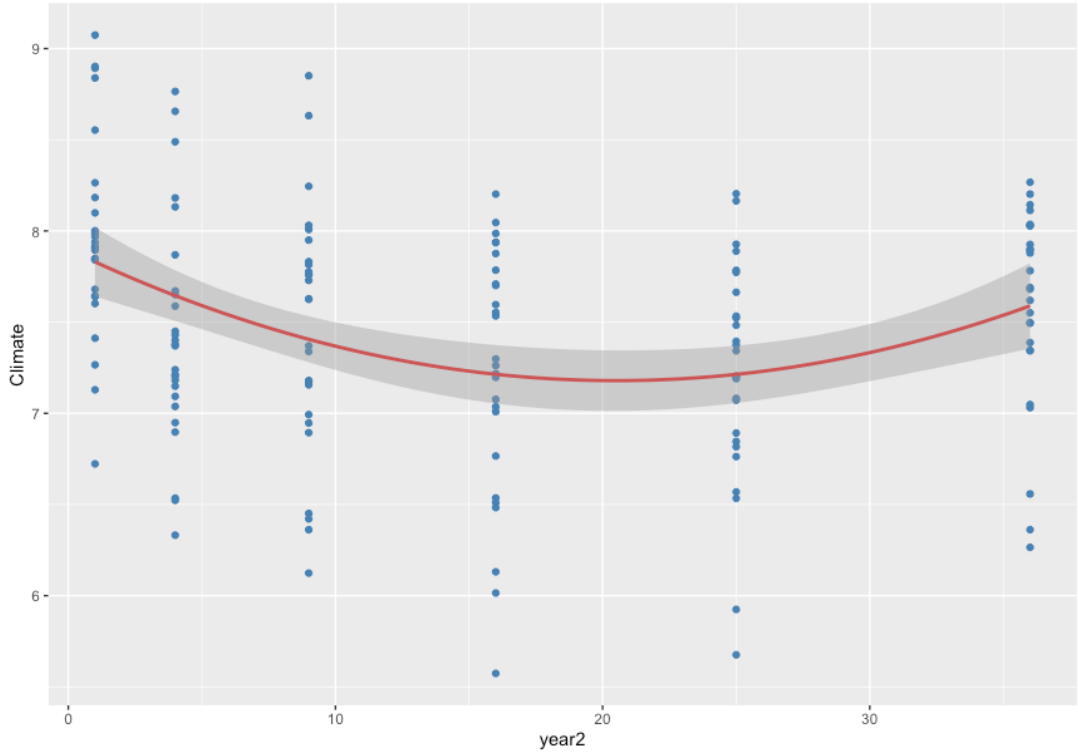
The figure shows that concern peaked in 2008. There was a large decrease in concern from 2008 to 2013. Thereafter, it decreased slightly from 2013 to 2015, reaching its bottom point in 2015, followed by a subsequent increase from 2015 to 2017[5]. The figure illustrates that there is a U-shaped relationship between time and concern on the aggregate level in this period. The results support the theory that the global financial crisis and the European debt crisis had a negative effect on concern about global warming. The trend indicates that concern decreased in the periods where the financial and European debt crisis were most harshly felt and increased as the effects of these crises wore off.

[5] Exact coefficients for each year are available in section B in the appendix.

It is interesting to note that these results contradict the findings in models 3 and 4 that showed that higher GDP per capita led to decreased concern. One possible explanation for the results, is that it was not the economic consequences of the financial crisis that lead to decrease in concern, but rather that one crisis overshadowed another crisis and took up space in the respondent's mind.

It is worth noting that alternative explanations might explain the development in concern. One possible explanation for the large decrease which started in 2008, is that the average climate concern was 7.963 in 2008. This is quite high on a 10-point scale. Therefore, some of the reduction might be explained by the high starting point in concern.

**Figure 3: Quadratic relationship between time and concern**



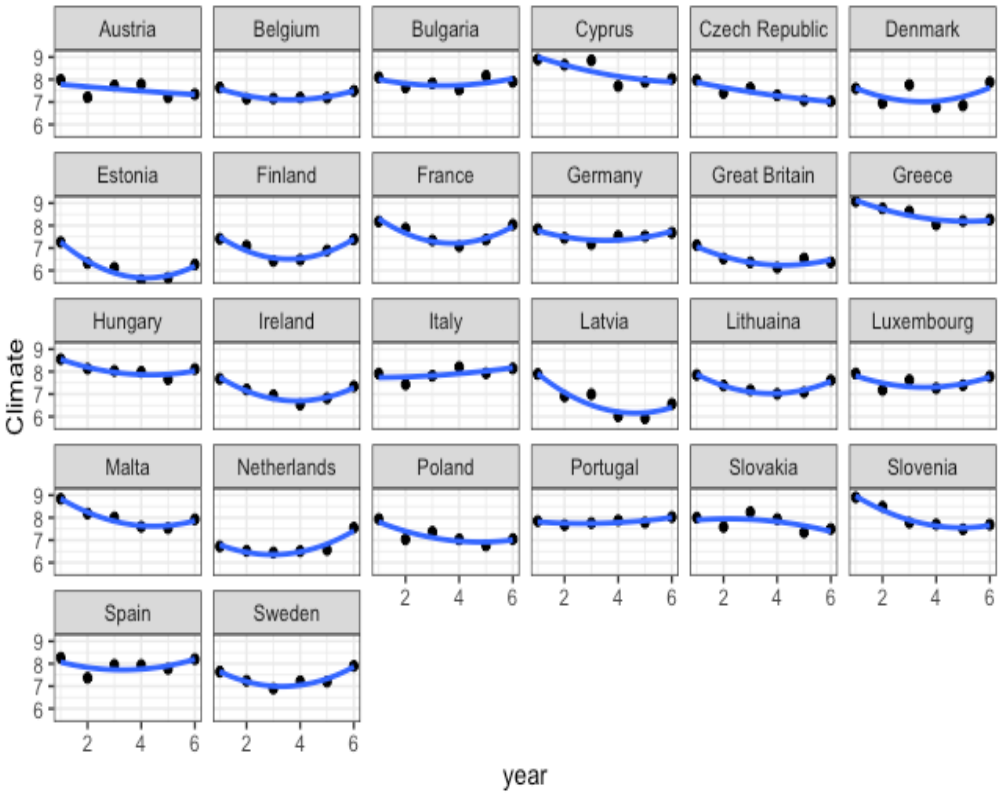

*Notes:* Results from the quadratic model. Year^2 is represented by the X-axis. Concern about climate is represented by the Y-axis. The blue dots represent the different countries. Source: Eurobarometer 2022, Eurostat 2022, Worldbank 2022.

To illustrate the trend observed in figure 2, I have included a model where year is used as a quadratic term. As one can see from figure 3, the U-shaped regression line is a better fit for the model than a linear regression line. This further underlines the notion that there is not a linear relationship between time and concern but that there instead is a U-shaped relationship.

The trends observed in figures 2 and 3, strengthen H2. The figures show that climate concern on the aggregate level decreased following the financial and European debt crises and increased only as the effects of the crises subsided. In the next part of the chapter, I will investigate whether this trend also is present on the national level.

*7.6.4 Average country-level concern over time*

**Figure 4: Yearly change in concern over time for each country**




Yearly change in concern over time for each country in the dataset. Figure based on multilevel model with fixed effect. X-axis represents year, while the Y-axis represents average level of concern.

As already mentioned, Figure 1 gives a broad overview of average concern in the countries included in the dataset, while Figures 2 and 3 shows the development of concern over time. But to capture the full extent of the variation in climate concern, it is necessary to model both how concern changes over time between countries and how concern varies over time within each country. This is illustrated by figure 4.

Figure 4 shows that there has been a decrease in climate concern from 2008 to 2017. This is consistent with the results from figure 2. In 21 of the 26 countries, (81%), climate concern decreased from 2008 to 2017. Concern only increased in 5 of the 26 countries in the dataset.

Figure 4, like figures 2 and 3 show that there has been a clear U-shaped development in concern over time. Year is included as a quadratic term in figure 4, and the figure show that 80.7% of the countries  in the dataset display a more U-shaped development – a quadratic relationship.

Even though figure 4 illustrates that there was a decrease in concern following the financial crisis, the results do not seem to indicate that the U-shaped development was more pronounced in countries like Greece, Cyprus, Spain, Ireland, and Italy which were among the countries most impacted by the financial crisis.

Overall, the result in figure 4 lend support to H2. Concern seems to have decreased on the country-level following the financial crisis.

# Chapter 8: Norwegian analysis

## 8.1 Structure of the analysis

The analysis of the Norwegian data is done in two parts. In the first part, I present results that seek to answer the research question; *Which factors influence concern about climate change?* To shed light on this, I have used four models. The first model demonstrates how the control variables influence climate concern. The second model illustrates the regional differences in climate concern in Norway. The third model analysis how party affiliation influences climate concern. In the fourth and final model, all the variables are included together.

The analysis begins with a description of how the explanatory variables affect climate concern. Party affiliation will be used to evaluate H4: *There is a clear left-right divide in concern about climate change in Norway, with left-wing voters displaying higher levels of concern.*

I then describe how the control variables affect climate concern.

In the second part of the analysis, I seek to answer the next research question, namely "*To what extent does concern vary over time?"*. To answer this, I will present a model which displays how climate concern have developed over time in Norway.

The results from this model will be used to evaluate H3: *The coronavirus pandemic led to decreased concern about climate change in Norway.*

The results will be discussed to some extent, but the discussion will be elaborated on in chapter 9 of the thesis.

## 8.2 Which factors shape climate concern in Norway

Table 4 (see below) shows the results for models 4, 5, 6 and 7. Model 4 includes control variables, model 5 includes county variables, model 6 includes party variables and model 7 is the full model which includes all variables. Model 7 will be used to evaluate the hypothesis. This is because this model has the lowest AIC, which indicates the best model fit. The model also includes all variables, which makes the results from the model more robust.

**Table 4: Multilevel models with control, county, and party variables**

| | **Model 4: Control variables** | | **Model 5: County variables** | | **Model 6: Party variables** | | **Model 7: Full model** | |
|---|---|---|---|---|---|---|---|---|
| | Coefficient | SE | Coefficient | SE | Coefficient. | SE | Coefficient | SE |
| *Round* | -.004 | .018 | | | | | -.002*** | .001 |
| *Female* | .336*** | .014 | | | | | .298*** | .014 |
| *Education* | .035*** | .002 | | | | | .028 | .002 |
| *Economy* | .014*** | .004 | | | | | .007 | .004 |
| *Democracy* | .142*** | .006 | | | | | .123*** | .006 |
| *Government* | .126** | .005 | | | | | -.091 | .005 |
| *Date of birth* | .034*** | .004 | | | | | .015*** | .004 |
| *Viken* | | | .021 | .028 | | | .177 | .290 |
| *Oslo* | | | .267*** | .030 | | | .298 | .256 |
| *Vestfold og Telemark* | | | -.008 | .036 | | | .120 | .222 |
| *Innlandet* | | | -.026 | .037 | | | .070 | .188 |
| *Agder* | | | -.112*** | .040 | | | -.003 | .154 |
| *Rogaland* | | | -.150*** | .036 | | | -.033 | .119 |
| *Vestland* | | | .047 | .031 | | | .099 | .085 |
| *Møre og Romsdal* | | | -.116*** | .043 | | | -.023 | .059 |
| *Trøndelag* | | | -.069 | .028 | | | -.035 | .066 |
| *Nordland* | | | -.038 | .042 | | | -.023 | .045 |
| *Troms og Finmark* | | | -.042 | .042 | | | -.031 | .058 |
| *AP* | | | | | .376*** | .032 | .137*** | .048 |
| *SV* | | | | | .683*** | .035 | .405*** | .088 |
| *FrP* | | | | | -.169*** | .037 | -.318*** | .112 |
| *Høyre* | | | | | .070** | .032 | -.139 | .124 |
| *SP* | | | | | .126*** | .033 | -.102 | .124 |
| *KrF* | | | | | .307*** | .032 | -.011 | .137 |
| *Venstre* | | | | | .480*** | .039 | .233** | .101 |
| *Rødt* | | | | | .617*** | .042 | .372*** | .043 |
| *MdG* | | | | | .839*** | .047 | .714*** | .064 |
| $\sigma^2$ | .567 | .710 | .610 | .817 | .714 | .895 | .594 | .770 |
| *Intercept* | 2.289*** | .046 | 6.731 | .061 | 7.117 | .426 | 6.977 | .064 |
| *AIC* | 97.517 | | 99.215 | | 93.340 | | 91.467 | |
| *BIC* | 87.602 | | 99.326 | | 93.575 | | 96.051 | |
| *ICC* | .669 | | .732 | | .690 | | .666 | |
| *Log likelihood* | -47.746 | | -49.594 | | -46.698 | | -47.866 | |
| *Observations* | *36 523* | | *36 523* | | *36 523* | | *36 523* | |
| *Number of groups.* | *18 650* | | *18 650* | | *18 650* | | *18 650* | |

*Notes:* Results from multivariate multilevel model, with observations defined as the lower level (n=36 523) and individual respondents defined as the upper level (n=18 650). Coefficients displayed and standard errors displayed. *** p<0.001, ** p<0.01, * p<0.05. Significance level used in the model is 5%. "did not answer" used as the reference category in model 3. Source: Norwegian citizen Panel 2022

## 8.3 Explanatory variables

### *8.3.1 Introduction*

The explanatory variables are variables linked directly to the hypothesis presented in chapter 4. The hypothesis that will be tested with models 4, 5, 6 and 7 are H4. The hypothesis states that: *There is a clear left-right divide in concern about climate change in Norway, with left-wing voters displaying higher levels of concern.*

The party affiliation variables will be used to test this hypothesis. Based on previous literature (Aasen 2017; Gregersen 2022), I expect respondents with a party affiliation to left-wing parties to display higher levels of climate concern. To measure party affiliation, political party[6] variables are used.

### *8.3.2 The effect of party affiliation*

In model 6, which only includes party variables, all the variables are significant. In model 7, the effect of party affiliation to Høyre, Kristelig Folkeparti (KrF) and Senterpartiet (SP) are insignificant, while the rest of the variables are significant. The results show that climate concern varies significantly based on the respondent's party affiliation.

In both models, voters from Miljøpartiet de Grønne (MdG) display the highest levels of concern. The results are unsurprising, as MdG is a green party with climate mitigation policies as their primary political cause.

The two other Norwegian parties, considered green parties, are Sosialistisk Venstreparti (SV) and Venstre. SV-voters report the second-highest level of concern in both models 6 and 7, while Venstre voters report the fourth-highest level of concern in both models. These results are consistent with previous research (Gregersen 2022).

The results are hardly surprising, given that Venstre, SV, and MdG are the three clearest examples of green parties in Norway. The theoretical expectation would be that these parties had the most worried constituencies. This is true for SV and MdG, but not for Venstre. Rødt-voters were the third most concerned about climate change.

[6] The party variables are based on data from the Norwegian citizen panel. Only parties represented in Stortinget in the time period from 2013 – 2022 are included in the analysis.

On the other end of the scale, Fremskrittspartiet (FrP) voters are the least worried about climate change, while Høyre voters are the second least concerned. This is true for both models.

In all the models, the results paint a clear picture. Left-wing voters display higher levels of concern, with MdG, SV, and Rødt voters exhibiting the highest levels of concern. In comparison, right-wing voters show lower levels of concern, with Høyre and FrP voters being the least concerned. Even though MdG does not belong to any of the traditional left-right coalitions in Norwegian politics, a case can be made that they are more to the left than to the right. This is exemplified by the fact that they before the 2021 election made it clear that they would rather govern together with a left-wing government than with a right-wing government (Aftenposten 2020).

It is noticeable that all party variables are significant in model 6, and that only Høyre, KrF and Sp show insignificant results in model 7. In comparison, only 4 of 11 county variables are significant in model 5, and none of the county variables are significant in model 7. Given this, as well as the relatively large differences in concern based on party affiliation, the results suggest that climate concern in Norway to a large extent is explained by ideological differences. The fact that the majority of the party variables are significant indicates that the voters for a party are quite homogenous in their preferences.

It can be hard to interpret the direction of the relationship between concern and party affiliation. On the one hand, party affiliation might affect the concern. As an example, if climate mitigation policies became a prominent FrP-policy, this might lead to increased concern by existing FrP-voters.

On the other hand, it might be that it is not party affiliation that affects climate concern, but rather that such concern affects party affiliation. The more concerned a person is, the more likely he/she is to vote for a green or a left-wing party. In other words , it could be that a person is worried about the climate, not because he votes for MdG, but rather that he votes for MdG because he is concerned about climate change. Given that the effect might go both ways, it is necessary to show a bit of caution when interpreting the results.

The Satisfaction with the government variable might also be used to test whether there is an ideological divide. The variable is positive and significant in model 4. The results imply that individuals who are more satisfied with the government are less concerned about climate change. The results are – at first glance – somewhat surprising, given that there is a significant

positive relationship between satisfaction with democracy and worry about the climate. One would expect some degree of correlation between these two variables[7]. One explanation for this could be that the data is measured between 2013 and 2022. Between 2013 and 2021, there was a conservative government in Norway. Therefore, it is natural to assume that voters on the right side of the political spectrum would display higher satisfaction with the government. Both previous research (Gregersen 2022; Krange, Kaltenborn and Hultman 2019; Austgulen and Stø 2013) and the results from my analysis show that there is a clear ideological divide in climate concern, with conservative voters displaying less concern about climate change. Most likely, the results would have looked different if the data had been measured in a period where left wing/green parties had been in Government. It seems reasonable to assume that the happier with such a government the respondents had been, the more concerned about climate change they had also been.

Satisfaction with the government is insignificant in model 7. One explanation for this might be due to the inclusion of parties in model 7. It might be that satisfaction with the government is determined by party affiliation and that this in turn leads to the variable becoming insignificant when adding the party variables.

The results strengthen H4 and indicate that there is a clear left-right divide in concern about climate change in Norway, with left-wing voters displaying higher levels of concern. The results indicate that ideology seems to play a large role in influencing climate concern in Norway.

## 8.4 Control variables

### *8.4.1 Introduction*

The control variables are included based on the literature presented in chapter 3. The control variables are split into two groups. The first group include county variables (model 5). The second group contains factors presented in chapter 3 which might influence climate concern, these are included in model 4.

[7] Even though one could expect some correlation between the variables, the VIF test presented in appendix H indicate that this is not case. Satisfaction with the government has a VIF value of 1.108 and satisfaction with democracy a value of 1.093. Both are well below the cutoff point of 5.

*8.4.2 The regional effect*

Model 5 displays the regional variances in concern in Norway. To measure this, counties[8] are used as variables.

7 of the 11 county variables report insignificant results. Only the results from Rogaland, Oslo, Møre og Romsdal and Agder are significant. The average level of climate concern is highest in Oslo, and Oslo is somewhat of an outlier in the analysis. The average concern in Oslo is 4,4% higher than in Vestland, which has the second-highest level of climate worry. The concern is 3.9% higher in Vestland than in Rogaland, which is the county with the lowest level of average concern. This means that the difference in concern is larger from the most worried county to the second most worried county, than from the second most worried county to the least worried county.

The biggest difference in concern in model 5 is between Oslo and Rogaland, with the average level of concern being 8.3% higher in Oslo than in Rogaland. That Rogaland is the county with the lowest average climate change concern might be explained by the fact that the county in many ways is the home of the Norwegian oil industry (E24 2022).

Previous research (Hamilton and Keim 2009, 2348), has shown that climate concern is higher in urban areas. That Oslo reports the highest levels of concern in model 5 are consistent with these findings

It is also noticeable that MdG got 15.3% of the votes in Oslo in the county elections in 2019 and 8.1% of the votes in the county elections in 2015. In both instances, this was by far their highest percentage in any county in Norway (Statistisk sentralbyrå 2022). For comparison, MdG only got 7.1% of the votes in Vestland in 2019, the county where the level of concern was second highest. Therefore, the results also suggest – not surprisingly – that there is a positive relationship between concern about climate change and the level of support for green parties. This is in line with the effects observed in the models 6 and 7.

It is worth noting that these results might be explained by factors other than regional variation. As an example, Oslo is the county with the highest average educational level (SSB 2022). Previous research has found that education is positively correlated with climate concern (Crona

[8] The counties used in the analysis are the counties that came as a consequence of the regional reform in Norway. In the rounds where the old counties are used, the counties which were merged following the regional reform are merged in the dataset to get an average score on climate concern.

et al. 2013; Running 2013; Knight 2016). This means that the results could be explained by a factor like educational level rather than the county in itself. As I will come back to, the results from model 4 show that education level has a significant effect on climate concern in Norway.

In model 7, When adding the party and control variables, the effect of the county variables loses its significance. Oslo is still the county with the highest positive coefficient; however, these results have gone from being significant in model 7 to insignificant in the full model. This means that the effect of regional variance disappears when adding the explanatory and party variables. This might suggest that other factors have a larger influence on climate concern than where in Norway you live.

### *8.4.3 Effect of control variables*

Model 4 includes the rest of the control variables. These variables include gender[9], education, age[10], satisfaction with the government, satisfaction with democracy and satisfaction with the economy. These are all micro variables measured at the individual level. There is also included a time variable (round) in model 4. All these variables are also included in the full model (model 7).

Gender is positive and significant in both models, showing that females are more concerned about climate change than men. The results are consistent with previous research on the field (McCright 2010, 66).

The education variable is positive and significant in model 4, showing that individuals with a higher education level are more concerned about climate change.

When adding the rest of the variables, the effect of education disappears, and the education variable are insignificant in model 7. This indicate that other factors have a bigger impact on climate concern in Norway. The insignificance of education is in contrast to previous research (Hamilton 2011; McCright 2011; Gregersen 2020).

[9] Gender is coded as female to make the interpretation of the results more logical. Female is coded as 1, which means that a positive coefficient indicates that female is more concerned about climate.
[10] Age is coded as date of birth to make the interpretation of the results more logical. The variable is not measured as "how old are you" but rather as "which year where you born" this means that a positive coefficient means that younger people are more concerned about climate change.

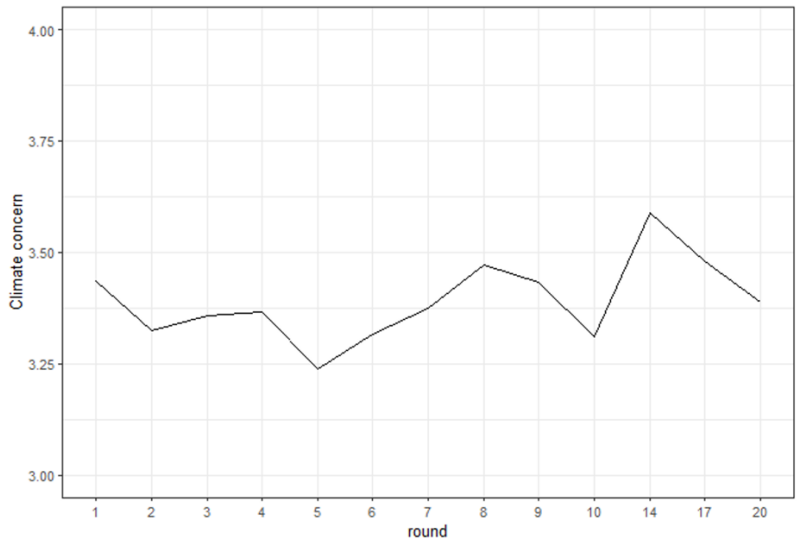
The age variable is positive and significant in both model 4 and 7. This indicates that younger people are more concerned about climate change than older. The results are consistent with previous research (Cvetkovic and Grbic, 2020; Shi et al. 2016; Zaval et al. 2014).

Individuals who are more satisfied with the Norwegian democracy have higher levels of concern about climate change according to the analysis. The variable is significant in both models 4 and 7. Previous studies have found that dissatisfaction with democracy may explain some of the rise in right-wing populism in the 2010s (Duijndam and van Beukering 2020, 353). Given that supporters of right-wing populism tend to be more skeptical of climate change (Lockwood 2018, 712), the results could therefore be seen as further evidence of the ideological divide on climate change.

The final control variable is economy, which is measured as satisfaction with the Norwegian economy. The variable is positive and significant. The results are in contrast to previous research from Norway, which found no correlation between satisfaction with the economy and climate change (Aasen 2017, 230). Also, research from Sweden found no clear correlation between concern and the economic situation in that country (Harring et al. 2011, 388). However, in model 7 the variable is insignificant.

### 8.5 Changes in concern over time

**Figure 5: Changes in concern over time**




*Notes:* Change in climate concern over time. Round is represented by the X-axis, while climate concern is represented by the Y-axis. Figure based on multilevel model with fixed effects. Full coefficient estimates available in section F in the appendix. Source: Norwegian citizen panel 2022. 5%-significance level used.

Figure 5 illustrates the change in climate concern over time in Norway. Each round represents a unique time point, starting with round 1, measured in 2013, and ending with round 20, measured in 2021. There are six months between each round.

9 of the 12 rounds display some level of significance[11]. Of these are five significant at every level, two significant at a 5%-level, and one significant at a 10%-level. 3 of the 12 rounds are not significant at any level. This illustrates that change over time seems to affect concern.

Figure 5 illustrates that climate concern is quite stable and it is hard to identify a clear trend. Concern does not change much from round to round, and the overall picture seems to be one of a stable level of concern.

Even though the changes over time are small, there are some changes. Climate concern is highest in round 14 (2019), while it is lowest in round 5 (2015). The average level of concern is 10.84% higher in round 14 than in round 5. Overall, climate concern varies from 3.239 at its lowest to 3.59 at its highest. Given that the dependent variable is measured on a 5-point scale, this indicates that climate concern, on average, is moderately high in Norway.

Previous studies have drawn mixed conclusions regarding public concern about climate change in Norway. One factor that might explain the relatively high levels of concern displayed in figure 5 is that Norway is in some way a frontrunner as regards climate change prevention and mitigation policies, with ambitious climate goals and a long tradition of climate mitigation policies. The most prominent example is that Norway in 1991, as the second country in the world, introduced a CO2 fee (Summer, Bird and Dobos 2011, 922). In contrast, many countries in the world still subsidizes the use of fossil fuels, and the introduction of a CO fee is regarded as highly controversial (Vernon, Parry and Black 2021, 3)

On the other hand, it is hard to label a country where the economy, to a large extent, is based upon extractive industries like oil and gas, as a climate frontrunner. Compared to other countries, the reduction in CO2-emissions have been small in Norway. In fact, since 1990 CO2 emissions per capita have increased in Norway, from 6.88 tons per capita in 1990 to 7.6 tons per capita in 2020. In the same time period, Sweden, a country similar to Norway in many aspects, reduced their CO2-emissions from 6.29 tons per capita to 3.8 tons per capita (World bank 2021). The petroleum industry directly or indirectly employed around 160 000 people in 2019, which equals 6% of the workforce. In 2019, oil and gas constituted 33% of Norway's

[11] Exact coefficients for each round available in section F in the appendix.

export, and income from the petroleum sector made up 14% of the Norwegian GDP (SSB 2022). The numbers show how important the petroleum industry is to Norway. Based on this, a logical assumption would be that the concern about climate change would be lower in Norway than in other European countries, given how dependent Norway is on industries that might be hurt by tough climate policies.

In article from 2007, Sandvik argues that concern about global warming is lower in industrialized, rich countries like Norway (2007, 334). He argues that individuals in wealthy, industrialized countries worry less about global warming. The reason is that they to a larger extent feel responsible for the consequences of climate change and psychologically try to "lure" themselves into a notion that this is not so dangerous.

Some authors have argued that climate concern is lower in Norway than in other European countries because  Norway – compared to many other countries – is not especially vulnerable to the effects of global warming (O´Brien, Sygna and Haugen 2004, 193).

The expectation presented in H4 was that the coronavirus pandemic would lead to a decrease in concern. The results, to some extent strengthen this hypothesis. There is a significant decrease in climate concern from round 17, which was measured before the outbreak of corona to round 20 which was measured after the outbreak. However, the decrease is quite small and to test the hypothesis thoroughly there should ideally have been included more data from after the coronavirus outbreak. There was also a large decrease from round 14 to round 17, so a possible explanation for the decrease from round 17 to 20 could be that concern was decreasing in Norway regardless of corona, and that the decrease from round 17 to 20 just followed this trend.

# Chapter 9: Discussion

## 9.1 Structure of the chapter

In this part of the thesis, I will discuss the results of the analysis in greater depth. The discussion will be structured as follows:

First, I look into the hypotheses presented in chapter 4. I will use the results to decide whether there is support for the hypotheses. Then, I discuss the research question in general and point out the factors that have the biggest impact on peoples' concern about climate change. The discussion will conclude with a brief discussion of the implication of the results and some potential avenues for future research.

## 9.2 The effect of vulnerability to climate change

The first hypothesis is that "*higher climate vulnerability lead to increased concern about climate change."*

Not many studies have researched how vulnerability to climate change influences public concern about climate change (Brody et al. 2008, 72). This is particularly the case in social sciences, where variables like age, gender, and education typically have been used to explain variability in concern (Zahran et al. 2006, 776).

Even though the literature is scarce, some studies have investigated the effect of climate vulnerability. A study conducted in southern England found that individuals who were more exposed to air pollution and suffered from health problems as a result of this were more concerned about climate change (Whitmarsh 2005, 158).

A qualitative study from the U.S. found that grass-roots environmental movements were more likely to appear in environmentally distressed communities (Bullard and Wright 1993, 836). Another U.S. study found that local climate change had an effect on concern. This study found that respondents living in areas with a significant increase in temperature were more likely to support climate mitigation policies (Zahran et al. 2006, 782).

There is however no unequivocal support for the theory that climate vulnerability will lead to heightened concern. A third study from the US, which surveyed ranchers and farmers in

Nevada, found no evidence that vulnerability positively affected climate worry (Safi, Smith, and Liu 2012).

A cross-national study of 47 countries found that individuals who lived in more climate-exposed countries displayed lower levels of climate concern (Kvaløy et al. 2012, 11).

The results from model 4 show that as vulnerability increases, concern about climate change also increases. The results are significant. This strengthens the hypothesis that increased climate vulnerability leads to increased concern.

It might not be surprising that increased vulnerability to climate change leads to heightened concern. The more surprising findings are that classic explanatory variables used in the field like age and education are insignificant. Previous research, especially within the social sciences, has traditionally explained climate concern by examining how social factors like age and education influence concern (Zahran et al. 2006, 782). These results suggest that a potential avenue for future research might be to turn away from the classic, social explanatory variables and instead analyze physical factors like vulnerability to climate change.

I have used a climate risk indicator to measure climate concern. Countries are given a score based on vulnerability to climate change. Lower scores indicate higher vulnerability. The indicator is based on data from 2000 to 2019. Each country in the dataset has been given an average climate vulnerability score for this time period. Given that climate to some extent fluctuates over time, the variable should ideally have been measured for each country in the dataset each year. It is worth noting that the fluctuations over time are relatively minor. Still, given that there are some fluctuations, there might be some measurement error given that the variable is based on a 19-year average. This might lead to decreased reliability. The reason I have chosen to use an average over time, is simply because TSCS data were not available for this variable.

In total, 180 countries are measured by the climate risk indicator. Of the countries included in the European analysis, Germany is the most exposed to climate change. Of the 180 countries measured by the indicator, Germany is the 18$^{th}$ most vulnerable country (Eckstein et al. 2021, 41). Even though this is not especially high, it means that the countries most vulnerable to the impacts of climate change are not included in the analysis. To capture the full extent of how vulnerability influences concern, it would have been beneficial if countries from other parts of the world, which are more vulnerable to climate change, were included. The fact that these

countries are not included might explain why vulnerability was not significant in model 2. It seems reasonable that people living in for example Bangladesh or Papua New Guinea – on land that might disappear when the sea level rise – are more concerned about climate risk than people living in areas which are not so dramatically affected.

The climate vulnerability index is based on four factors (Eckstein et al 2021):

- average fatalities from 2010 to 2019 due to climate change.

- average fatalities per 100 000 inhabitants from 2010 to 2019 due to climate change.

- average losses in GDP in million US$ from 2000 to 2019 due to climate change.

- average losses per unit GDP in % from 2010 to 2019 due to climate change.

Given that two of the four indicators are based on losses in GDP, a logical assumption would be that these indicators would have a larger effect in countries where GDP is at a lower base level. Arguably, an average loss of 4% of unit GDP has a larger impact in a country where GDP is 5 000$ per capita than in a country where it is 50 000$ (even though the loss in dollars would of course be larger in the country with av high GDP). Ideally, the dataset should therefore include countries where there are large discrepancies in GDP per capita. Even though there are some differences in GDP per capita between the countries, Europe is, to some extent, a homogenous continent, and the differences would have been larger if countries from other regions of the world were included in the analysis. It is possible that the effect of the climate vulnerability variable would have been stronger and more significant if countries with more considerable differences in GDP per capita were included in the analysis.

A critique that can be raised against the model is that factors other than the four used to create the climate risk indicator may affect climate vulnerability. As an example, it might be argued that health problems caused by air pollution lead to increased climate vulnerability, but not to a direct increase in fatalities or a direct economic loss. Other factors might for example be water or food shortage. Given that this does not necessarily affect any of the four factors of the climate risk indicator directly, this is an example of a factor that is not captured in the climate vulnerability variable.

Another limitation of the climate vulnerability variable is that it is measured at the country level. Climate vulnerability does not only vary between countries, but also within countries. Climate vulnerability might be higher in some parts of a nation and lower in other regions.

Given that the variable is measured at the national level, the analysis is based on a rough estimate of climate vulnerability in a country. Ideally, differences in vulnerability should not only be measured between countries but also within countries.

A climate vulnerability variable is not included in the Norwegian citizen panel data. This makes it hard to measure how such vulnerability influences climate concern in Norway.

Some authors have argued that southwestern and northern Norway are the two regions in the mainland of Norway that are most vulnerable to climate change, while southeastern Norway is the least vulnerable (O`Brien, Sygna, and Haugen 2004; Hansen-Bauer et al. 2017). Based on this, the expectation would be that concern were higher in southwestern and northern Norway to the degree that these consequences are known to people living there. The results from model 8, which illustrates regional variations in climate concern, do not support this. Oslo, located in the southeastern part of Norway, reports the highest concern level, while Rogaland, situated in the western part of the country, reports the lowest levels. Nordland and Troms and Finmark, located in the northern part of Norway, report relatively low levels of concern. The only county that fits with the theory is Vestland, situated in the western part of the country. This is the county that reports the second-highest level of concern.

It is also worth noting that even though model 8, which only includes county variables, yields significant results, none of these differences are significant in model 10, which includes all the explanatory variables.

Several factors may account for the differences in regional concern in Norway. For example, Rogaland is the county that reports the lowest level of concern. At first glance, this might suggest that there is no link between climate vulnerability and climate concern, given that Rogaland is located in a part of Norway which might be more exposed to the impacts of climate change. However, it is reasonable to assume that the concern level in Rogaland has more to do with the large amount of oil industry in the county and is not necessarily proof that vulnerability to climate change does not affect concern. Also, it is hard to say whether people in the region are aware that the climate risk for the region might be higher than in other parts of the country.

In general, Norway is not especially prone to climate change. According to the climate risk indicator, out of 180 countries, Norway is the 149th most vulnerable country (Eckstein et al 2021, 41). Given this, it is logical to assume that vulnerability to climate change is a less

important predictor of climate concern in Norway than in countries that are more vulnerable to climate change.

### 9.3 The effect of the financial crisis

The second hypothesis states that **"***The financial crisis led to decreased concern about climate change."*

As mentioned earlier, the finite pool of worry theory states that external shocks, which increases concern about one issue, will decrease concern about other issues (Evensen 2021, 1). An example of such an external shock is the 2008 financial crisis.

A study conducted in the U.S. in 2012 found that climate concern decreased following the financial crisis (Scruggs and Bengal 2012). A second study conducted in the U.S. in 2015 found the same effect (Capstick et al. 2015, 48).

A third study conducted in Europe found that as quarterly GDP growth rates in Europe decreased, concern about climate change decreased (Capstick et al. 2015, 51). In all these studies, the authors argued that the decrease in concern was due to the effect of the finite pool of worry.

The financial crisis impacted people in different forms. It caused a rise in unemployment and economic uncertainty. Many lost savings due to fall in house prices and the decline in share values. Companies went under, affecting both owners and employees. The crisis was obviously the object for big attention by the media. All in all, the financial crisis was not only felt by governments, politicians, and business owners, but also a 'shock' felt by ordinary people (Greenglass et al. 2014, 9).

Based on this, the expectation would be that there was a U-shaped development in climate concern in Europe. The theoretical expectation would be that concern decreased following the impacts of the financial crisis and the European debt crisis and then increased as the effects of these crises wore off. Another expectation would be that the decrease was most pronounced in the countries most impacted by the financial crisis and the European debt crisis.

To see whether this is the case, it is first necessary to identify the start and end date of the financial crisis and European debt crisis in Europe. The financial crisis started in 2008, but the impact in Europe was not felt immediately. In Europe, the financial crisis was followed by the European debt crisis. It is hard to pinpoint the exact start and end date of this crisis. Some have

argued that it started in 2009 after the Greek prime minister George Papandreou announced that previous governments had failed to disclose the actual size of the nation's deficit and that the national debt was larger than previously reported. It is also hard to pinpoint an exact end date, but the financial markets somewhat calmed down after the announcement in 2012 from the European Central Bank that it would become the euro-zone lender of last resort (Beker 2014, 1). It is worth noting that even though the financial markets calmed, GDP continued to decrease in several European countries. It was not until 2015 that there was an increase in GDP in a majority of European countries. Overall, the trend was that GDP per capita rose from 2012 to 2014 in a majority of the countries, with a subsequent decrease from 2014 to 2015 and an increase from 2015 to 2017 (Worldbank 2022).

The results find support for the theory that there was U-shaped development in concern. Figures 1 and 2 illustrate that is true on the aggregate level.

Figure 3 illustrate that this also is true on the national level. The impact of the European debt crisis was felt most harshly between 2010 and 2012. This corresponds with the decrease in concern from 2009 to 2013. Even though the effects of these crises slowly were beginning to weaken, the effects were still noticeable from 2013 to 2015, with several European countries seeing a reduction in GDP in this period. As the effects of the financial crises wore off, the decrease in climate concern diminished in the same period. When countries began to recover financially and GDP started to increase in a majority of the countries looked at in the dataset, climate concern also started to increase. These results are consistent with the finite pool of worry.

Given that several other factors were relatively stable in the same period as climate concern decreased, this may rule out alternative explanations. During the time period measured the climate issue increased in prominence, the effects of climate change continued to be noticeable[12], and the fifth IPCC report was released between 2013 and 2014 (Scott, Hall, and Gosling 2016, 8).

If it was the consequences of the financial crisis, like reduction in GDP and increase in unemployment that lead to the increase in concern. One would expect that the countries most

[12] Of the top 10 hottest years on record, five were recorded between 2008 and 2015 (Lindsey and Dahlman 2022, 1)

harshly affected by the financial crisis also saw the largest drop in concern and the most U-shaped development over time.

Even though it is hard to pinpoint precisely which countries were most severely impacted by the financial crisis and the European debt crisis, Greece was perhaps the country most severely affected, GDP per capita nearly halved, from 31997$ in 2008 to 18076$ in 2015. Unemployment rose from 8% in 2008 to 25% in 2015 (World Bank 2022). Together with Ireland and Portugal, Greece entered into the European Union's financial assistance program, and Spain entered into another EU financial program. At the same time, Italy implemented a series of structural reforms. Cyprus was another country where the impact of the crisis was severely felt (Beker 2014, 1).

The results do not seem to support that these countries saw the largest drop in concern. There was a large decrease in climate concern from 2008 to 2015 in both Cyprus and Greece. There was a slight increase in concern in Portugal and Italy from 2008 to 2015, while there was a slight decrease in concern in the same period in Spain. The only country where the development matches the theoretical assumption is Ireland. In this country, there was a large decrease in concern from 2008 to 2015, which cannot be explained by a high level of concern in 2008, and subsequently a large increase in concern from 2015 to 2017.

Neither do the results seem to indicate that these countries experienced the most U-shaped development in concern. There is a U-shaped relationship over time in Spain, Cyprus, and Greece, while there is a linear increase in Italy and a linear decrease in Cyprus. This means that only 60% of these countries display a U-shaped relationship in how the worry about climate change has changed in the measured period. Given that 80% of the countries in the dataset display a U-shaped development in concern, this is below the average.

Even though the results do not seem to indicate that these countries saw the most U-shaped development, it is worth noting that both Greece and Cyprus were among the countries that experienced the largest reduction in climate concern, as well as being two of the countries most severely impacted by the financial crisis. In both these countries the decrease was between 1 to 2 points on a 10-point scale from 2008 to 2017. This might suggest that the financial crisis did lead to a decrease in climate concern in these countries. Some of the decrease might be explained by the fact that the level of concern was very high in 2008. As an example, the average perceived seriousness of global warming was 8 in Cyprus in 2017, after it had decreased

from 9.5 in 2008. Even after the reduction, the degree of concern is well above the average in the dataset.

If the financial crisis were the driver of the decreased concern about climate change, a natural assumption would be that as GDP per capita in a country fell, climate concern in this country decreased. However, the results find no support for this mechanism. On the contrary, the results from the lagged GDP per capita variable show that an increase in GDP per capita leads to reduced climate concern.

The financial crisis did not only lead to a decrease in GDP per capita but also an increase in unemployment. This means that it might be possible that some of the decrease in concern is explained by an increase in unemployment rather than the effect of the financial crisis in itself. Whether used as a normal or a lagged variable, the unemployment variable is not significant in any models. The results therefore suggest that this is not the case, and that the decrease in concern following the financial crisis is not explained by the increase in unemployment.

One possible explanation for the results from the unemployment and GDP per capita variable, is that it is not the consequences of the financial crisis that lead to the decrease in concern. Rather it was because the "shock" of the financial crisis occupied much of the respondent's mind, and lead to a "crowding out" effect, where concern about climate change got replaced by concern about the financial crisis. This effect is consistent with the "finite pool of worry".

If this is the case, one would expect that a "shock", like Brexit would lead to a decrease in concern in Britain. The expectation would be that concern decreased around the time the Brexit vote took place. The results do not find support for this theory. Concern was highest in Britain in 2008, followed by 2015 and 2017, which was the years the Brexit debate was at its peak.

Even though most countries display a U-shaped development in climate concern in the period, it is not given that this is due to the financial crisis. Several studies have argued that the climate issue has become more politicized and polarized in later years and that this has led to a decrease in climate concern (McCright and Dunlap 2011; Chinn, Hart and Soroka 2020). This does not explain the increase in concern from 2015 to 2017, but it might explain some of the decrease from 2008 to 2015.

The increase in concern might also be explained by the fact that the issue of climate change gathered more attention in the media due to the Paris agreement, which was signed in 2015 (Falkner 2016, 1107).

In spite of the fact that countries most impacted by the financial crisis did not see the largest decrease, the results strengthen the hypothesis that the financial crisis led to decreased concern. The findings also strengthen the finite pool of worry theory and the assumption that there has been a U-shaped development in climate concern from 2008 to 2017.

### 9.4 The effect of Covid 19 on climate concern in Norway

The third hypothesis states that "*The coronavirus pandemic led to decreased concern about climate change in Norway."*

A U.S. study conducted in 2020 found that climate concern decreased after the initial outbreak of corona (Bostrom et al. 2020, 5). The authors argued that this was because of a "crowding out" effect. This effect is driven by the same mechanisms as the finite pool of worry, which implies that concern about one issue decreases as concern about another issue increases (Bostrom et al. 2020, 2).

Some authors have argued that corona did not lead to a "crowding out" effect, but rather a "crowding in" effect. This means that as individuals recognized that the coronavirus was a threat that could be mitigated by strong policy action, this recognition led to increased support for the idea that climate change is also a threat that could be mitigated by strong policy action (Hulme et al. 2020, 3).

The results from the analysis of the NCP data show a significant decrease in climate concern in Norway from round 17, which was conducted before the coronavirus outbreak, and round 20, which was conducted after the outbreak. This might indicate that climate concern decreased due to the coronavirus outbreak.

Even though there was a reduction in concern, it is not given that the outbreak of corona caused the decrease. Based on the finite pool of worry theory, the expectation would be that not only should corona lead to a decrease in climate concern, but that the reduction immediately after the outbreak would be larger than the reduction between earlier rounds. Concern decreased between round 17, measured in February 2020, and round 20, conducted in March 2021. But the decrease in climate concern was larger between three other rounds: rounds 4 and 5, 9 and 10 and 14 and 17. There were no external shocks with the same magnitude as corona between any of these rounds which could explain this decrease.

There was an especially large decrease in climate concern from round 14, measured in January in 2019, to round 17, measured in March 2020. Therefore, one possible explanation for the decline in concern in the subsequent period from round 17 to 20 is that climate concern was on a downward trend in Norway. If this was the case, the decrease in concern might just have followed this pattern and not occurred due to corona.

Another explanation for the relatively small decline in concern might be that round 20 was conducted between the 26th of January and the 8th of March 2021. This was after people had lived with the threat of corona for around one year. If round 20, for example was measured immediately after the outbreak of corona, it might be that the decrease in concern would have been larger, due to the fact that people were used neither to the virus nor the restrictions.

To test the hypothesis, the data should ideally have included more rounds conducted after the outbreak of corona and rounds measured at the pandemic's start. This way, it would have been possible to see whether corona led to a sustained decrease in climate concern and whether the initial outbreak led to a larger decrease. With only one round measured after the outbreak of corona, it is difficult to conclude whether corona caused the reduction, or whether there might be alternative explanations for the decrease. It is also worth noting that even though corona affected all of Norway, the impact was much larger in some areas than in other. As an example, the restrictions and consequences of corona were more harshly felt in urban areas like Oslo and Bergen than in more rural areas.

### 9.5 The ideological effect

The fourth hypothesis states that: *There is a clear ideological divide in concern about climate change in Norway.*

A 2009 study found that 63% of conservative males in Norway do not believe in anthropogenic climate change. Among the rest of the population, the number was 36% (Krange, Kaltenborn, and Hultman 2019, 1).

A survey conducted in 2022 based on the Norwegian Citizen Panel data found that concern was highest among MdG voters, followed by SV voters. FrP and Høyre voters displayed the lowest levels of concern. These findings suggest that there is a left-right divide in climate concern in Norway (Gregersen 2022).

A study from 2013 set out to assess which factors that explained climate skepticism in Norway. The authors found that worldview and political beliefs were the variables with the largest explanatory power. Respondents with individualistic values and individuals on the right side of the political spectrum were more skeptical of climate change and less concerned about its impacts (Austgulen and Stø 2013, 145).

The results from my analysis strengthen the hypothesis 4, there seems to be an ideological divide in concern about climate change in Norway. MdG, SV, and Rødt voters are most concerned about climate change, while FrP and Høyre voters are least concerned. All the differences are significant in model 4, which only includes party variables. But the effect of party affiliation to Høyre, Sp and KrF becomes insignificant when adding all the explanatory variables. That there is a clear left-right divide in climate concern are consistent with previous research on the field (Gregersen 2022; Krange, Kaltenborn and Hultman 2019; Austgulen and Stø 2013).

The results show an almost perfect ideological divide between conservative and liberal voters in climate concern. One exception to this is Venstre. Their voters display higher levels of concern than Arbeiderparti voters. However, Venstre is a liberal party near the political center, which fronts itself as a green party. This may explain the high levels of concern among its voters. Sp voters can also be seen as an exception. The party voters are among those least concerned about climate change. However, the party is in a coalition with AP in the government. The party is traditionally regarded as a centrist party, but their politics differ from the rest of the parties in many substantial issues. This might be one explanation for the results among their voters.

The differences in concern are relatively large. FrP voters are, on average, 14.5% less concerned about climate change than MdG voters. This increases to 15,5% when adding all the explanatory variables and is a quite striking difference between individuals in the same country.

In model 9, which only includes the party affiliation variables, all the variables are significant. In model 10, which includes all the explanatory variables, the effect of party affiliation to Sp, Høyre and KrF becomes insignificant. While all county variables became insignificant when adding the explanatory variables, most party variables stayed significant. This underlines that ideology or party affiliation is a more important predictor of climate change concern in Norway than regional variances.

The climate issue is less characterized by political conflict and polarization in Norway than in most other countries (Linde 2020, 2006). It might be reasonable to assume that the effect of ideology would be larger in countries where climate issues are more polarized. However, the results show that ideology is an important predictor of concern even in Norway, where the issue is less polarized. As previously mentioned, it can however be hard to pinpoint the exact direction of the causal relationship. Party affiliation might affect climate concern, but it is as possible that the relationship is the other way around and that climate concern affects party affiliation.

### 9.6 Implications and potential avenues for future research

The impacts of climate change will continue to grow in the future. As the impacts are felt more severely worldwide, climate change will continue to be a topic of discussion and research. Therefore, the research in this field will continue to grow, not only in number of publications, but also in importance. This part of the thesis will point at the implications of my study and what these implications might mean in terms of potential avenues for future research in the field.

My thesis is mainly concerned with the factors that influence climate concern. Previous research has found a strong positive link between climate concern and support for climate policy (Botzen, Duijndam, and Van Beukering 2021, 364). But the important question of how to translate concern into actual climate change prevention and mitigation policy remains. Even though this might be a more complex question to answer, to manage to implement effective climate policies, one would do well to begin with understanding climate concern.

One of the main problems with testing the finite pool of worry theory, is that few events have a large enough impact globally to steal attention from other issues. Some events can have a big impact on a continent, like Brexit. Some events have a large impact nationally, like the explosion in Beirut in august 2020. In contrast, few events have consequences that are felt worldwide. Even in the case of the events having impact worldwide, the effect is often felt more in some parts of the world than others and by some individuals harder than others. The financial crisis is arguably an event felt worldwide, but even this crisis hit Europe and The United States harder than Asia.

In this sense, the coronavirus pandemic provides a unique opportunity. The pandemic was a global event, the impacts were felt worldwide, and very few individuals were unaffected. As

more data becomes available, researchers who want to test the finite pool of worry theory would do well to take an in-depth look at how the pandemic affected climate concern.

This thesis has analyzed "shocks", which I expected would have a negative effect on climate concern. But the effect might also be true the other way, where the consequences of climate change like heatwaves, drought, forest fires, food shortages and increased migration in itself might constitute "shocks". These "shocks" should lead to heightened climate concern (and lesser concern for other issues) according to "the finite pool of worry". A potential avenue for future research might therefore be to investigate whether "external shocks" caused by climate change leads to heightened concern and broader support for climate mitigation policies.

In my thesis, I analyze how climate vulnerability affected climate concern between countries. The results suggest that climate vulnerability leads to heightened concern. However, climate vulnerability is not constant within countries. Some parts of a country might be more exposed to the impacts of such change than other. To get a complete picture of the influence of climate vulnerability, it would therefore be beneficial to analyze this on the sub-national level. As mentioned earlier, the impacts of climate vulnerability on climate concern are scarcely looked at in the literature, with only a few studies analyzing the impact on climate concern (Kim and Wolinsky-Nahimas 2014, 79). Even fewer studies seem to have looked at how sub-national differences in vulnerability influence climate concern (Zahran et al. 2005; Arbuckle, Morton, and Hobbs, 2005; Gbetibouo 2009). A cross-national study that looks at how climate vulnerability on the sub-national level influences climate concern would significantly contribute to the existing literature in the field. Such a study would illuminate how sub-national vulnerability affected concern and how this varied between countries.

While the result seems to indicate that concern is higher in countries more vulnerable to climate change, the question of why this is the case remains unanswered in the thesis. The most obvious explanation is that people who might in the near future experience the consequences of climate change, naturally gets more worried about it. It might also be that increased vulnerability leads to more attention in media and in politics, and that this might lead to heightened concern. No matter what the dynamics between the effects are, research that helps explain why heightened vulnerability leads to increased concern could be valuable. Not least could this help predict how people will react when the consequences of climate change in some years will be felt more concrete all over the globe.

The results from the Norwegian analysis suggest that climate concern is heavily influenced by ideology and party affiliation. Norway has a clear left-right divide, with conservative voters displaying lower climate concern. This means that a change in attitude towards climate change among the parties that traditionally have the most climate sceptic voters, is necessary to get the support for the harsh measures that is needed to halt climate change. But as the present rise in petrol prices show, there are many factors in play. As underlined by previous research, a prerequisite for broad support for climate change politics is that people feel that the measures strike a fair balance and are not structured in a way that those with least resources are hit hardest (Paavola 2006, 594). The political divide is anyhow such an important factor for people's attitude towards climate change that one would do well to look more into the role of ideology when investigating climate concern.

Another way of increasing support for climate change policies, might be to try to depolarize the climate issue. Considering the broad scientific consensus in these matters, one would think that this should be possible. Experience shows, however, that this is a task that is easier said than done. One reason might be that the politics needed to stop global warming necessarily will affect people's lives negatively in many ways. It can potentially mean a halt in the economic growth and the rise in living standards that the western world is accustomed to. And given the need to act quickly and strongly to prevent further climate change, one can expect that many people still will continue to be sceptic about the danger of climate change. The general reluctance among individuals to big changes in short time can thus be futile ground for continued polarization in this field.

My thesis has exclusively looked at climate concern in 26 European countries. European countries are homogenous in many ways. And the fact that the thesis only includes 26 countries is a reliability problem. Therefore, it is not given that the results have external validity worldwide. Even though this is the case, the results demonstrate some noticeable differences between these countries. There are differences both in the level of concern and in the development of climate concern. Even though the results illustrate such differences, to fully understand what influences climate concern, a study looking at a larger number of countries and continents would give a more comprehensive understanding. As more data becomes available, studies looking at this would be a worthwhile undertaking. This is true both for studies that include a higher number of countries, studies that investigate a more extended time period, and studies that include a greater number of variables.

This thesis builds exclusively on quantitative methods. One way of further testing the research question is through qualitative methods. Qualitative methods can further explore the causal mechanisms illustrated in this thesis and further test the reliability and validity of the results.

### 9.7 Concluding remarks

The research question that this thesis set out to answer was:

*Which factors influence concern about climate change, and to what extent does concern vary between countries and over time.*

There are substantial differences in the level of climate concern in the 26 European countries that have been analyzed. Concern have changed over time, with a decrease in the level of concern in the period covered by my thesis. This trend is especially clear in the European analysis.

The results indicate that increased climate vulnerability in a country lead to increased climate concern. More classic explanatory variables used in the field, like age and gender, were insignificant. This suggests that physical variables such as climate vulnerability are important to consider when explaining climate concern.

The results indicate that the financial crisis led to a decrease in concern in Europe, and that there was a U-shaped development in the level of concern during the crisis. Even though there might be alternative explanation, the results indicate that the "external shock" of the financial crisis that led to the decrease in climate concern. Therefore, the analysis strengthens the theory that there exists a finite pool of worry when it comes to climate questions. Large external shocks seem to be followed by a decrease in climate concern. Circling back to the quote at the start of the thesis, as concern about the "end of the month" increases, concern about climate change, which in a quite exaggerated way can be described as "the end of the world", decreases.

The results from Norway show that climate concern has been relatively stable from 2013 to 2021. There was a small decrease in climate concern following the outbreak of corona. However, it is hard to say whether COVID was the reason behind this decrease. The data should ideally have included more rounds, measured after the outbreak of the pandemic, to get a more precise answer to this.

Perhaps the main finding from the Norwegian analysis is the role party affiliation plays in influencing climate concern, and that this ideological divide plays a huge role even in the

relatively homogenous and unpolarized Norway. The effect of party affiliation seems to overshadow more intuitively appealing variables as education and where in the country you live.

Finally, it should be noted that this thesis only scratches the surface with regard to the factors that influence climate concern. I can only rule out the variables I adjust for, and there might be alternative factors that explain the results in the thesis. Further research is needed to get a complete picture of all the factors that influence climate concern.

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# 11.0 Appendix

**Appendix A: Effect of countries on perception about global warming**

| | Coefficient |
|---|---|
| *Belgium* | -.239 |
| *Bulgaria* | .322 |
| *Cyprus* | .794*** |
| *Czech republic* | -.144 |
| *Denmark* | -.243 |
| *Estonia* | -.1.337*** |
| *Finland* | -.595* |
| *France* | .102 |
| *Germany* | -.008 |
| *Great Britain* | -1.035*** |
| *Greece* | .954*** |
| *Hungary* | .536* |
| *Ireland* | -.456 |
| *Italy* | .360 |
| *Latvia* | -.830*** |
| *Lithuania* | -.191 |
| *Luxembourg* | -.017 |
| *Malta* | .470* |
| *Netherlands* | -.822*** |
| *Poland* | -.345 |
| *Portugal* | .283 |
| *Slovakia* | .224 |
| *Slovenia* | .463* |
| *Spain* | .372 |
| *Sweden* | -.194 |
| *Intercept* | 7.543*** |
| *Observations* | 156 |
| *R^2* | .689 |
| *Adjusted R^2* | .629 |

*Notes*: Results from OLS model. (N = 156). Coefficients displayed. Results based on model 4. Austria used as the reference country. Standard error in parentheses; ***p<.001, **p<.01, *p<.05. Source: Source: Eurobarometer 2022, Eurostat 2022, Worldbank 2022, Eckstein et al. 2021.

**Appendix B: Yearly change in climate concern**

| | Coefficient |
|---|---|
| *2009* | -.525** |
| *2011* | -.499** |
| *2013* | -.733*** |
| *2015* | -.739** |
| *2017* | -.383* |
| *Intercept* | 7.963*** |
| *R-squared* | .143 |
| *Adjusted R-Squared* | .114 |

*Notes:* Results based on model 3. Coefficients displayed. 2008 used as the reference year. Standard error in parentheses; ***p<.001, **p<.01, *p<.05. Source: Eurobarometer 2022, Eurostat 2022, Worldbank 2022, Eckstein et al. 2021.

**Appendix C: Autocorrelation in models 1, 2, 3 and 4**

| | Model 1 | Model 2 | Model 3 | Model 4 |
|---|---|---|---|---|
| *DW* | 1.676 | 1.587 | 1.597 | 1.540 |
| | (.002) | (.004) | (.002) | (.002) |

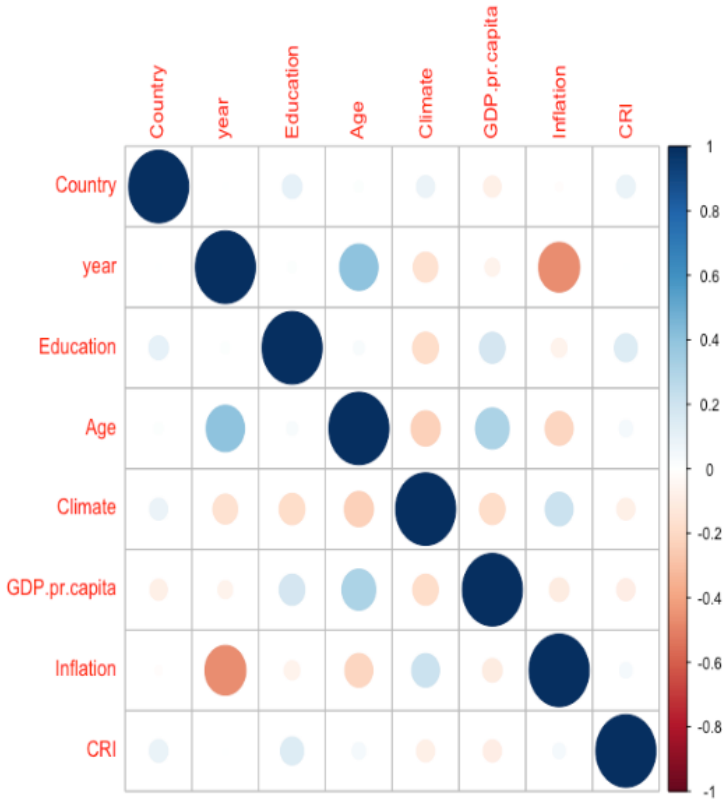
Notes: Durbin-Watson test for models 1, 2, 3 and 4. P-values displayed in parentheses.

**Appendix D: VIF–test (models 1,2,3 and 4)**

| | Model 1 | Model 2 | Model 3 | Model 4 |
|---|---|---|---|---|
| *Education* | 1.001 | 1.103 | | 1.548 |
| *Age* | 1.001 | 1.103 | | 1.492 |
| *GDP per capita* | | 1.950 | | 1.667 |
| *Unemployment* | | 1.463 | | 3.148 |
| *CO2* | | 1.209 | | 1.567 |
| *Urban population* | | 2.147 | | 1.657 |
| *Inflation* | | 1.246 | | 1.719 |
| *CRI* | | 1.686 | | 1.982 |
| *GDP per capita (lagged)* | | | 1.464 | 1.636 |
| *Unemployment (lagged)* | | | 1.201 | 1.583 |
| *CO2(lagged)* | | | 1.158 | 3.171 |
| *Urban Population (lagged)* | | | 1.466 | 1.887 |
| *Inflation (lagged)* | | | 1.209 | 1.895 |

Notes: VIF-test for models 1,2,3 and 4. VIF values displayed

**Appendix E: Correlation plot for models 1 and 2**




*Notes*: Correlation plot displaying the correlation in models 1 and 2. The correlation ranges from -1 to 1, with larger dots indicating higher levels of correlation.

## Appendix F: Change in concern over time (model 10)

| | Coefficient | SE |
|---|---|---|
| *Round 2* | -.113*** | .041 |
| *Round 3* | -.079 | .068 |
| *Round 4* | -.070** | .029 |
| *Round 5* | -.198*** | .033 |
| *Round 6* | -.120*** | .034 |
| *Round 7* | .034* | .035 |
| *Round 8* | .034 | .024 |
| *Round 9* | -.003 | .033 |
| *Round 10* | -.127*** | .028 |
| *Round 14* | .153*** | .029 |
| *Round 17* | .043*** | .020 |
| *Round 20* | -.047** | .019 |
| *Intercept* | 3.437*** | .018 |
| *AIC* | 105.54 | |
| *BIC* | 105.68 | |
| *ICC* | .731 | |
| *Log likelihood* | -56.410 | |
| *Observations* | 36 523 | |
| *Number of groups* | 18 650 | |

*Notes*: Results from multilevel model with random effects, individuals are defined as the upper level (n=36253) and unique individuals defined as the lower level (n=18 640). Coefficients displayed. Standard error in parentheses; ***p<.001, **p<.01, *p<.05. Source: Norwegian Citizen Panel 2022

## Appendix G: Autocorrelation in Models 7,8,9 and 10

| | Model 7 | Model 8 | Model 9 | Model 10 |
|---|---|---|---|---|
| *DW* | 1.973 | 1.977 | 1.979 | 1.979 |
| | (.004) | (.003) | (.002) | (.002) |

Notes: Durbin-Watson test for models 7,8, 9 and 10. P-values displayed in parentheses.

**Appendix H: VIF–test (models 7,8,9 and 10)**

| | Model 7 | Model 8 | Model 9 | Model 10 |
|---|---|---|---|---|
| *Round* | 1.070 | | | 1.486 |
| *Female* | 1.088 | | | 1.017 |
| *Education* | 1.065 | | | 1.085 |
| *Economy* | 1.093 | | | 1.082 |
| *Democracy* | 1.172 | | | 1.205 |
| *Government* | 1.108 | | | 1.274 |
| *Birthdate* | 1.018 | | | 1.048 |
| *Viken* | | 2.640 | | 2.676 |
| *Oslo* | | 2.240 | | 2.266 |
| *Vestfold og Telemark* | | 1.636 | | 1.658 |
| *Innlandet* | | 1.565 | | 1.565 |
| *Agder* | | 1.437 | | 1.458 |
| *Rogaland* | | 1.731 | | 1.765 |
| *Vestland* | | 2.031 | | 2.064 |
| *Møre og Romsdal* | | 1.348 | | 1.362 |
| *Troms og Finmark* | | 1.394 | | 1.397 |
| *Nordland* | | 1.350 | | 1.359 |
| *AP* | | | 3.513 | 2.600 |
| *SV* | | | 3.439 | 1.627 |
| *FrP* | | | 4.350 | 1.805 |
| *Høyre* | | | 4.556 | 2.623 |
| *Sp* | | | 3.242 | 2.102 |
| *KrF* | | | 4.625 | 3.142 |
| *Venstre* | | | 2.391 | 1.345 |
| *Rødt* | | | 2.489 | 1.365 |
| *MdG* | | | 2.827 | 1.447 |

Notes: VIF test for models 7,8,9 and 10. VIF values displayed