Anjani KD Wollan

Framing and communication

A study of culture-sensitive communication
regarding climate change and energy policy

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Norwegian University of
Science and Technology

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Project description

The purpose and objective of this study is to observe how people cognitively deal with multifaceted issues such as climate change. With a framework of framing and resonance, this study delves into culture-sensitive communication regarding climate change and energy policy. This is done in order to understand obstacles regarding communication strategies and opportunities promoting sustainable energy policies.

This study is a part of Norwegian University of Science and Technology (NTNU) Sustainability research program (ntnu.edu, 2019), an initiative aiming at doing research and generating knowledge in terms of sustainable development and climate change mitigation. One of the primary focuses is to establish an international research network of scholars centred at NTNU. The data collected in this study will be part of the pretesting of the stimuli for the larger experimental framing research that will be conducted in France, Germany, Poland and Norway. The contribution of the current master thesis is to test the effectiveness of different frames among a Norwegian sample, and will serve as a precursor of the international comparison.

The larger goal is to change unsustainable patterns of behaviour and development within society through understanding how the public accepts/rejects messages, in order to mitigate the effects of climate change. This project aims to lay the groundwork for cross-disciplinary discourse, by connecting the Department of Energy and Process Engineering with the Department of Sociology and Political Science at NTNU. Hopefully, cooperation and interdisciplinary work will enrich both departments' approaches to energy topics, and provide climate science research that is solid and thorough.

Main content:
- Introduction to the content, issue and research questions
- Overview of existing literature and concepts
- Theoretical framework
- Hypothesis and measurements for the experimental study
- Methodology and procedure
- Presentation of the empirical data and results
- Discussion and analysis
- Conclusion and final words

Supervisor: Stefan Geiss

Subject code: POL3920 (Master Thesis in Industrial Ecology)

Abstract

In order to mitigate the consequences of climate change, sustainable development must be fostered within the society. The purpose and objective of this study is to observe how people cognitively deal with multifaceted issues such as climate change. This is done in order to understand obstacles regarding communication strategies and opportunities promoting sustainable energy policies. The research question in this study is: *How do people cognitively deal with multifaceted issues?* Moreover, this study delves into culture-sensitive communication regarding climate change and energy policy, with the framework of framing and resonance. Designing messages to overcome cognitive barriers will be especially important in climate communication as the issue at hand is complex, open-ended and requires individuals to make conscious changes.

A survey will be conducted in the Norwegian environment to test under which conditions a message is more likely to resonate and be accepted by the public. The data is gathered through an online survey, where four different frames (articles) are presented as the stimulus material. These are: (1) Environment/nature frame (ENVframe), (2) Economic consequence/price frame (PRIframe), (3) Greenhouse gas frame (GGEframe), (4) Neutral/growth in Norway frame (NEUframe). Next, the participants are presented with a longer article, which will be the same for all frame groups. The frame articles will serve as the independent variables to measure the participant's frame reception, information processing and cognitive responses. A hypothesis is made regarding how the participants will behave in the study: *People will pay more attention to those aspects of the long article that match the theme of the short article.* Additional research questions are: *Which of the frames is best for processing/remembering the content as accurately as possible? Can the different frames influence the preferred energy-mix in the Norwegian environment compared to the perceived energy-mix today?* The goal is to have a stronger contingency of framing processes in order to design messages that can be more accepted by the public, and thereby more effective in its communication.

Observations show a trend that presenting a message packaged in different conditions through the short articles (frames), can prime the participants to make decisions and process information based on which of the frames they were presented with. The participants read the longer article through a different set of meta-communicative instructions, with a different set of rules which can influence beliefs, attitudes and behaviour. In addition, the trend shows that the frame articles are involved with influencing how the participants judge the different energy-mixes as important— how they reach different conclusions and judgments varies with which frame article they were presented with. In regards to fostering and promoting sustainable energy policies, the results show that the NEUframe gave the best results. Participants presented with this frame article wanted less fossil fuels and more renewable energy sources. Regarding accuracy recall, the participants presented with the ENVframe accurately remembered more information from the frame articles than the other groups.

This study contributes in the understanding of under which conditions people accept/reject messages. Understanding how the public process messages and accepts them as the truth will be an important stepping stone when wanting to implement changes in society in general. Moreover, communication is an important tool for mobilizing, motivating and influencing the public to action and change.

Preface

This master's thesis is written during the autumn semester of 2020 at the Department of Sociology and Political Science at the Norwegian University of Science and Technology (NTNU). This master's thesis is the finalisation of my degree in the MSc programme in Industrial Ecology, specialising in Environmental Politics and Management.

It was a great experience for me to write this master's thesis. To delve deep into a topic has made me realize the fun side of researching and observing— although there were unexpected delays and problems along the way. However, with a persistent pace, the finalisation became final.

I would like to thank my supervisor Stefan Geiss for helping me through the process of this master's thesis, and being available for questions. The guidance and support given through meetings and workshops has assisted me along the way to finalise the writing. Thank you for the conversations and knowledge given about the topic and related issues, which has helped me a great deal in getting in the right direction.

I would also like to thank everyone who participated in this study, the paper would not have been the same without you. Thank you for your time, energy, focus, insights and effort. The data and observations are tremendously appreciated and needed.

And lastly, I would like to thank my friends— and pet dog, Bamse, who I have laughed with, cried with, and conversed with. Issues regarding the topic of the master's thesis have been thoroughly discussed and ideas debated, which has helped me in the process of idea-generation prior and during writing this paper. Thank you for giving me the support, words of encouragement and structure that was very well needed.

It has been a ride,
Anjani Karianne Dawn Wollan

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List of concepts

Climate change
Change in global climate pattern mainly attributed to anthropogenic activities causing increased levels of carbon dioxide in the atmosphere (Steffen et al., 2015).

Sustainable development
A development that meets the needs of the present without compromising the ability of future generations to meet their needs (IPCC, 2014).

Wicked problem
Not easily defined problems, characterized as being complex, open-ended and intractable. Highly ambiguous and messy, with no clear solutions (Rittel and Webber, 1973).

Mental-counterarguing
When an individual block out messages one does not want to hear, and makes up their own arguments to why the message is wrong (Kubal, 1998).

Cognitive dissonance
When an individual holds contradictory beliefs, values and ideas. Can lead to psychological stress when they exhibit behaviour that goes against one/more of them (Sternberg & Sternberg, 2012).

Resonance
The level of fit between a message and the audience's perception of reality (Gamson & Modigliani, 1989).

Schema
A meaningful structure of related concepts that an individual has (Sternberg & Sternberg, 2012).

Inconvenient messages
Messages that cause discomfort or cognitive dissonance in an individual (Stoknes, 2014).

Cognitive frames
Templates/data structures that organize pieces of information in cognitive representations. Structures that individuals use to locate, perceive, identify and label life experiences to make sense of them (Hamill et al., 1985).

Cultural frames
Templates/data structures that organize pieces of information and stories that fit with the larger culture and reflect the values, ideas and beliefs (Van Gorp, 2007).

Attitudes
A way of thinking/feeling about something that is an individual's predisposed state of mind regarding an object/a value (Sternberg & Sternberg, 2012).

Values
Principles, standards and behaviours that an individual judge as important in life. A regard of something that is held to deserve (Sternberg & Sternberg, 2012).

Beliefs
Without the need of proof, an acceptance that something is true/seen as the "truth". An individual's perception of reality (Sternberg & Sternberg, 2012).

Lock-in-effect
Sustainable choices are limited due to a given system of infrastructures, social norms and habits (Tukker et al., 2008).

Energy culture
Systems of knowledge, information and behaviour regarding resource allocation and energy technologies (Stephenson et al., 2015).

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Chapter 1: Introduction

1.1   RESEARCH PROBLEM
1.1.1   Issue and research question

The climate is changing rapidly due to our activity on Earth (FitzGibbon & Mensah, 2012; Clayton et al., 2014; Fischer-Kowalski et al., 2014; IPCC, Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change, 2014; Steffen et al., 2015; Stephenson et al., 2015). This becomes an issue when society fails to adjust to the knowledge that exists in order to mitigate the consequences of climate change (Stoknes & Rockström, 2018). Little policy changes have occurred as a result of the scientific information, and societies continue business as usual (Wexler, 2009; Stoknes, 2014). The Paris Agreement, for instance, took years of cooperation and negotiation to create. However, countries have failed to deliver the requirements, and the USA has even backed out of the agreement altogether. Policy response regarding climate change has been slow, inconsistent and unstable, and there seems to be a lack of a clear vision for where we are heading (Tukker et al., 2008; Stoknes, 2014; Cann & Raymond, 2018). Understanding how individual cognition works will help with tailoring strategies for changes on a society-level (Moser, 2009).

There have been a lot of public discussions in the media about topics such as "green change" and "sustainable development goals" (Fischer-Kowalski et al., 2014; Stoknes & Rockström, 2018)— but what exactly and specifically does this mean for us normal citizens? What changes are required and how will this be communicated outward? Individuals, once having a strongly held belief, will most often resist changing these beliefs. We tend to live life a certain way, and when change is required, uncomfortable emotions and feelings may arise (Kepplinger & Daschmann, 1997; Shen, 2004; Chong & Druckman, 2007). The trend seems to be: that the public is unconvinced and unmobilized (Tukker et al., 2008; Stoknes, 2014)— perhaps this is true, also in developed countries where we live externally comfortably, the society is affluent, and the information is available for the citizens (Moser, 2009). Climate change issues can be seen as a "wicked problem", which is characterized as highly uncertain and ambiguous (Rittel and Webber, 1973; Wexler, 2009; Newman & Head, 2017)— with a lot of interconnected aspects to consider, and forces pulling in different directions (Cann & Raymond, 2018). Hence a research question is asked and formulated as: *How do people cognitively deal with multifaceted issues?* Moreover, what are the arguments that arise in people's cognition and their minds? How, why and under which conditions do cognitive dissonance and mental-counterarguing arise? And how do individuals accept messages?

A survey will be conducted to test under which conditions a message is more likely to resonate— accepted by the public (Kubal, 1998; Ferreira, 2004; Buijs et al., 2011). Four different frames, in the form of short articles, will be present in the study, which will serve as the independent variables to measure the participants' frame reception, information processing and cognitive responses. Will people pay more attention to those aspects of the long article that match the theme of the short article? Presenting a message packaged in different conditions through the short articles (frames), can prime the audience to make decisions and process information based on which of the frames they were presented with (Shah et al., 1996; Price et al., 1997; Valkenburg et al., 1999; Chong & Druckman, 2007). This can make the participants read the longer article through a different set of meta-communicative instructions, with a different set of rules which can influence beliefs, attitudes and behaviours (Van Gorp, 2005; Krippendorff, 2017). Another research question to be asked is: *Which of the frames is best for processing/remembering the content as accurately as possible?* The goal is to have a stronger contingency of framing processes in order to design messages that can be more accepted by the public, and thereby more effective in its communication (Rittel & Webber, 1973; Head, 2008; Druckman and Bolsen, 2011). Designing messages to overcome cognitive barriers will be especially important in climate communication as the issue at hand is complex, open-ended and require individuals to make conscious changes (Moser, 2009; Clayton et al., 2014; Stoknes, 2014; Cann & Raymond, 2018).

1.1.2 Motivation and aim

We constantly exist in one reality or another— we see the world through different lenses/perceptions, moving from one reality to another (Krippendorff, 2017). We live by different sets of unspoken "truths" that can be observed through the language we use, metaphors and phrases, pictures, important opinions, and unpopular beliefs (Pan & Kosicki, 1993; Van Gorp, 2007). We are indeed influenced by our prior experiences and our past, but not only that— our thought patterns, reactions, behaviours and beliefs/values are all deeply conditioned by everything around us (Gamson, 1992; Van Gorp, 2005). It seems that our brains create patterns, or pathways, that become more and more pronounced the more we use these pathways (Sternberg & Sternberg, 2012; Entman, 1993). And how does this process work? Are we even aware of this? And can we operate apart from it? Can we ever be free of it? And is the reality/"truth" that each individual perceives anywhere near the objective reality?

My motivation with this study is to gain a deeper understanding regarding this phenomenon of social construction of reality. How does the public react and process information about climate change due to their existing beliefs, attitudes, and cultural background? And which messages are more likely to be challenged by mental-counterarguing? A hypothesis is that a message that is deemed as inconvenient or goes against an individual's values and beliefs will create inner resistance and become harder to accept. The fundamentals of this concept can be applied to any topic— the mechanisms will function just the same. Perhaps this can raise the awareness about our conditionings of the past, how this affects our ability to objectively process new information and messages. To understand what reality really consists of can be challenging and almost impossible as our minds and the larger culture are built up of prior experiences and beliefs of the past (Festinger & Canon, 1965; Hamill et al., 1985; Fiske et al., 1990; Neuman et al., 1992; Kepplinger & Daschmann, 1997; Shen, 2004).

Furthermore, the power of communication and the media can be an effective tool in trying to create a lens in which we are looking at the world (Gamson, 1992). In today's society we are constantly under the influence of the media, both consciously and unconsciously (Van Gorp, 2007; Moser, 2009). Understanding how this can affect us and the implications of this can make us more aware and conscious of which input we want to help shape us. I would not go as far and directly state that we are being manipulated, but we are under *some* influence that can sway us in one way or the other— and gaining an understanding about this can help in our development in attaining a fairer democracy and higher level of free will (Chong & Druckman, 2007; Wise & Brewer, 2010). We have seen in the past, that politicians under campaigns when wanting to implement new policy measures, actively take part in mass communication strategies that can lead to action (Berbrier, 1998; Buijs et al., 2011; Gerbaudo, 2013; Cadwalladr, 2018; Goldhill, 2019; Merrill & Goldhill, 2020). We can ask ourselves the question, how much society has been nudged in a direction based on the lobbying power of the media, and to what degree the media has influenced the development of social construction. It is hard to say, as the construction of reality is an interplay of different factors in action simultaneously (Gamson, 1992; Kepplinger and Daschmann, 1997; Durham, 1998; Scheufele, 1999; Van Gorp, 2007).

Finally, what do we think about this concept of reality— and the power communication has had in influencing our perception of it? Is it morally correct and ethical of politicians, media, marketing and advertising to conduct mass communication campaigns that can influence the actions of the public? This question may be too big to answer in the present study, but spreading awareness about the mechanisms of the topic at hand can assist in understanding *how* we consume the input around us, and *how* it can influence and prime us when making decisions in the future.

1.2   BACKGROUND
1.2.1   Study background

The study aims to delve into issues regarding culture-sensitive communication in climate change and energy policy. One of the primary focuses is to establish an international research network of scholars centered at NTNU, which deals with communication obstacles and opportunities in promoting sustainable energy policies. Part of the theoretical foundation used in this paper was discussed during my project thesis in 2018/19: "*How can messages be adapted to the cultural environment they are*

emitted in?". The data collected in this study will be part of the pretesting of the stimuli for the larger experimental framing research that will be conducted in France, Germany, Poland and Norway. The set of cognitive frames that messages can address and build upon to enhance learning and persuasion vary between countries and change over time. Therefore, in cross-country comparison, the same frame may be very effective in facilitating learning and persuasion in one country, and very ineffective in another (Van Gorp, 2007).

Moreover, energy related issues are often complex or wicked as energy generation, distribution, and consumption are interdependent and have a technological and a social aspect to it, which both warrant attention (Head, 2008). Complex or wicked are issues that can be characterized as open-ended and intractable. Complexity also implies difficulty when defining the causal linkages of an event and the boundaries of their effects, and is often determined by the degree of uncertainty and social disagreement on a particular issue (Moser, 2009; FitzGibbon & Mensah, 2012). In addition, the social interdependencies between markets, consumers, products and value chains, with innovation, research, development, and government agencies reinforce established practice and make change slow and incremental (Geels, 2011). Tukker et al. (2008) argue that a "lock-in-effect" exists, where in practice sustainable choices are limited due to a given system of infrastructures, social norms and habits— "*consumer behaviour change is only likely if three components are addressed simultaneously: motivation/intent, ability and opportunity*" (Tukker et al., 2008). In order to have an overview and operate within a holistic mindset, a techno-socio-political approach should be the foundation for further research.

In this study, terms such as resonance, framing effects and mental-counterarguing will be explained and woven together towards predicting based on theory, whether or not framing will influence how a message is perceived and understood by the public in the Norwegian context— in later stages, which is beyond the scope of this thesis, the research design will be expanded to include other countries with a strongly different "energy culture" (Stephenson et al., 2015), building on the Norwegian findings.

1.2.2 Climate change and its implications

Climate change issues can be categorized as a wicked problem (Head, 2008), and a large body of literature argues that an interdisciplinary approach to solving such will be necessary (Schandl et al., 2015). Modern societies have many aspects and layers to them, where technology and social development go hand in hand— it is hard to decouple one from the other (Tukker et al, 2008; Geels, 2011). Implementing policy changes and new solutions in today's society requires an understanding of the social aspects within the society, the effects of these, and how open individuals are to change (Newman & Head, 2017). Climate change and its effects are one of the issues planet Earth and its inhabitants face today that is categorized as uncertain and ambiguous, with no clear solutions— it is messy, scattered, and solutions must emerge from the grassroot level of society (Wexler, 2009; Clayton et al., 2014). Understanding the complex interplay between the causes and effects takes time, and even with solid scientific information and analysis, there is still room for error as the waves of repercussions can touch upon all aspects of society in unpredicted ways (Head, 2014; Stoknes, 2014; Cann & Raymond, 2018).

Today, the number one driving force for climate change can be linked to human activities (Fischer-Kowalski et al., 2014; IPCC, Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change, 2014; Stoknes & Rockström, 2018). Climate research points to the same direction: anthropogenic interference with the Earth system has increased (Stoknes, 2014). Steffen et al. (2015) argues that in order to maintain a state of resilience of the Earth system, a shift in how contemporary human societies interact with the environment is needed. In order to mitigate the risk of destabilization, human societies must evolve towards operating within the planetary boundaries, which aim to define a safe operating space for anthropogenic activities that is sustainable (Stoknes & Rockström, 2018).

To which extent we are able to adjust our socio-metabolic rate in order to decrease pressure on Earth, will determine how well equipped we are able to mitigate the impacts generated from climate change (Fischer-Kowalski et al., 2014). Moreover, The Intergovernmental Panel on Climate Change

(2014) states that limiting global warming to 1.5ºC above pre-industrial levels will be preferable in order for our societies to be responsive to the consequences generated by climate change, and create a pathway for sustainable development. Despite the overwhelming evidence, societies are often inertial in changing convenient societal habits. Reaching the 1.5ºC target would require *"substantial and sustained reductions in greenhouse gas emissions"*, and *"rapid, farreaching and unprecedented changes in all aspects of society"* (IPCC, Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change, 2014).

Even though scientific evidence is clear on how anthropogenic activities influence the climate, Stoknes (2014) found that there is a decrease in concern and support by the public for changes in climate policies. The data and models that are available through climate science has become more and more reliable over the last 20 - 30 years, providing evidence and indication that the metabolism of our societies are affecting the Earth system in negative ways (Steffen et al. 2015; Stoknes & Rockström, 2018). Lack of public concern can create challenges and hinder development when ambitious climate policies are to be presented and integrated within our societies (Moser, 2009; Schandl et al., 2015; Cann & Raymond, 2018).

The inverse relationship between climate concern held by the public and scientific evidence about climate change can be described as the "climate paradox". Stoknes (2014) provides tentative explanations for why the climate paradox is being upheld: *"climate change perceived as distant in both time and space, the lack of a global treaty and political action, the quest for economic growth, the financial crisis, the complexity of the problem leading to numbing and helplessness, cultural filters, cognitive dissonance, limited individual responsibility, an active counter-campaign and denial as a fear-avoidance strategy"*. Understanding why conventional climate communication strategies have not been effective in resolving the climate paradox can serve as an important tool for developing more optimal strategies in the future. Studies concerning individual and social responses to climate change are becoming more established in the research arena for climate change and its consequences (Tukker et al., 2008; Geels, 2011; FitzGibbon & Mensah, 2012; Clayton et al., 2014; Fischer-Kowalski et al., 2014; Stoknes, 2014; Steffen et al., 2015; Schandl et al., 2015; 2015, Stephenson et al., 2015; Stoknes & Rockström, 2018).

1.2.3 Climate communication

Inconvenient messages, such as climate change, can easily lead to cognitive barriers which function as a defense mechanism to avoid thinking about the risks and dangers connected to the effects of climate change (Chong & Druckman, 2007; Moser, 2009; Stoknes, 2014). One of these cognitive barriers is mental-counterarguing, which is when individuals block out messages they don't want to hear, or make up their own arguments to why the message is wrong. Understanding the mechanisms behind mental-counterarguing can assist during the process of designing messages that will overcome cognitive barriers. In addition, human beings have a very limited capacity for what we most often worry about, which include concerns that are very close to us in proximity— such as our family, health, comforts and jobs. Climate change issues are so distant from our everyday lives that people often experience feelings of helplessness and lack of meaningful solutions, which can again contribute in distancing themselves from the issue (Moser, 2009).

Stoknes (2014) identifies that constructive messages, which contain solutions to a problem, can contribute in reducing denial and dissonance, and increase the probability for the message to be accepted by the public. Additionally, if a message resonates with and reflects public opinion, the values and interests of the population, the message will be more accepted without much resistance (Kubal, 1998). Messages that "fit" with the public's perception of reality will rarely be subject to mental-counterarguing (Gamson, 1992; Van Gorp, 2007; Stoknes, 2014; McDonnell et al. 2017). However, a good fit between a message and public opinion does not necessarily imply that the message serves the best solutions to the public/society. Experienced resonance by the public can be seen as the degree of fit between the message frame and the cognitive frames that exist in the public (Hamill et al., 1985; Van Gorp, 2007). Resonance is the outcome of different conditions and variables that must be present

simultaneously— (1) degree of fit; (2) values held by the public; (3) offer problem-solving; (4) culture and which frames fit with the perceived "truth" (Petty & Cacioppo, 1986; Gamson & Modigliani, 1989; Kubal, 1998; Gross & D'Ambrosio, 2004; Ettema, 2005; Gross, 2008; McDonnell et al., 2017).

In order to develop an efficient process of policy change and legislation, public support is needed (Head, 2008; Druckman and Bolsen, 2011; Gerbaudo, 2013; Cann & Raymond, 2018). Attitudes about climate change need to be aligned in order for action to take place (Stoknes, 2014). Since culture can be seen as the foundation of how people organize knowledge and perceive the outside world, it is important to integrate culture into communication (Kepplinger & Daschmann, 1997; Van Gorp, 2007). Not all messages will work in different societies, as different societies have different cultures, which have different "truths" (Buijs et al., 2011; Krippendorff, 2017). Moreover, the emergence of mental-counterarguments is often against subjective perceptions and judgments of messages that are inconvenient, and that spring out of deep-rooted cultural beliefs (Chong & Druckman, 2007). Framing processes can influence messages and their essence, and hopefully create a new pathway for optimal communication based on the cultural environment they are emitted in (Shah et al., 1996; Price et al., 1997; Valkenburg et al., 1999; Van Gorp, 2007). With the help of framing theory, information and data will be gathered through an investigation of the conditions under which acceptance of a message is stronger or weaker, concerning energy policy in Norway.

1.3   APPROACH
1.3.1 Structure of paper
This paper is composed of eight chapters. A summary is given in Table 1:

Chapter	Contents	Function
1. Introduction	Research problem, background and scope, motivation and aim	Research formulation and overview of the issue
2. Literature review	Previous research on the topic, framing, cultural resonance, communication	Theoretical framework
3. Theory	Framing effects, cognitive responses	
4. Hypotheses	Predictions	Research and implementation
5. Methodology	Empirical research, data gathering, design and procedure	
6. Results	Data analyses, statistics and findings	Results from the research
7. Discussion	Causality, other aspects to consider, discussion of relevant findings	Interpret and describe the significance of the results
8. Conclusion	Summary, implication of further research	Syntheses

Table 1: Structure of the paper

First, an introduction to the research problem will be given in Chapter 1, together with the background of the issue to illuminate the scope and extent of the topic. In addition, motivation and aim is stated. Second, a thorough literature review of previous research, theories and definitions will be presented in Chapter 2. Here, concepts are discussed and explained. Third, Chapter 3 addresses the theory that will serve as a basis for understanding how framing works, and how this can influence an audience. The main things that will be discussed here are types of frames, framing effects, cognitive functions and cognitive reactions. Next, Chapter 4 presents further research questions and a hypothesis for the study.

Predictions for how the participants will behave in the study is addressed. Moreover, the procedure is described in Chapter 5— alongside design and sample characteristics, and the dependent variables that were measured. Furthermore, the results are presented in Chapter 6. This is followed by a discussion, which will be in Chapter 7. In this chapter, limitations to the study and afterthoughts are included. Finally, Chapter 8 will be concluding remarks and a short summary of the whole paper.

1.3.2 How to answer the research questions

The present study will be a social science experiment through an online survey. The study background is to observe the comprehensibility of information-rich media content and features of the message and the presentation that increase or decrease comprehensibility. In what context and under which conditions does a message become accepted by the public? The goal is to create a realistic setting, demonstrating the practical relevance of the factors the experimental stimuli operationalize. Moreover, the study will be a baseline pretest that establishes the fundamental prediction that a message frame affects beliefs, attitudes, and behavioural intentions. In the study there are four different versions of a short article, and five experimental conditions. The study tried to probe to what extent processing of the information in the second, longer article— which was the same in every experimental condition— conditional on which short article they had read before. The presumption is that people will pay more attention to those aspects of the long article that match the theme of the short article. Hopefully the results will contribute in answering the broader research question, stated as: *How do people cognitively deal with multifaceted issues?*

Moreover, ways of reasoning and the process of reaching a conclusion will vary based on how a message is presented (Entman, 1993; Semetko & Valkenburg, 2000; Chong & Druckman, 2007). How a problem is being presented and portrayed can often influence how a solution is being reached by the participants. The shorter articles can demonstrate that emphasizing on *"qualitatively different yet potential relevant considerations"* (Chong & Druckman, 2007) can affect beliefs and decision-making based on which frame the participants were presented with (Borah, 2011; Lecheler & de Vreese, 2011).

Chapter 2: Literature review

2.1   EXISTING LITERATURE
2.1.1   Different bodies of literature
An overview of the chosen existing literature is listed in Table 2:

Topic overview	Literature
General framing	Chong & Druckman, 2007; Durham, 1998; Entman, 1991; Entman, 1993; Gamson & Modigliani, 1989; Gamson, 1992; Krippendorff, 2017; Price & Tewksbury, 1997; Scheufele, 1999; Van Gorp, 2007
Capture of frames/types of frames	Matthes & Kohring, 2008; Pan & Kosicki, 1993; Rhee, 1997; Semetko & Valkenburg, 2000; Van Gorp, 2005
Information processing/cognitive responses	Fiske et al., 1990; Hamill et al., 1985; Kepplinger & Daschmann, 1997; Neuman et al., 1992; Perse, 2001
Experimental framing studies	Borah, 2011; Dardis et al., 2008; de Vreese & Elenbaas, 2008; Druckman & Bolsen, 2011; Gross & D'Ambrosio, 2004; Gross & Brewer, 2007; Gross, 2008; Kahneman & Tversky, 1984; Lecheler & de Vreese, 2011; Matthes, 2009; Price et al., 1997; Shah et al., 1996; Shen, 2004; Schuck & de Vreese, 2008; Tversky & Kahneman, 1981; Valkenburg et al., 1999; Wise & Brewer, 2011
Communication/psychological processes	Bennett & Iyengar, 2008; Cann and Raymond, 2018; Festinger & Canon 1965; Heider, 1946; Katz, 1947; Matz et al., 2017; Moser, 2009; Nickerson, 2000; Petty & Cacioppo, 1986; Rosenberg, 1956; Sternberg & Sternberg, 2012; Stoknes, 2014
Climate change issues	Clayton et al., 2014; Fischer-Kowalski et al., 2014; FitzGibbon & Mensah, 2012; IPCC, Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change, 2014; Steffen et al., 2015, Stephenson et al., 2015; Stoknes & Rockström, 2018; Tukker et al., 2008
Resonance/cultural resonance	Berbrier, 1998; Buijs et al., 2011; Ettema, 2005; Ferreira, 2004; Gerbaudo, 2013; Kubal, 1998; McDonnell et al., 2017
Public policy/societal issues	Geels, 2011; Head, 2008; Head, 2014; Newman & Head, 2017; Rittel & Webber, 1973; Schandl et al., 2015; Wexler, 2009
Website articles	Cadwalladr, 2018; Goldhill, 2019; Gordon, 2012; Merril and Goldhill, 2020; Ntnu.edu, 2019

Table 2: Existing literature

Table 2 gives an overview of the literature, starting from *general framing*, which discusses the definitions and concepts of framing. Next, *capture of frames/types of frames* addresses the different types of frames that exist— their characteristics and functions, and how different frames can influence an audience. *Information processing/cognitive responses* describes how framing influences individuals in a more theoretical manner— how different functions in an individual's mind gets affected by framing, and how this process is taking place. Next there is a body of literature regarding *experimental framing studies*, which are studies that have been done regarding an experiment about framing and their influence on individuals. Moreover, literature on *communication/psychological* processes discuss how individuals respond to communication, and addresses any cognitive barriers or hinders regarding communication. Literature on *climate change issues* are also included, with it being mostly reports and research regarding how the planet is changing and mitigation of consequences. Furthermore, *resonance/cultural resonance* describe how culture is an important factor to consider in communication, as it influences how individuals perceive their reality or "truth". The literature also includes topics as motivating into collective action and problem-solving in a society. *Public policy/societal issues* address issues that are difficult to solve, how to tackle policy issues and changes, and works as arguments for why communication is important when dealing with issues such as climate change. Last, there are some website articles included, which are mostly about mass communication strategies in recent times.

As mentioned, the background of the study is to observe the comprehensibility of information-rich media content and features of the message based on different presentations that can either increase or decrease comprehensibility. To get an understanding of this, different literature about framing have been used— from theories of what framing is as a concept, to the different types of frames, to information processing when faced with frames, to experimental framing studies which observe the link between framing and behaviour/thoughts/values/beliefs. Next cultural resonance, communication and cognitive processes are explained and integrated together with framing, which will help in giving a deeper and broader insight into the topic. If a message fits with the cultural ideas and ideals of the public, it will be easier treated as a given truth, and chances are less for mental-counterarguing (Kubal, 1998; Chong & Druckman, 2007; Van Gorp, 2007; McDonell et al., 2017). There is also literature regarding climate change issues and public policy/societal issues to give a more solid foundation for this study.

2.1.2   Framing

Framing focuses on how a story or a message is presented (Durham, 1998; Price and Tewksbury, 1997; Entman, 1991). Entman (1993) defines it as "*framing is selecting "some aspects of a perceived reality" to enhance their salience "in such a way as to promote a particular problem definition, causal interpretation, moral evaluation, and/or treatment recommendation*". Framing can be used when constructing a problem, provide a perspective from which to interpret it, help perceive some aspects of it, while disregarding or overlooking others, and influence how persuasive we find the information being communicated (Moser, 2009). Moreover, Van Gorp (2007) defines frames as "*conceptual tools which media and individuals rely on to convey, interpret, and evaluate information*", meaning that framing will influence how an audience read and perceive a message (Shah et al., 1996; Price et al., 1997; Valkenburg et al., 1999). Chong and Druckman (2007) state that even small and subtle changes in how an issue is presented, can result in changes in attitudes and opinions held by the audience.

As Tversky and Kahneman (1981) addresses, there exist psychological principles that influence how individuals perceive decision problems and evaluation of the different options— where decision problems are characterized by which people systematically violate the requirements of consistency and coherence. The frame that is used to display the different problems will influence how individuals reach their decision by the formulation of the problem. The same logically formulated problem can make individuals reach different solutions, based on the impression the formulation gives. This type of framing mechanism is equivalence framing, and can showcase how framing works in terms of manipulating the perception of the problem/issue (Kahneman & Tversky, 1983; Entman, 1993; Price & Tewksbury, 1997; Sternberg & Sternberg, 2012). For instance, how individuals perceive a problem can be explained

through the thought experiment on "the glass is half full" vs. "the glass is half empty". Here, the same problem will be perceived either as a positive (gain) or a negative (loss), depending on which perspective the problem was formulated in.

Van Gorp (2005) states that the frame is not the message in itself, rather it serves as a guideline for the audience to understand the message in a certain way— frames have become a tool for meta-communication. In Krippendorff's (2017) conception, framing is the process of moving from one reality to another. He recognizes that we are always existing within one frame or another, whether it is conscious or subconscious— until meta-communicative instructions lead us into another reality in which a different set of rules apply that change our beliefs, attitudes and behaviour. A frame can mark the difference between two realities, two distinct sets of mindsets and behaviour; and can help in analysing the continuous construction, deconstruction, and reconstruction of the social realities that exist. Furthermore, elements such as symbols and metaphors can influence opinions through metacommunication and heuristics (Gamson, 1992). Arguments that are built around the fears and prejudice of the public can provoke feelings and make them seem important, even though their relevance and fairness may be minimal. Frames can also stimulate good feelings and associations when providing solutions or a mindset to solve a problem (Gross, 2008). Strong frames have the ability to convey messages that are seemingly congruent to the beliefs and values held by the public (Chong & Druckman, 2007).

Scholars and practitioners increasingly recognize the importance framing has to say for communication, and can never be isolated from the environment that they operate in (Gamson, 1992). A message can be interpreted and decoded in various different ways, depending on the existing cognitive frames than an individual has/uses/applies (Hamill et al., 1985; Fiske et al., 1990; Neuman et al., 1992; Pan & Kosicki, 1993; Rhee, 1997; Druckman & Bolsen, 2011), which are organized patterns of thought or "*mentally stored clusters of ideas that guide individual's processing of information*" (Entman, 1993). Kepplinger and Daschmann (1997) raise the question of whether cognitive structures are a consequence of real-life experiences, or formed by prior media coverage. Both seem to be true, as cognitive structures emerge out of an interplay of different factors (Durham, 1998; Scheufele, 1999). On the one hand, the media have a strong influence in constructing social reality, and on the other hand the audience shape what is accepted and not (Pan & Kosicki, 1993; Van Gorp, 2007). This interplay between the media and audience is the foundation on which our "truths" (belief/values) can exist.

Moreover, framing in communication can become an important tool when wanting to influence how the public will interpret a message, and must be strategically and thoroughly thought out in order for the communication to be effective (Moser, 2009). For climate change issues, scientific information has been available to us for a very long time. Climate discourse first appeared on the public agenda in the mid-to-late 1980s, and soon after, climate researchers have claimed that climate change is one of the greatest threats towards humanity (Fischer-Kowalski et al., 2014; Stoknes & Rockström, 2018). However, Moser (2009) finds evidence that there are still many with a direct stake in maintaining the status quo, and have emerged as loud spokespersons against the need for mitigation policies and change. Cann and Raymond (2018) describes that frames which focus on downplaying the information about climate change and use denialism as a framing strategy are still being used. Yet, communication about the environment and scientific information regarding it has improved public awareness, especially in the developed countries. The perceived sense of urgency, concern and importance vary greatly across different cultures and nations (Moser, 2009; Stoknes, 2014).

There exists a body of literature on experimental framing studies, which specifically study the effect and interaction of framing and attitudinal/behaviour change and individual preferences. Several studies, such as Shah et al. (1996), Shen (2004), Schuck and de Vreese (2008), de Vreese and Elenbaas (2008), Dardis et al. (2008), Matthes (2009), and Wise and Brewer (2010) focuses on how framing can influence behaviour and attitude in political campaigns, voting intentions and positions between candidates and/or policymakers. Prior research has indicated that media framing in particular has the potential to influence what individuals take into consideration when forming opinions and making decisions on especially controversial/ambivalent issues. By selecting and highlighting certain facts while excluding other information, frames can have a powerful impact on public opinions and audience

interpretations of issues and events. Lecheler and de Vreese (2011) studied the duration of framing effects, and what happens to them after the initial exposure— whether they vanish or persist and whether they influence real-life opinions and attitudes over time. Druckman and Bolsen (2011) studied framing and motivated reasoning— how the success of any emergent technology largely depends on public acceptance.

Moreover, Tversky and Kahneman (1981) and Kahneman and Tversky (1984) looked at how the way a problem is described, written and presented can influence the decisions made by the audience. In their studies, they observe decision problems and the psychological principles that govern the perception of these, and the evaluation of options. The studies by Price et al. (1997) and Valkenburg et al. (1999) both observe the cognitive responses of news frames in the audience based on the different types of frames (conflict frame, human interest frame, consequence frame, morality frame, responsibility frame). Different journalistic story frames can affect the thoughts and feelings of the audience. Furthermore, the studies by Gross and D'Ambrosio (2004), Gross and Brewer (2007) and Gross (2008) looked at how people experience emotions as a product of their cognitive judgments and evaluations about an issue, and that different types of frames (episodic frames vs. thematic frames, conflict framing vs. substance framing) can influence these judgments, hereby the emotions. Borah (2011) observed the influence of competitive frames and motivated processing, and the process of seeking more information and conversation when wanting to make a decision.

2.1.3 Climate change as a wicked problem

Head (2008) describes that "wicked problems" are generally seen as complex, open-ended and intractable. Often these problems include societal and technological aspects, and cannot be solved without a holistic perspective. The boundaries of wicked problems are hard to define and delineate, and because of its interdisciplinary nature they can touch upon several aspects of society. The solution pathways are often indeterminate and ambiguous, in addition to being prone to unintended consequences. Wexler (2009) describes that there are two defining characteristics of wicked problems: the scarcity of available information and difficulties in interpreting it. In regards to climate change policy action, a deeper comprehension in public understanding and reliable knowledge on this particular policy issue is needed in order to prevent ill-equipped problem solvers (Wexler, 2009; Clayton et al., 2014; Head, 2014; Stoknes, 2014; Cann & Raymond, 2018). Implementing new policies can be tricky due to the fact that policy problems can exhibit wicked tendencies (Newman & Head, 2017). This means that an increase in scientific information available to decision-makers will not necessarily result in an optimal and effective way to solve these problems. To be able to adapt new problem-solving skills and methods, there must be room for an arena where dialogue can function as a tool to identify and deal with wicked problems.

The term wicked problems were first defined by Rittel and Webber (1973) in a paper dealing with the confrontation of social policy problems. They identified ten characteristics of wicked problems: (1) there is no definitive formulation of a wicked problem, even the definition and scope of the problem is contested; (2) wicked problems have no definitive solution; (3) solutions to wicked problems are not true or false, but good or bad in the eyes of stakeholders; (4) there is no immediate or ultimate test of a solution to a wicked problem; (5) every (attempted) solution to a wicked problem is a one-shot operation— the results cannot be readily undone, and there is no opportunity by trial and error; (6) wicked problems do not have a clear set of potential solutions; (7) every wicked problem is essentially unique; (8) every wicked problem can be considered to be a symptom of another problem; (9) the existence of a discrepancy can be explained in numerous ways; (10) the planner has no right to be wrong— there is no public tolerance of experiments to fail (Rittel & Webber, 1973).

Wicked problems tend to score high on aspects such as complexity, uncertainty and value divergence, and can be seen as a combination of these. Head (2008) discusses these terms where "complexity" is characterized by interdependencies of elements and subsystems. "Uncertainty" is seen in relation to risks, consequences of action and changing patterns. Lastly, "divergences" imply fragmentation in viewpoints, values and strategic intention. All these three elements must be present in

order to characterize a problem as wicked. Climate change policy can be categorized as a wicked problem, characterized with non-immediacy, blame shifting and responsibility shifting. It is a series of interlinked issues, which cannot be dealt with in isolation. The impacts are varied and diverse and happen simultaneously on many levels such as: short-term, long-term, global, national, regional and local. Moreover, the scientific information available, or knowledge base, has been contested. Viewpoints and perspectives are polarized, even though there has been a growing consensus due to research. Next, allocation of responsibility is extremely difficult as there is no clear actor who is responsible for creating or solving these issues. It will be tricky to make the right decisions in terms of effectiveness of the instruments, forms of regulatory mandate and market-based mechanisms, and which decisions will be politically and publicly accepted (Rittel & Webber, 1973; Head, 2008). What is certain is that there is no right or wrong solution, however the outcome may be good for some but not for others (Wexler, 2009).

2.1.4 Psychological barriers

In communication and language there will always be psychological barriers, and Katz (1947) accredited part of this due to the emotional character and mental limitations of human beings. These barriers are hindrances that can prevent the intended meaning of a message to reach the audience or from reaching a specific goal through communication, like for instance when mental-counterarguing arises. In terms of climate communication, it is important to design messages in such a manner that overcoming cognitive barriers is possible, and understanding which mechanisms individuals use to block inconvenient messages necessary for a more effective way of communicating.

In the past decade, more time has been invested in the research of climate communication and its impact, and the issue is perceived more important for the future. Moser (2009) and Stoknes (2014) provide some explanations to why the nature of the climate issue is extremely challenging to communicate. The first factor is what Moser (2009) describes as invisible causes, meaning that the traits and symptoms of climate change are not visible for us to notice, making it hard for immediate action. Next is the perceived distance of the issue, both in space and time (Stoknes, 2014). The lack of immediateness can be caused by the temporal and geographic distance between cause and effect (Moser, 2009). In addition to this, climate issues have often been communicated through frames which focus on disaster and doom. This can backfire due to the fact that the public does not feel any hope or autonomy that their actions can better the situation. The result can be dissonance, where the lack of convenient climate friendly behaviours can weaken the overall attitudes over time. Since climate change threatens our survival, it is uncomfortable to accept all the existing scientific information— denial can give refuge from fear, guilt and threats.

Stoknes (2014) also talks about identity, and how attachments and identity can activate cultural filters so that one's identity overrides the facts and information that is available. Any new knowledge that might be a threat to existing beliefs, values and ideas will be subjective to mental sparring, and can cause uncomfortable sensations to arise (Kepplinger & Daschmann, 1997; Shen, 2004; Chong & Druckman, 2007; Clayton et al., 2014). Furthermore, the lifestyles of modern humans have changed from our ancestors'. The landscapes have been vastly altered by humans— we spend most of our lives in climate-controlled buildings and modes of transportation. Interaction with nature is minimal, making it hard to notice subtle, incremental environmental changes (Clayton et al., 2014). There is also a delayed or absent gratification for taking action, and the lags in the climate systems and the cumulative nature of emissions make it difficult to observe the link between taking mitigation action and seeing beneficial changes in the climate. Oftentimes the public will express disbelief that humans can alter the global climate, which makes sense since we are biologically wired to react to dangers that are immediate— survival has always been a constant interaction directly with the environment and its inherent challenges (Moser, 2009).

2.1.5 Resonance

Interpreting and decoding a message depends on an active process in which context, social location, and prior experiences play a role (Gamson, 1992). Kepplinger and Daschmann (1997) reason that personal experiences and cultural traditions will influence an individual's subjective procreation of perception and understanding of reality. Van Gorp (2007) explains culture as: *"organized set of beliefs, codes, myths, stereotypes, values, norms, frames, and so forth that are shared in the collective memory of a group or society"*. Moreover, culture brings with it a different set of "truths" that is held by its respective public, which serve as a normative guideline to comprehend how the external world works (Van Gorp, 2007; Moser, 2009). As a consequence, messages that contain cultural elements and information that are in line with what the public holds as true, will have more potential in influencing the public and lead to collective action (Kubal, 1998). In this paper, the literature on cultural resonance is linked to persuasion literature on mental-counterarguing (Petty & Cacioppo, 1986) and the long-standing tradition in studying selective exposure and selective processing (Bennett & Iyengar, 2008), based on consistency theories (such as theory of cognitive dissonance, theory of cognitive-affective consistency, balance theory, or confirmation bias) (Heider, 1946; Rosenberg, 1956; Festinger & Canon, 1965; Nickerson, 2000).

Language use, ideas and values are all factors that play a role in creating resonance, which can be described as the level of fit between a message and the audience's perception of reality (Gamson & Modigliani, 1989; Ettema, 2005; McDonnell et al., 2017). Word choice, metaphors, descriptions, arguments, and visual imagery present in a story will function as a medium in which meaning to an issue can be manifested through. (Pan & Kosicki, 1993; Matthes & Kohring, 2008). These elements are put together, creating a larger package which is referred to as frames (Van Gorp, 2005). The concept of framing essentially involves selection and salience within a communicating text (Entman, 1993), and focuses on how a story or a message is presented (Price & Tewksbury, 1997; Moser, 2009). If a message resonates and reflects with the public's values and interests, the message is more likely to be accepted without much resistance (Kubal, 1998; Ferreira, 2004; Buijs et al., 2011). Moreover, Van Gorp (2007) understands framing as a bridging concept between cognition and culture. Since resonance exists through interactions, it is never static and constantly shaped. Additionally, resonance can happen when cognitive distance is experienced; the object offers a solution, which the audience experiences as neither too familiar nor too disruptive of their prior beliefs (Gross & D'Ambrosio, 2004; Van Gorp, 2007; Gross, 2008; McDonnell et al., 2017).

Furthermore, resonance has a lot to do with perceived trust— and to understand trust, the relationship it has with risk and gain must be included. It is these three notions that are often included and interweaved in most popular media narratives. When an interpretative package appears natural and familiar, resonance increases. Ettema (2005) as well as Kubal (1998) identified three factors that influence the level of fit between the public perception and frames: (1) Empirical credibility— is there evidence for, and to what degree is the social problem as captured within the frame believable; (2) Experimental commensurability— how fitting is the frame to the audiences' prior experiences; (3) Narrative fidelity— the level of fit between the frame and to the audiences' cultural narratives. Buijs et al. (2011) observe that cultural resonance happens when elements of a certain frame correlates with specific items within a culture, and depends on: (1) salience of beliefs and values; (2) resonance with every day-life experience; (3) resonates with dominant storylines.

Moreover, Gerbaudo (2013) observes that for an idea to spread transnationally, the successful reception depends on the ability of the social environment to achieve cultural resonance in new geographic areas. There exist a lot of barriers within the global landscape, which are highly segmented and divided in terms of language, culture and religion— these serve as obstacles to the transnational transmission of ideas. Failed attempts in transmission of ideas transnationally have primarily been attributed to the inability to "import" certain frames, and the lack of resonance it has with the public. Berbrier (1998) mentions that *"successful social movements depend on, in part, on how arguments are "framed and the degree to which they resonate with the targets of mobilization""*. Additionally, he states that culture is internalized into individuals' affective meaning systems, and therefore has a great influence in behaviour and cognition. Affect control theory can explain why individuals are motivated to

act/think in a way that confirms their fundamental sentiments about the social reality they exist in. Buijs et al. (2011) describe that social representations theory can explain how different social groups can have different understandings/perceptions about an object, and that the different understandings will influence their communication/behaviour toward that object. Van Gorp (2007) mentions that because societies and cultures are different, they carry with them a limited set of cognitive frames. Moreover, cognitive frames will play a role in information processing (Hamill et al., 1985), hence, the same message can in one society work well, while in another backfire completely (Gerbaudo, 2013)— due to the different cognitive frames that are present.

2.2   CONTRIBUTION TO A NEW PARADIGM

Framing is tightly knit with the fields of cognitive psychology, anthropology, communication and culture (Van Gorp, 2007). The origins and conceptualization of framing have emerged from different fields. Knitting together framing with cultural resonance will hopefully shed more light on effective climate communication strategies, which can be used in specific areas to engage in action and mitigate some of the effects of climate change. Stoknes (2014) mentions that: *"Through the use of such a multidisciplinary approach, we can develop an evidence-based range of practical communication solutions for overcoming the psychological climate paradox"*. However, Gordon (2012) comments that there are some risks regarding effective communication, which are: *"the exposure of the way we really are and the possibility of becoming different"*. This implies that there are some aspects with respect to communication that will influence and persuade our belief system, values and attitudes.

In recent years, communication as a tool for influencing behaviour has become even more important to be aware of, especially in light of Cambridge Analytica (Cadwalladr, 2018; Goldhill, 2019; Merrill & Goldhill, 2020)— where its ability of targeted communication with ads based on the audiences' psychological traits has managed to manipulate them in terms of political preferences and voting behaviour. The data gathered from the audience about the audience themselves, was unknowingly collected through the social media website, Facebook. The data can give indication about the audience: their personality based on "likes" and which social groups they belong to— which proves vital for effective communication, as social contagion has a massive influence on behaviour (Berbrier, 1998; Buijs et al., 2011; Gerbaudo, 2013). Our digital footprints can lead to an understanding of how each individual think, their attitudes, wishes, and needs— which can help in tailoring effective communication strategies in order to influence their choices in accordance to the goal of the message. This is due to the message being as "true", and can provide the audience with solutions to their problems and create resonance.

Matz et al. (2017) found evidence that *"the application of psychological targeting makes it possible to influence the behavior of large groups of people by tailoring persuasive appeals to the psychological needs of the target audiences"*. However, what convinces one individual to choose and behave in a desired way may not do so for another. Scaling this concept up to a larger group of people, society or culture, will somehow create the same effects— due to cultural cognitive schemas— what people perceive as the truth (Van Gorp, 2007). There can be huge benefits of this method of communicating when wanting to influence individuals to make behaviour change. However, the same targeted communication for behavioural change can also lead to potential pitfalls regarding manipulation and influence toward behaviour that is not in the individuals' best interest.

Chapter 3: Theory

3.1 FRAMING

3.1.1 Types of frames

As of today, there exist a handful forms of frames in the news media, which all have a distinct set of characteristics. Each frame represents a focus, a lens, in which the message is being presented through. Semetko and Valkenburg (2000) discusses the five types of frames that have been identified in various earlier studies, and is presented in Table 3:

Type of frame	Focus	Characteristics
1. Conflict frame	Conflict between two (or more) opposing groups/individuals	Conflict can attract audience interest, complex issues can be oversimplified, shallow content
2. Human-interest frame	Applying an emotional/dramatic angle to the presentation of a message	Engages the audience's feelings by personalizing the message, making them more relatable
3. Economic consequence frame	Economic consequences following/associated with a message (event, issue, problem)	Level of impact can be on an individual/group/national/global level etc., risk versus gain
4. Morality frame	The moral/ethical aspect connected to the message	Usually appears after an event that causes some controversy, serving as a moral prescription on how to behave
5. Responsibility frame	Attempts to identify and attribute who/what is responsible for causing/solving different events	Failing to look at the bigger picture, as there seldom is only one actor responsible (especially in complex issues)

Table 3: Types of frames

Framing has the capacity to tell the public *how* to think about certain issues and events (Valkenburg et al., 1999). Even if the reasoning device is not explicitly stated in the message, the audience will interpret the information with respect to the frame (Shah et al., 1996; Price et al., 1997; Valkenburg et al., 1999). The consequences of different frames regarding public interpretation of events and issues will vary from culture to culture (Gamson & Modigliani, 1989; Neuman et al., 1992; Semetko & Valkenburg, 2000; Van Gorp, 2005). Price et al. (1997) found that frame-induced knowledge activation can influence problem-solving and decision making by shaping the information/considerations/constructs that enter the minds of the audience members. Information that is readily accessible in the minds of the audience is more likely to be activated (Perse, 2001). Ideas and feelings that are not already in mind, but are induced by the salient attributes of the current situation can also play a role in knowledge activation.

In this study, four different frames will serve as the lens in which the audience is being tested for recall of information, mental-counterarguing and cognitive responses. These frames will focus on: environmental impacts, a neutral frame (growth in Norway), electricity prices, and greenhouse gas emissions. The frames are represented in four different short articles. These frames will serve as a foundation for observing how they affect the participants, while trying to induce different knowledge activation. The different frames are meant to trigger associations that can resonate with different emotions, ideas and information.

3.1.2 Framing effects

Semetko and Valkenburg (2000) describe framing effects as: *"one in which salient attributes of a message (its organization, selection of content, or thematic structure) render particular thoughts applicable, resulting in their activation and use in evaluations"*. Small changes in how a message is presented can sometimes produce large changes in opinions (Chong & Druckman, 2007). Framing effects can persist beyond initial exposure for a longer period of time (Lecheler & de Vreese, 2011). Moreover, the same message containing an equivalence of logical information can purposely be phrased differently, for instance as a loss or a gain. This process is referred to as *equivalency framing effects*, where the difference in phrasing will guide and influence the audience to interpret the message in different ways, affecting reasoning/evaluation/problem-solving/decision making (Tversky & Kahneman, 1981; Kahneman & Tversky, 1983; Entman, 1993; Price & Tewksbury, 1997; Sternberg & Sternberg, 2012). *Emphasis framing effects* refer to the process where a subset of considerations in a message is emphasized, making the audience focus on these considerations in their decision making, in addition to establishing hierarchies among competing frames (Borah, 2011).

In order for framing effects to occur, a given consideration must be available to the individual—stored in memory to be available for retrieval and use. This is a part of the *mediational processes* behind framing effects, which is about retrieval and use of memory/beliefs/considerations, of which opinions form and are drawn upon. Next, the consideration must be accessible and retrieved from long-term memory ("ready for use"). Not all beliefs can become accessible at a given moment— recent or frequent exposure to frames that induce a given consideration can help to increase accessibility (Price & Tewksbury, 1997). Depending on the motivation of each individual, different competing considerations that either come in mind spontaneously or are suggested by a frame, will be weighed against each other when engaged in an evaluation-process of options (Perse, 2001). The context of the consideration will also influence which consideration is perceived more applicable out of the individuals' accessible interpretations (Chong & Druckman, 2007; Lecheler & de Vreese, 2011). Figure 1 from Price and Tewksbury (1997), illustrates how the process of construct activation and use over time appears.
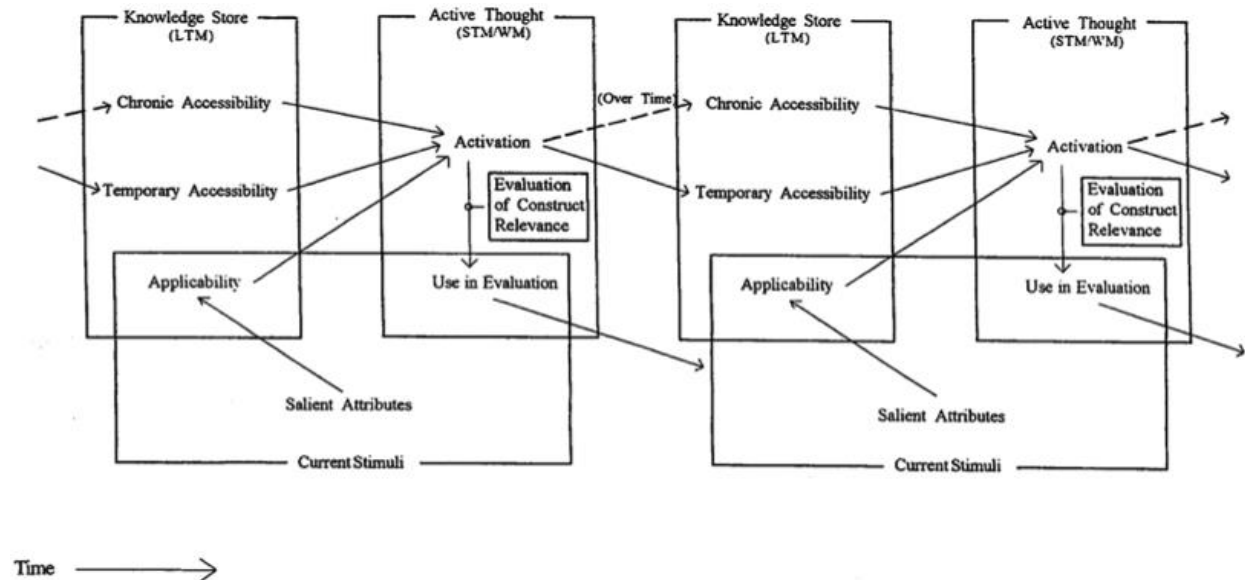

Figure 1: Process of construct activation and use over time: Price & Tewksbury (1997)

Variables that condition framing effects are called *moderators*, which are the individual's predispositions (values, opinions, beliefs). The framing effects are reduced by the increase of one's resistance to disconfirming information, and especially in individuals who have strong predispositions (Borah, 2011). On the other hand, after controlling for prior attitudes and opinions, knowledge can enhance framing effects due to a higher probability that the considerations emphasized in a frame will be available or comprehensible to the individual (Perse, 2001). The more an individual knows the higher the likelihood

that a belief will be retrieved and become available upon a given stimulus (Chong and Druckman, 2007). Additionally, frames that are able to connect through cultural values and have a strong perceived credibility connected to them, will have a stronger frame reception and acceptance (Gamson, 1992; Berbrier, 1998; Kubal, 1998; Semetko & Valkenburg, 2000; Van Gorp, 2007; Gerbaudo, 2013).

Effects of *competition* can be observed when there exist competing frames/perspectives on issues in the media. When the audience is offered a set of differing perspectives, they often tend to choose the alternative that is consistent with their prior values and beliefs (Kubal, 1998; Shen, 2004). Knowledgeable individuals are more likely to express a preference on the issue that is consistent with their values. Chong and Druckman (2007) found in their research about competitive frames that individual preferences are a function of prior values and the relative strengths of the competing frames. If an issue is perceived as ambiguous— uncertain (incomplete information) and ambivalent (conflicting cognitions) individuals tend to seek more information to minimize the ambiguity (Scheufele, 1999). Motivated processing and willingness to seek information can intensify framing effects (Borah, 2011). In addition, an interpreter can sort out inconsistent information and fill in missing parts of a story in order to construct coherent representation of the situation (Rhee, 1997). Opposing frames can stimulate good public discussions, and being open for different perspectives and weighing in contrary evidence are important aspects of a functioning democracy (Chong & Druckman, 2007; Wise & Brewer, 2010).

Furthermore, frames that are appealing to the audience will be present in public discussions, making them stronger (Entman, 2003; Chong & Druckman, 2007). These frames are perceived to be more compelling and "true" compared to alternative arguments, and have the ability to convey messages that are seemingly congruent to the beliefs and values held by the public. Elements such as symbols that can resonate with ideology and culture can influence opinions through metacommunication and heuristics (Semetko & Valkenburg, 2000; Ferreira, 2004; Ettema, 2005; Van Gorp, 2005; Sternberg & Sternberg, 2012) and create resonance with the audience (Berbrier, 1998; Kubal, 1998; Buijs et al., 2011; McDonell et al., 2017). Moreover, increased factual information does not indicate more acceptance with the public (Druckman & Bolsen, 2011; Stoknes, 2014). Frames that provoke feelings and emotions in the audience, good or bad (depending on the subject at hand), can increase framing effects— either by focusing on fears and prejudices of the public or providing solutions to solve a problem. Since emotions usually emerge out of the cognitive evaluations of a cognitive context, they do play a role in shaping the perceived position and acceptance/denial of a frame (Gross & D'Ambrosio, 2004; Gross, 2008).

3.2   INFORMATION PROCESSING
3.2.1 Cognitive functions
Pan and Kosicki (1993) argue that frames function as a composition of both internal structures of the mind and media constructions of reality embedded in media. The conceptions of framing can be explained through a sociological perspective and psychological perspective— where in the first one frames are seen as a schema of interpretation which individuals use to locate, perceive, identify and label life experiences to make sense of them. In the psychological conception frames are templates/data structures that organize pieces of information in cognitive representations/individual schemas— a meaningful structure of related concepts (Sternberg & Sternberg, 2012). The existing cognitive structures in an individual is shaped by among other things (prior experiences, knowledge, culture, traditions, beliefs, environment) former media coverage, and will to an extent condition the mind (Festinger & Canon, 1965; Hamill et al., 1985; Fiske et al., 1990; Neuman et al., 1992; Kepplinger & Daschmann, 1997; Shen, 2004).Figure 2 from Scheufele (1999) illustrates the interconnectedness between the media and the audience in three continuous processes: inputs → process → outcomes (and the processes in between which influence the inputs and outcomes).
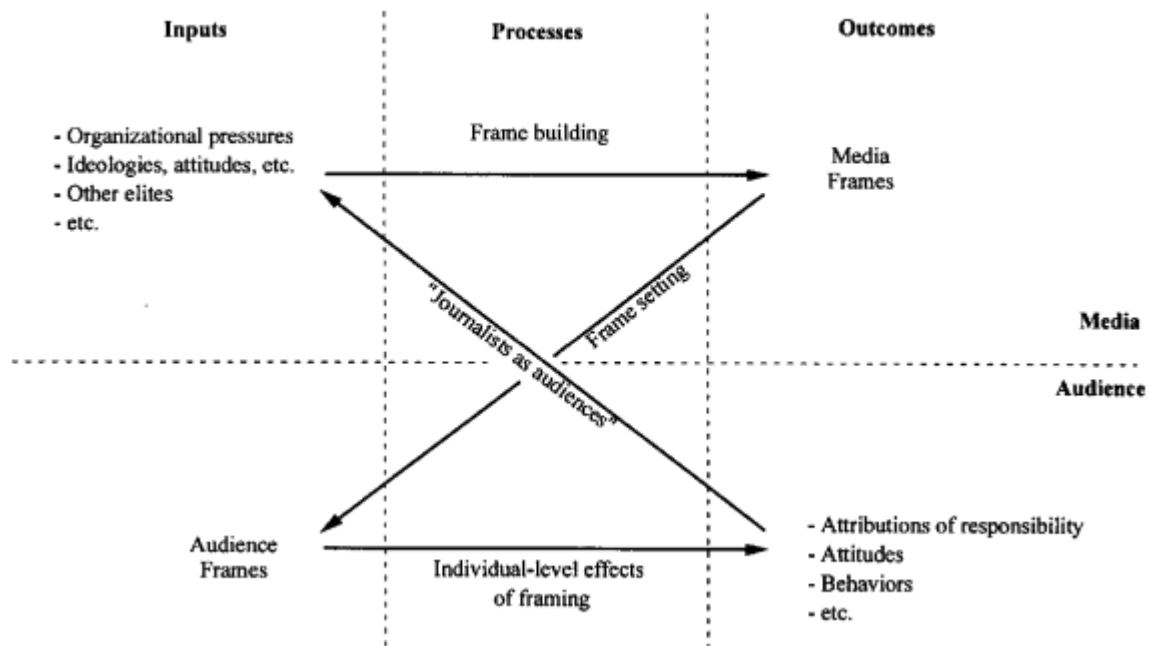
Figure 2: Process model of framing (inputs, processes, outcomes): Scheufele (1999)

As individuals get confronted with information, the relevant schema, or attitude structure, is located in order to guide their processing. As a mediational process, both frequency and recency of use will influence and determine which schema is being activated. Exclusion of information on the one hand, and selecting and highlighting other information on the other, can have a powerful impact on audience interpretations of issues and events (Shen, 2004; Bennett & Iyengar, 2008). By emphasizing on particular values present in the society, *value framing* seeks to shape policy debates about social issues. Within individuals, core attitude exists to fulfil certain individualistic needs (Heider, 1946; Rosenberg, 1965), and attitudes can have more than one function— Shah et al., (1996) identified schematic function, which provides individuals with a frame of reference for understanding attitude objects, and value-expressive function, which affirms one's core values and defending of self-concept. An individual's self-concept is often linked to strong feelings of ethics and moral, hence, value framing containing ethical/moral interpretations will likely guide and influence an individual's decision-making strategy (Kubal, 1998). This function when aggregated to a social level (social attitudes) is the *social representations theory*, which describes how different social groups understand an object differently from others and with regards to this will communicate and behave according to their understanding toward a given object, and what value the object has been given (Buijs et al., 2011).

In order to shape public opinion about a policy issue the frames existing in society must typically compete with one another to "win" a position in the audience's mind and use them to form opinions. These frames exist in the communicator, the message itself, the receiver/audience, and the broader culture in which it operates (Wise & Brewer, 2010). The frames that are experienced as resonant (and accepted) are perceived to solve problems better than the alternative frames that currently exist (McDonnell et al., 2017). The experience of resonance is strongly linked with the attitudes of the audience.

Petty & Cacioppo (1986) provide an understanding through the *Elaboration Likelihood Model of Persuasion* which is a dual process theory describing the changes of attitude through persuasion/communication. This can be seen in Figure 3. An individual can evaluate, remember, and finally accept or reject a message through two processing routes: central —careful consideration and high level of elaboration, or peripheral— not cognitively analysed and rely on secondary factors. Which route that is used for processing a message is largely determined by an individual's level of motivation— which is again influenced by attitude and cognitive dissonance theory, the ability to investigate the facts and arguments, and opportunity, for instance time and energy. When motivation and/or ability to

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process facts and arguments is decreased, the peripheral cues present in the message become more important as modes of persuasion. In situations where the central route is being used, the results of attitude change will show greater temporal persistence, greater prediction of behaviour, and greater resistance to counter persuasion than that from the peripheral route.
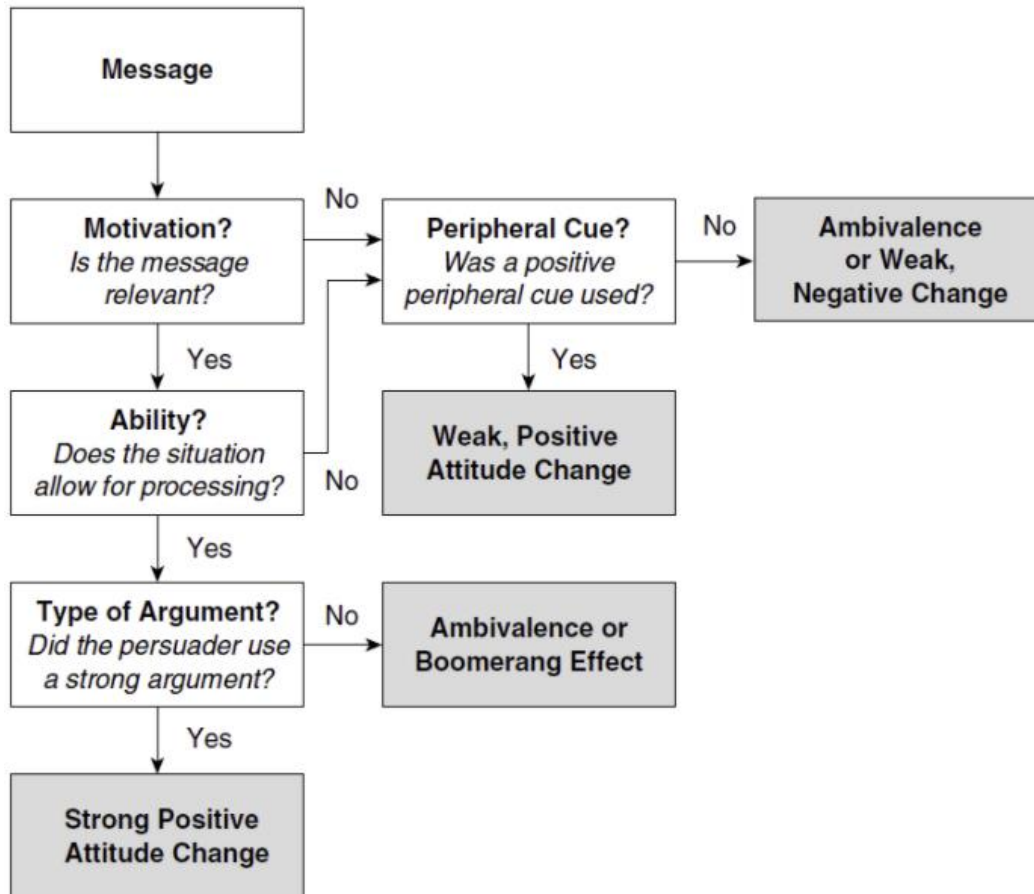

Figure 3: The Elaboration Likelihood Model of Persuasion: Petty & Cacioppo (1986)

3.2.2 Cognitive reactions

In this study, an online survey will be conducted in an attempt to measure cognitive reactions in the participants while reading the frame articles— negative or positive judgments, emotions and experiences. As the audience encounters different arguments and frame articles (stimulus materials), positive and/or negative emotions and attitudes connected to the arguments can arise (Sternberg & Sternberg, 2012). There will also be an attempt to measure the audiences' memory and text recall of the stimulus materials and main arguments present in the articles in the study. This includes elements such as accuracy of information, attention of the audience, and related information. In addition, recall of true positives (information in the text) versus true negatives (related information not in the text) will be measured. A short summary of the variables from the participants that will be attempted to measure is presented in the Table 4:

Response of frames	Positive (acceptance of arguments)	Negative (blocking/denial of arguments)
Reading time	Able to read the article with no hindrances	Article takes too long to read
Recall of arguments (understanding)	Can accurately remember arguments	Hard to remember arguments
Cognitive responses	Acceptance of a message	Denial/blocking of a message
Issues salience	High issue salience, resonance with the public	Does not stand out in any significant way
Attitude/preference changes	Attitude change in line with the suggestions of the message	No attitude change, or attitude change in the wrong direction

Table 4: Cognitive reactions

The response of the frames will mirror the dependent variables that are measured in this survey, and will be the foundation for determining whether a frame is deemed accepted or not— based on if the cognitive responses of the frames are positive or negative. Moreover, the *response of frames* is a collection of my own reasoning regarding frames for this particular study— and an indication to whether or not they will be accepted or not by an audience depending on how they behave. The distribution of how people will react, respond and think of the arguments will to an extent be determined by the culture they are emitted in (Kubal, 1998; Gerbaudo, 2013; McDonnell et al., 2017). Frames that build upon the ideas and beliefs of the larger culture will become more resonant and "stronger" (Chong & Druckman, 2007), and the chance of acceptance will be higher (Berbrier, 1998; Ferreira, 2004; Ettema, 2005; Stoknes, 2014). Opportunities for a message to be accepted and the attitudes surrounding the arguments/facts will be weakened through dissonance, which again will strengthen denial (Stoknes, 2014). Familiarity and a sense of naturalness of the arguments will increase acceptance (Kubal, 1998; McDonnell et al., 2017). The *frame reception* of the different frame articles in the study may vary from frame to frame— as the frames may contribute to different levels of experienced resonance.

Chapter 4: Hypotheses

4.1 QUESTIONS TO CONSIDER

The present study will examine how individuals process information when faced with a multifaceted issue such as climate change. When a message is perceived by an audience, the information will activate knowledge structures (schema), and through this guide the processing of the information takes place (Price & Tewksbury, 1997). Frequency and recency of use and exposure will increase activation and accessibility. In addition, highlighting and selecting (exclusion/inclusion) of information will influence audience interpretations of issues and events (Shen, 2004; Bennett & Iyengar, 2008). Framing will influence how the audience interpret the information, and the way in which a message is framed has a significant effect on the audience's thoughts which often "mirrors" the frame (Shah et al., 1996; Price et al., 1997; Valkenburg et al., 1999). Moreover, framing often involves active participation from the audience and the culture around (Pan & Kosicki, 1993; Scheufele, 1997; Borah, 2011). The acceptance of a message will also be determined through perceived resonance by the audience, where the more something resonates, the more the message is accepted (Kubal, 1998; McDonnell et al., 2017). This means that the audience can relate to the content and build bridges to existing cognitive structures, and new information can easily be put into the existing cognitive structures and learning is enhanced— interpretation is along established lines of reasoning, being both in relation to old information and extension of it (Van Gorp, 2007). The broader research question of this current study is, as presented in the introduction: *How do people cognitively deal with multifaceted issues?*

Exposure to differently framed messages can influence the audience's ability to recall the information presented in these stories (Valkenburg et al., 1999). Frames can induce differences in the affective tone of responses to the messages, hence making them predictive of attitude change. Additionally, individuals are able to suppress activated knowledge constructs if they judge it irrelevant to an evaluation or decision. By activating certain constructs at the expense of others, frames can directly influence what enters the minds of the audience, *how* the information should be processed (Price et al., 1997), and *what* portion of the existing cognitive structure is used to make sense of newly incoming input. Can the short articles prime the participants in looking at the long article through a different perspective, and thereby influence attitudes, beliefs and policy preferences? A supposition is that the short articles in this study, which all have different frames, will influence how the participants read the long article in regards to information processing and text recall (memory, accuracy, attention, related information). Recalling and processing of information will be influenced due to salient parts, arguments, facts, highlights, different focus and different ways of telling the participants *how* to think about the issue— even though it is not explicitly stated.

4.2 HYPOTHESIS

As the different short articles focus on different themes and aspects of climate change, some of them are bound to fit better in the Norwegian environment, depending on how each of the frames resonate with the public. This will depend on the results and goals that are trying to be reached from the messages communicated. In addition, can some of them backfire— do the arguments cancel each other out? We ask another research question that is directly linked to the different frames in the study: *Which of the frames is best for processing/remembering the content as accurately as possible?* Here, positive vs. negative cognitive responses will be observed with each frame. Moreover, accuracy will test whether the participants find it easy to recall information based on what they have read, and test which frame makes it easier to do so within the Norwegian environment. To test the participants' understanding of the text that they have been given, measurement of recall accuracy of the information post-reading can give an indication. To measure the predictive attitude, change from the different frames, one can ask the question: *Can the different frames influence the preferred energy-mix in the Norwegian environment compared to the perceived energy-mix today?* The analysis will address the percentage change of

perceived energy-mix today in Norway and preferred energy-mix in 20 years in Norway— which can show whether an attitude change has taken place.

The different frames that the participants will be given is: Nature/environment frame (ENVframe), Neutral frame/growth in Norway (NEUframe), Electricity price frame (PRIframe), and Greenhouse gas emissions frame (GGEframe). Since the themes and content in each frame vary, it is predicted that each frame will differ in receptivity and resonance with the Norwegian participants— depending on the larger culture and prior media content and coverage. A speculation is that the PRIframe will resonate the least with the Norwegian public, as this theme has not been frequently visible in the culture and previous media-coverage. In addition, the topic seems unimportant to the public as electricity prices in Norway are fairly stable, and not something the public discusses and/or think/worry about. Price changes are not seen as a threat, as there is a lot of perceived safety and stability in Norway regarding electricity. The GGEframe is predicted to resonate relatively low with the Norwegian participants as this frame does not appeal to any feelings and contains a lot of facts and information that can be tedious to read and absorb. A speculation as to which frame will work well in the Norwegian context and resonate with the public will be the ENVframe, as the unspoilt nature and scenery is something the Norwegian public truly value. This is also seen in media-coverage, different commercials, and is ingrained in the culture as Norwegians do love the outdoor-lifestyle.

The hypothesis of this study will be stated as: *"The participants exposed to the nature frame (ENVframe) will exhibit the best recall accuracy".*

That is because recall accuracy can be linked to a high degree of understanding the message, and remembering the information that was present in the article. Higher degree of recall accuracy can also be seen as an effect of attention (Petty & Cacioppo, 1986). For the participants that accept a message and pay attention to it, understanding and the processing of information will become easier. Increased positive cognitive responses— or "acceptance" of a message when reading the frame articles, can again influence the understanding of the message and enhance recall accuracy. This is again connected to the resonance experienced by the participants (how well the message "fit") when reading each frame, and how much the participants perceives the topic as important. Due to the ENVframe and its associations to the outdoor-lifestyle, and its perceived importance in the Norwegian culture and traditions, this frame could trigger more feelings and emotions and enhance attention to the message (Chong & Druckman, 2007). A projection about how people will pay attention to the information in this study is presented as follows: *People will pay more attention to those aspects of the long article that match the theme of the short article.* Breaking this down and concretizing it will lead to additional exploratory questions/projections regarding frame reception within the participants:

a. The short article (frame) will influence how readers interpret, remember and process the information in the long article.
b. Readers will have a higher ability to recall information (true positives) in the long article that matches the short article.
c. The short article (frame) can influence and contribute to how the readers will make decisions regarding energy policy in Norway based on which frame they encountered.

4.3 MEASUREMENTS

An assessment of the plausibility of the hypothesis being true, will be tested by using the data that were gathered through the participants in the online survey. Listed below are the research questions that were tested in R— to see, among other things, if the groups differ in reading time, memory-recall, positive/negative cognitive responses and issue salience. This is to observe whether the participants have perceived and understood the message, and are able to process the information and experience resonance. Next, is the testing of whether the different frames have led to an attitude change in policy preference, and whereby resonance and the acceptance of a message has something to do with the change in attitude (if there is any).

A. Research question 1: Do groups differ in their reading time?
B. Research question 2: Does the ENVframe group recall environment arguments better?
C. Research question 3: Does the PRIframe group recall price arguments better?
D. Research question 4: Does the GGEframe group recall GGE arguments better?
E. Research question 5: Does any of the frames lead to more positive cognitive responses?
F. Research question 6: Does any of the frames lead to more negative cognitive responses?
G. Research question 7: Does any of the frames lead to higher issue salience?
H. Research question 8: Does any of the frames lead to increased demand for renewable energy?
I. Research question 9: Does any of the frames lead to decreased demand for fossil energy?
J. Research question 10: Does any of the frames lead to decreased/increased demand for nuclear energy?

The research questions will observe how dependent variables change across groups and whether the frames influence any of the observations. The cognitive responses on "acceptance" of a message, which is not directly measured, can be seen as a set of variables that in turn will determine accuracy— or understanding, which can again influence a predicted attitude change (difference of perceived energy mix today and preferred energy mix in 20 years). The main hypothesis that will be answered in this study is stated as: *"The participants exposed to the nature frame (ENVframe) will exhibit the best recall accuracy"*. This is due to the predicted resonance of the frame with the Norwegian public, as nature and environmental protection is perceived important. The Norwegian public greatly value the unspoiled nature and scenery, and believe in its inherent value which is present in the Norwegian culture, tradition and lifestyle.

The other frames are expected to be less immediately relevant for the Norwegian public. The price frame, for instance, is expected to resonate less, as prices for electricity are relatively low, and sensitivity for prices is most likely lower for Norwegian inhabitants as it is a wealthy country. As for the greenhouse gas emission frame, electricity production in Norway generates virtually zero greenhouse gasses. Hence, the effect of this frame will be less pressing to the Norwegian public, as electricity production is already seen as "green" in terms of emissions. When applying the neutral frame, this serves as a baseline for predicted "neutral" reactions from the Norwegian public— the frame does not highlight any issues or problems that need to be addressed.

Chapter 5: Methodology

5.1   RESEARCH DESIGN APPROACH
5.1.1   Sample and design
The participants in this study are students from NTNU in Trondheim, Norway. The data was collected between February and April 2019 through an online survey. The study examines under which conditions acceptance/denial of a message is occurring in the context of climate change when confronted with different frames, and how this can possibly influence policy preferences in the participants. Through an online survey, the measurements were based on different questions that the participants will be presented with after being exposed to a given set of stimuli materials. The attempt to measure constructs can further show us patterns such as for instance resonance with the different frames, framing reception, understanding of information and acceptance of messages/frames. This includes memory and text recall of the information in the stimuli materials and cognitive responses (positive vs. negative) during reading. Testing of information and facts that is in the text (true positives) and related information/associated facts that are not in the text (true negatives) can give more insight into how knowledge structures/schemas get activated by the different frames.

5.1.2   Procedure
The participants of this study were students at different campuses and faculties at NTNU. They were given invitations to join, and information about the study through posters that were hung up on different sites/campuses/online. In addition, they were invited through direct communication, invitation to events where the study was being hosted, and through lectures. The study was conducted online on computers, through SoSci Survey— a comprehensive online questionnaire, which lasted about 30-60 minutes depending on which questionnaire, and how fast the participants were. Before the participants started on the survey, they got a short introduction of the study and some instructions to follow. The study was completely anonymous, and no information that could be traced back to the participants personally were stored. Since the survey was voluntary, the participants had the chance to leave before the survey was finished, although they were encouraged to complete the whole survey. To incentivise the participants a lottery was being held at the end, with a 10% chance of winning a gift card worth NOK 500 for Trondheim city centre (Midtbykortet).

The study involved a few questions first, then two articles appeared that the participants were instructed to read. First, a short article appeared, representing a frame that the participants were presented with. This was supposed to prime the participants to further do the survey with the perspective that was given in the frame article. It was also something that needed to be measured, in terms of how effective it was. Second, a longer article appeared which stretched over several pages. All the participants received the same long article, as a means to see whether or not the frame articles had influenced their information processing and cognitive responses.

Some questionnaires did not have any articles, to serve as a control-group (CTRL). The questions in the beginning are meant to be a means to gather information about the participant's knowledge, beliefs and attitudes *before* reading the article (which may influence how they answer the questions). There are four different versions of the short article— the long one is the same in all the questionnaires (except the one without articles). The participants got the different questionnaires at random. The questions after the articles attempted to measure the frame reception of each short article (frame) and the memory, information processing and text recall of the participants. A prediction of this study is that people will pay more attention to those aspects of the long article that match the theme of the short article, hence the information processing will be conditioned. The main hypothesis is stated as: "*The participants exposed to the nature frame (ENVframe) will exhibit the best recall accuracy'*". After the participants were done with the survey they got a debrief— that the study tried to probe processing of the information in the longer article conditional on which short article they read.

5.1.3 Stimulus material

Four different and short articles were presented in this study, packaged in different frames. These frames and their respective functions and expectations are shown in Table 5:

Type of frame	Title of frame article	Function	Expectations
Nature/environmental frame (ENVframe)	Hydropower everywhere: "Power stations spoil our untouched nature"	Provoke feelings associated with the destruction of nature and killings of animals → appeal to the participant's conscience and sense of morals.	To resonate with the Norwegian public based on feelings on protecting the untouched nature. It is ingrained in the Norwegian culture to value nature and the outdoor lifestyle for leisure.
Electricity price frame (PRIframe)	On the rise: Electricity prices in Norway up by 20%	To weigh in the different scenarios, and how they will affect electricity prices → consider the economic risks and gains associated with energy policy.	Will resonate less, due to electricity prices being relatively low and stable in Norway. Additionally, Norway is a wealthy country, where changes in electricity prices are not something that is commonly discussed by the public or media.
Greenhouse gas emissions frame (GGEframe)	Wrong direction: CO_2 emissions in Norway still on the rise	Attributes responsibility to the oil and gas sector → does not seek to evoke any emotions, instead the text is made up of a lot of information, facts and numbers about the emissions in Norway and other countries.	Will resonate less, as the electricity production in Norway is virtually zero, and the Norwegian public view Norway as "greener" compared to other countries. The amount of information might also be heavy to read, making it not as interesting.
Neutral frame (NEUframe)	A country worth living in: Norway is growing	Meant to be a neutral frame → does not evoke to bring out any negative emotions or reasonings considering climate change.	Neither overly resonating or denying of the message in the article— will only serve as a neutral frame to have a baseline in order to compare to the other frame articles.

Table 5: Frame articles

The ENVframe, PRIframe and GGEframe all focus on the increase in consequences and impact due to climate change, although with differing perspectives and themes. The ENVframe tells a story of how the Norwegian landscape and biodiversity is under threat due to hydropower— which are everywhere, in addition to different power plants spoiling the untouched nature. The PRIframe focuses on the economic consequences of climate change, specifically the rise of electricity prices. Here the article tells a story of how the increase in electricity demand due to electric cars will influence the potential economic losses experienced by the public, with different scenarios of how much of an increase there will possibly be in the future—depending which energy policy Norway will follow. The GGEframe shows the negative development in terms of climate change and the increase in greenhouse gas emissions. It emphasizes that the Paris-agreement is under threat, and that CO_2 emissions are still on the rise. The

NEUframe looks at the challenges and opportunities in Norway, a country of growth— and is the only frame that has a positive title.

5.2 DEMOGRAPHY

In total there were 103 participants, where 57 of them were male and 45 were female (one of the participants did not give an answer). The distribution of participants by group is presented in Table 6 and Figure 4:

	CTRL M (SD)	ENVframe M (SD)	GGEframe M (SD)	NEUframe M (SD)	PRIframe M (SD)	Total
Female	0.38	0.50	0.37	0.45	0.50	0.44
Male	0.62	0.44	0.63	0.55	0.50	0.55
Age	26.7 (8.7)	24.8 (2.7)	25.2 (3.0)	24.6 (2.0)	26.8 (3.9)	25.7 (5.1)

Table 6: Sample characteristics
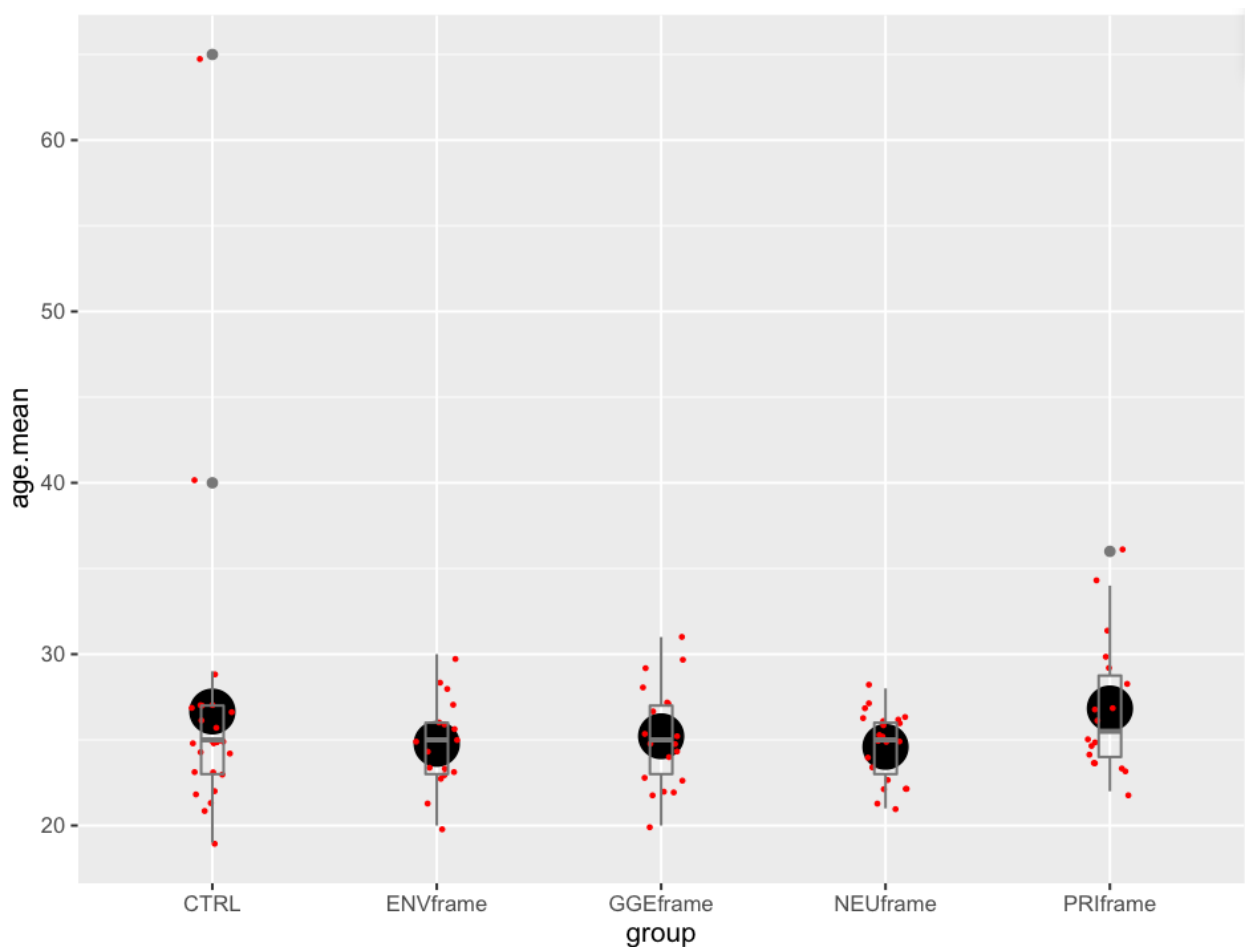
Figure 4: Sample characteristics

5.3   ANALYSIS STRATEGY
5.3.1   Power analysis
Due to the nature of this study with a small sample size, the statistical power is low. As mentioned, this is a pilot-study of a larger experimental framing research programme that will be conducted in France, Germany, Poland and Norway. Since the study has low statistical power, the chance of discovering effects that are genuinely true is relatively low, and meaningful differences or effects can be overlooked. Low statistical power may lead to the difficulty to detect or reject false null hypotheses (Cashen & Geiger, 2004). In addition, the reliability of the evidence that is observed and obtained in the study is low, and can produce more false negatives compared to high-powered studies— the results incorrectly fail to indicate the presence of a condition when it is in fact present. Moreover, when a low-powered study succeeds in discovering a true effect, the estimate of the magnitude of the given effect provided by the study can be exaggerated (Button et al., 2013). Furthermore, this study can only detect relationships that are really strong— if the study finds the results significant, there is most likely a relationship. Some relationships exist which this study cannot observe, and as a result are overlooked— as the study is not capable of capturing all the present conditions/relationships that are really present due to low statistical power.

Emmert-Streib and Dehmer (2019) states that *"the principle idea of a statistical hypothesis test is to decide if a data sample is typical or atypical compared to a population assuming a hypothesis we formulated about the population is true"*. The goal is to provide evidence on the plausibility of the null hypothesis, and a result has significance when it is very unlikely to have occurred given the null hypothesis. The three main components that determine the level of statistical power of a study is: the significance level, the sample size, and the effect size (Cashen & Geiger, 2004). In the case of this present study, the significance level (α) is set to 10% error probability. This means that the acceptable levels of statistical error is set to 10%. Additionally, the reliability of the results from the sample will increase as the sample size and number of observations in the sample increases (Button et al., 2013; Emmert-Streib & Dehmer, 2019). The effect size characterizes the extent of the relationship between the variables in the population— and will tell whether an effect is large enough to be considered significant (Cashen & Geiger, 2004).

When doing statistical hypotheses testing, there can be two types of errors present which must be taken into consideration. Type I (α) error is the probability of rejecting the null hypothesis when it is actually true, and Type II (β) error is the probability of failing to reject the null hypothesis when it is actually false (Cashen & Geiger, 2004). The lower the significance level, the less likely a Type I error will be committed— the significance level represents the probability of making a Type I error, resulting in a false positive decision. Moreover, the statistical power ($1 - \beta$) of a test is the probability that it will not commit a Type II error (correctly rejecting the null hypothesis when it is actually false)— when that error is committed it results in a false negative decision (Button et al., 2013). Increasing the power by changing the significance level will increase the probability of committing a Type I error, as this will reduce the critical value. Additionally, reducing the significance level will increase the probability of committing a Type II error and cause a reduction in power (Emmert-Streib & Dehmer, 2019). In other words, being stricter with Type I errors will create more probability for Type II errors.

Furthermore, the collected data was analysed using R analytics, a programming language for statistical computing. The data was imported to the program, where the variables were labelled with different names, preparing them for analysis. The method used is structural equation modelling in order to analyze the structural relationship between the measured variables and constructs. The script used for analysis is attached in the Appendix of this paper. To check if the results from the experiment were significant, an ANOVA test was used. Here, testing of different groups was done to see if there is any difference between them.

5.3.2 Dependant variables
The measurements that this study wants to measure are the cognitive reactions that were shown in Table 4. These are the dependent variables that can change due to the frame articles, which serve as

the independent variables. The dependent variables can indicate whether a frame is accepted or denied by the participants— hence, if it resonates or not. Once the variables have been measured, comparing the data of the different frame groups can show which frame scored the highest, and thereby conclude whether or not a frame resonates with the audience— and how they resonate due to the larger culture, as this can influence what is accepted and not.

First of all, to check whether or not the frame articles were able to influence the participants, a manipulation check was done. This is to make sure that the participants have understood, perceived and reacted in a way that is expected of them when exposed to the conditions/stimulus, and by that can draw more accurate conclusions when analysing cause and effect— the relationship between the independent and dependent variables. The manipulation check was done in four steps, with four different outcomes that measure different, but related conditions. This is shown in Table 7:

Variable	What it measures	Why it measures
True positives (TP)	Sum of correct recognition of information present in the frame received	To see if the participants can remember the information that they received through the frame article → have they understood the text and paid attention to it?
True negatives (TN)	Sum of correct recognition of non-occurrence	To see if the participants can distinguish which piece of information was not present → can they eliminate related information that was not present?
Accuracy (TP + TN)	Recognition of which information was received (present in the article) and do not mix it up with information that would have fit the frame but was in fact not part of the frame article	To see if the participants can accurately remember the information present in the frame article → can indicate high understanding and attention to what they read in the text → can further indicate acceptance of the frame
Frame-consistent memory (TP − TN)	Recognition of the information from the frame article and mix up information that would fit the frame but was in fact not part of the frame article	To see if the participants remember the information together with related information about the topic in the text → can indicate what the frame activates as knowledge structures in the participants

Table 7: Manipulation check

Next, is the actual measurements of the variables that were measured in the study. First is the variable *reading time*, which shows how long each participant took to read the articles. This indicates how information-dense and heavy the frame article was. Information-rich texts containing numbers and graphs can be harder to read and understand for the participants (Moser, 2009; Stoknes (2014). In addition, longer reading time can indicate that the participants were not interested in the subject, hence the reading time took longer. Texts that are hard to read can be perceived as boring and overbearing, making them harder to accept. Interesting texts will probably take a shorter amount of time to read, as the participants get a nice flow while reading. In addition, texts that do not appeal to the individual on an emotional level can be perceived as hard and tedious, as there is no subjective resonance that occurs (Van Gorp, 2007; Gross, 2008). Additionally, longer reading time also indicates that the understanding of the topic is harder to grasp, and the actual meaning behind the text can be obscured by denying most of the logical arguments.

Moreover, is the variable *recall of arguments*, which is how well the participants can recall the arguments that were present in the frame article. This shows whether the participants can remember the logical structure of the arguments that were presented, and can indicate how memory works. However, texts that contain a lot of emotions and feelings can make the logical arguments harder to remember, as the participants will be preoccupied with the general feeling of the frame article (Gross & Brewer, 2007; Lecheler & de Vreese, 2011). Yet, there will be a larger understanding by the participants that are able to recall arguments accurately.

Furthermore, the variable *cognitive responses* show how the participants reacted— whether it be positive or negative, while reading the frame article. This can be linked to the level of perceived resonance by the participants connected to each frame article. Positive cognitive responses, such as "I liked what I read", can be connected to warm feelings and acceptance of the text. Negative cognitive responses can indicate that the participants found the text to be harder to accept, due to the feelings that arose. This can also foster cognitive dissonance and denial for the frame article, as it makes the participants uncomfortable (Kepplinger & Daschmann, 1997; Clayton et al., 2014). Blocking of messages often arises as the participants do not like what they are reading, as it does not fit with their prior beliefs and attitudes about an issue (Shen, 2004). Moreover, frames that bring positive emotions and feelings will be easier to accept (Gross & D'Ambrosio, 2004; Stoknes, 2014).

Moving on, is the variable *issue salience*, which addresses how important the participants deemed the issues presented through the frame article. Issues that are seen as important can have a higher rate of acceptance, especially in the public media culture (Perse, 2001). In addition, salient issues often get a larger spot in public discussion, which can reinforce their perceived importance (Price & Tewksbury, 1997). Additionally, issue salience can indicate how much the participants have read or encountered similar issues before, in the larger media in Norway. This can influence how the participants reach decisions and their attitudes about a topic. Frame articles that are low in issue salience does not stand out in any way, and can make the participants forget about the issues present in the text, as it fades in the background of the issues that exist which have higher issue salience (Scheufele, 1999).

Last, is the variable *change in energy policy preference,* which can indicate the attitudes and judgments the participants have of each energy source based on the frame article. This variable was questioned twice in the survey, once before and once after reading the frame articles. This is to test whether the frames were able to influence the attitudes and beliefs of the participants. Measuring this is done through the percentage change in energy policy preferences prior to the frame article and after the frame article— to see if the attitudes and judgments on each energy source has changed— and which direction they have changed. This can also be a predictive indicator for behaviour change— as attitudes change, the behaviour that comes with it might change as well. The change in energy policy preference will also serve as an important factor to consider while tailoring communication strategies in general, as different types of frames can foster different attitude changes within the larger public (Petty & Cacioppo, 1986; Kepplinger & Daschmann, 1997; Chong & Druckman, 2007; McDonnell et al., 2017).

Chapter 6: Results

6.1   MANIPULATION CHECK

A manipulation check is used to control and decide whether a manipulation in an experimental design is effective or not. After being exposed to the stimulus materials (frame articles), the participants were asked to determine whether a piece of information was present in the frame they have just read or not. Here, they were exposed to a number of statements regarding each frame, which they were to label as "true" or "false", and whether or not the statements were in the text that they had just read. This is to observe whether the participants can accurately recall the information they were presented with. The manipulation check showed successful manipulation for the different groups. The tables below show the scores for each frame— where the diagonal cells show the scores in the case one has received the frame belonging to the group, and the other cells show the scores of each group when the information comes from another frame/group.

6.1.1   True positives (TP)

The true positive score is the sum of correct recognition of information present in the frame received. These are represented in Table 8, for the diagonal cells. The other numbers represent false positive scores. When comparing the group that received the frame, the score should be higher than the score in the other groups if the group participants recognize which information they received (the other groups did not receive the information). As for this case, the scores which show the true positives (diagonal cells) show that the participants were able to recognize the information they received in the frame article.

	Information from:				
	CTRL	**ENVframe**	**GGEframe**	**NEUframe**	**PRIframe**
ENVframe	—	*2.77*	0.56	0.73	0.69
GGEframe	—	0.45	*1.50*	1.27	0.81
NEUframe	—	0.09	0.00	*0.73*	0.06
PRIframe	—	0.73	0.63	1.07	*1.56*

Table 8: Scores for "True positives"

6.1.2   True negatives (TN)

The true negative score is the sum of correct recognition of non-occurrence. This tests whether the participants are able to tell apart plausible arguments/narrations that were not contained in the article. This is shown in Table 9. When comparing the group that received the frame, the score should be as high as the score in the other groups if the group participants do not mix it up with information that would fit the frame, but that was in fact not present in the frame article. As seen from the scores of true negatives (diagonal cells) the correct recognition of non-occurrence is somewhat harder for the participants to distinguish. The PRIframe was the only group where the scores of true negatives were the highest, hence the participants did not mix up information associated with the frame (but was not in the frame article). As for the other frames this particular process was hard for the participants, and the scores were low compared to the other scores.

	Information from:				
	CTRL	**ENVframe**	**GGEframe**	**NEUframe**	**PRIframe**
ENVframe	—	*0.90*	1.38	0.93	1.25
GGEframe	—	0.82	*0.75*	1.20	1.19
NEUframe	—	0.55	0.81	*0.13*	0.56
PRIframe	—	1.36	1.25	1.20	*1.56*

Table 9: Scores for "True negatives"

6.1.3 Accuracy (TP + TN)

The accuracy score is the sum of all variables, and shown in Table 10. When comparing the group that received the frame, the score should be higher than the score in the other groups if the group participants both recognize which information was received (present in the article) and do not mix it up with information that would have fit the frame but was in fact not part of the frame article. The scores of accuracy (diagonal cells) show a trend that the participants remember the information received, without mixing it up with associated information. However, the GGEframe shows a higher score when presented with information connected to the NEUframe.

	Information from:				
	CTRL	**ENVframe**	**GGEframe**	**NEUframe**	**PRIframe**
ENVframe	—	*3.18*	1.94	1.67	1.94
GGEframe	—	1.27	*2.25*	2.46	2.00
NEUframe	—	0.64	0.81	*0.87*	0.63
PRIframe	—	2.09	1.88	2.27	*3.13*

Table 10: Scores for "Accuracy"

6.1.4 Frame-consistent memory (TP − TN)

The frame-consistent memory score is the sum of correct recognition of occurrence and false recognition of non-occurrence. This is shown in Table 11. The higher the score, the more participants believe that frame-consistent elements are present— some being really present, and shown in the diagonal cells, and others being projected into the material. When comparing the group that received the frame, this score should be higher than the scores in the other groups if the group participants correctly recognize the information from the frame article and mix up information that would fit the frame but was in fact not part of the frame article— a false remembrance of the information that the participants think they received, although they actually did not receive it in the frame article. The scores of frame-consistent memory (diagonal cells) show that the participants were able to more precisely recall information that was in the frame and associated information that resembled the ones in the frame article.

	Information from:				
	CTRL	**ENVframe**	**GGEframe**	**NEUframe**	**PRIframe**
ENVframe	—	*1.36*	− 0.83	− 0.20	− 0.56
GGEframe	—	− 0.36	*0.75*	0.07	− 0.38
NEUframe	—	− 0.45	− 0.81	*0.60*	− 0.50
PRIframe	—	− 0.64	− 0.63	− 0.13	*0.00*

Table 11: Scores for "Frame-consistent memory"

6.2 RESULTS
6.2.1 Reading time

	Groups				
Reading time	**CTRL**	**ENVframe** M (SD)	**GGEframe** M (SD)	**PRIframe** M (SD)	**NEUframe** M (SD)
Baseline	—	803.29 (162.33)			
Difference/ change	—		206.07 (219.20)	39.42 (219.20)	− 110.52 (209.56)

Table 12: Scores for "Reading time"

Note: $F_{(3,65)}=0.836$, $p=0.465$; not significant

From Table 12, observations regarding *reading time* show that the neutral group had the lowest reading time (-110.52 lower than the baseline), with a score of 692.77. Moving forward, the environment group (baseline) had the second lowest reading time, with a score of 803.29, followed by the price group (39.42 higher than the baseline), with a score of 842.71. The longest reading time observed was the GGE group (206.07 higher than the baseline), with a score of 1009.36. The results were not significant, and overall there was no group that differed significantly from each other in terms of reading time.

6.2.2 Recall of arguments

Recall of arguments	Groups (information from)				
	CTRL M (SD)	**ENVframe** M (SD)	**GGEframe** M (SD)	**PRIframe** M (SD)	**NEUframe** M (SD)
ENVframe	—	*− 0.26 (0.17)*	0.00 (0.15)	− 0.04 (0.15)	0.26 (0.15)
GGEframe	—	− 0.36 (0.30)	*− 0.02 (0.27)*	− 0.45 (0.26)	0.80 (0.26)
PRIframe	—	− 0.77 (0.34)	0.23 (0.31)	*− 0.34 (0.30)*	0.76 (0.31)

Table 13: Scores for "Recall of arguments"

Note: F(1,55)=2.53, p=1.117; not significant for ENVframe
       F(1,55)=0.00, p=0.953; not significant for GGEframe
       F(1,55)=1.20, p=0.278; not significant for PRIframe

From Table 13, observations show *recall of arguments*, each group was being tested to see if the participants were able to recall arguments that they were presented with through the frame article. The analysis showed that the results were not significant for all frames (ENVframe, GGEframe, PRIframe). In addition, the effect is in the wrong direction, it would seem that the participants' ability to recall arguments from the frame article would be worse rather than better.

6.2.3 Cognitive response

Cognitive response	Groups				
	CTRL	**ENVframe** M (SD)	**GGEframe** M (SD)	**PRIframe** M (SD)	**NEUframe** M (SD)
Baseline		2.59 (0.16)			
Positive	—		0.03 (0.20)	− 0.48 (0.20)	0.17 (0.20)
Baseline		1.53 (0.13)			
Negative	—		0.04 (0.16)	− 0.06 (0.16)	0.18 (0.16)

Table 14: Scores for "Cognitive response"

Note: F(3,58)=4.82, p=0.005; highly significant for positive cognitive responses
       F(3,58)=0.96, p=0.417; not significant for negative cognitive responses

To test the *cognitive responses* of each frame, the participants were requested to answer questions regarding reactions/responses concerning emotions/feelings/thoughts that came up during reading the frame article. The results are shown in Table 14. This gave an indication whether or not they liked the article or not— how they judged what they read in terms of their own subjective experience while reading, and can be helpful with determining whether a frame is accepted or denied. In terms of positive cognitive responses, the PRIframe leads to fewer positive cognitive responses compared to the environment group (ENVframe). The other two groups (NEUframe and GGEframe) did not differ significantly from the environment group, but did show a marginally increased positive response compared to the environment group.

As for the negative cognitive response, the three frame groups really do not differ significantly from each other or the environment group. Observations show that the NEUframe produced slightly more negative cognitive response compared to the other groups, however it is not enough to make any conclusions regarding negative cognitive responses.

6.2.4 Issue salience

Issue Salience	Groups				
	CTRL	**ENVframe** M (SD)	**GGEframe** M (SD)	**PRIframe** M (SD)	**NEUframe** M (SD)
Personal	—	− 0.47 (0.24)	− 0.15 (0.21)	− 0.14 (0.21)	0.05 (0.21)
Social	—	− 0.61 (0.25)	− 0.30 (0.22)	− 0.59 (0.22)	− 0.40 (0.22)

Table 15: Scores for "Issue salience"

Note: $F_{(4,76)}=1.23$, $p=0.300$; not significant. Generally, an average of 3.90 points personal issue salience on a 1-5 scale

$F_{(4,76)}=2.44$, $p=0.046$; significant. Generally, an average of 2.50 points social issue salience on a 1-5 scale

Issue salience deals with whether or not something is particularly noticeable or important. The results are shown in Table 15. Personal salience captures how much oneself perceived the issue as important or interesting for oneself, personally. The results from the data were not significant, however the trend looks interesting. Generally, on a 1-5 scale, the average points of personal issue salience is 3.90 points. When the environment frame is presented, the score is 0.47 points lower, totalling 3.43 points. When the GGE frame is presented, the score is 0.15 points lower, totalling 3.75 points in personal issue salience. When the price frame is presented, the score is 0.14 points lower, totalling 3.76 points. When the neutral frame is presented, it is 0.05 points higher, totalling 3.95 points.

Social issue salience captures how much one thinks the issue is important for society/community in general— or for many other people, but not necessarily oneself. The results from this observation are deemed significant. Generally, on a 1-5 scale, 5 being very important and 1 being not important, the average points of social issue salience is 2.50 points. When the environment frame is presented, the score is 0.61 points lower, totalling 1.89 points. When the GGE frame is presented, the score is 0.30 points lower, totalling 2.20 points in social issue salience. When the price frame is presented, the score is 0.59 points lower, totalling 1.91 points. When the neutral frame is presented, it is 0.40 points lower, totalling 2.10 points.

6.2.5 Change in energy policy preference

Change in demand	Groups				
	CTRL	**ENVframe** M (SD)	**GGEframe** M (SD)	**PRIframe** M (SD)	**NEUframe** M (SD)
Renewable energy	—	− 8.10 (7.22)	0.57 (6.29)	− 1.81 (6.40)	7.56 (6.53)
Fossil energy	—	16.34 (7.89)	− 0.29 (6.87)	3.65 (6.99)	− 9.63 (7.13)
Nuclear energy	—	− 8.24 (7.38)	− 0.27 (6.43)	− 1.83 (6.55)	2.07 (6.67)

Table 16: Scores for "Change in energy policy preference"

A change in energy policy preferences addresses whether or not there have been a change in perceived energy-mix versus preferred energy-mix. The results are shown in Table 16. This is the difference between the first time and the second time the participants have responded to the same question—*how much of which type of source would you like?* The question was presented once prior to reading the articles, and once after. Generally, the participants in this study show an average of 9.4% points increased demand for renewable energy. Observations show that when the environment frame is presented, the increase is 8.1% lower (decrease), totalling 1.3% points. When the price frame is presented, the increase is 1.8% lower (decrease), totalling 7.6% points. When the GGE frame is presented, the increase is 0.6% higher, totalling 10%. When the neutral frame is presented, it is 7.6% higher, totalling 17% points.

Moreover, generally there was an average of 28.7% points decrease in demand for fossil energy. The results show that the observations are marginally significant. When the environment frame is presented, the decrease is 16.3% higher (increase), totalling −12.4% points. When the GGE is presented, the decrease is 0.3% higher (increase), totalling −28.4% points. When the price frame is presented, the decrease is 3.6% higher (increase), totalling −25.1% points. When the neutral frame is presented, the decrease is 9.6% lower, totalling −38.3% points.

Furthermore, generally there was an average of 19.3% points increase in nuclear energy. When the environment frame is presented, the increase is 8.2% lower (decrease), totalling 11.1% points. When the GGE frame is presented, the increase is 0.3% lower (decrease), totalling 19% points. When the price frame is presented, the increase is 1.8% lower (decrease), totalling 17.5% points. When the neutral frame is presented, the increase is 2.1% points higher, totalling 21.4% points.

Chapter 7: Discussion

7.1 RESEARCH QUESTIONS AND HYPOTHESIS

7.1.1 Summary

The study has attempted to address the different factors to consider for how people cognitively deal with multifaceted issues. Climate change is seen as an ambiguous topic, and can be categorized as a wicked problem (Head, 2008; Wexler, 2009). With this comes a lot of challenges that must be dealt with. First of all, issues that are complex often are built up of many interwoven aspects of our society (Rittel and Webber, 1973; Newman & Head, 2017). This means that the holistic understanding of these issues can be hard to grasp— due to the many aspects the audience has to consider (Cann & Raymond, 2018). When looking at the results of this study, the data indicates how an issue is presented— which focus point the story has to offer, will change how an audience interprets and understands the issue. When dealing with multifaceted issues, only looking at the issue from one side can cause an artificial or shallow understanding of how to judge the issue at hand. The aspect in which the frame focuses on will be the emphasis of what the audience understands and focuses on. In addition, communication about these issues require information and facts that are not biased— meaning that they are objective, and can be viewed as the truth regardless of the culture in which they operate in. This can foster an understanding of the issue, without connecting to it personally or with intense feelings and emotions.

As seen from the results and the manipulation check, the participants of this study do pay more attention to those aspects of the long article that match the theme of the short article. The frame articles were able to influence how the participants interpret, remember and process the information in the long article. From the manipulation check, the trend showed that the participants were able to accurately remember more information that was present in the frame article— they understood the frame and acted accordingly. Moreover, the hypothesis which was stated as: *The participants exposed to the nature frame (ENVframe) will exhibit the best recall accuracy,* seem to be true, as the score for this variable was the highest among the other frame groups. In addition, the frame articles influenced how the participants deemed the preferred energy-mix in the Norwegian environment should be compared to the perceived energy-mix today. This means that frames, even at a one-time exposure, can influence the attitudes and beliefs of an audience.

For reading time, the neutral frame group had the shortest time, followed by the nature frame, the price frame and last the greenhouse gas frame. For recall of arguments, the neutral frame exhibited the best results, followed by the other three. There were no significant differences between the three frames, and the recall of arguments would be worse rather than better. Moreover, for the cognitive responses the price frame led to fewer positive cognitive responses compared to the nature frame, and the neutral frame and greenhouse gas frame led to a marginally increased score for positive cognitive response. Next, scores for personal issue salience in general were higher than scores for social issue salience, meaning that the participants deemed the issues as more important for themselves personally than for a larger group. For the personal issue salience, the one that scored the highest was the neutral frame. For the social issue salience, the one that scored the highest was the greenhouse gas frame. As for the change in energy policy preference, the neutral frame scored the highest in promoting more sustainable energy policies— where there was an increase of demand renewable energy sources is, and a decrease in demand for fossil energy sources.

7.1.2 Limitations to the study

There are some limitations to the study that must be considered. First of all there might be a perceived language barrier that was experienced by the Norwegian students, as the survey was conducted in English. Some notes that the participants provided from the survey indicated that some questions were hard to properly understand. These included: (1) that it was difficult to understand "*plants* in my neighbourhood would upset me", where there was confusion regarding the word plants, as this could mean powerplants or actual plants. (2) Statkraft and Equinor, which are both big energy corporations, was grouped into one alternative in the survey. The participants became confused as to whether they

were linked together, as they felt the different corporations do different things (has a different image from one another), and would choose one as better than the other in terms of sustainability— and not both of them as one alternative. Perhaps the culture in Norway has a lot to say here in how the participants view both the corporations and would rank them as almost the opposite of each other. (3) The participants felt that the survey took longer than they expected. The participants finished within an hour, whereas the planned time was to take about 30 minutes. This indicates that the survey perhaps was heavier than expected— which can influence the participants motivation to finish the survey, and to accurately answer the questions that were presented.

Other limitations to the survey was due to a small sample size. Preferably there would be more participants so that the correlations and trends from the data would produce more accurate results. In addition, the participants were all students from NTNU, meaning that there is little variety in terms of age and background— hence it is unclear whether the results can be generalized to a larger public or not. The survey has low test power, which means that any detected effects may not be accurately true for the larger population and will only merely be an indication of an effect/trend. A study that has low statistical power will have low chance of discovering effects that are genuinely true, and meaningful differences or effects can be overlooked. In addition, it may lead to the difficulty to detect or reject false null hypotheses (Cashen & Geiger, 2004; Button et al., 2013; Emmert-Streib & Dehmer, 2019). This study can only detect relationships that are really strong, and some relationships exist in reality which this study is unable to observe— the study is not capable of capturing all conditions.

In addition, the survey was only conducted as a one-time-event meaning that the participants only got a one-time exposure to the different frames and their effects. This does not necessarily directly lead to an attitude and behaviour change in the participants (Petty & Cacioppo, 1986; Price & Tewksbury, 1997; Perse, 2001), but may indicate what resonates more with the Norwegian public as each frame represents a different set of lenses which can fit more accurately with the larger culture. Repetition can enhance a connection and resonance with a frame, and make it easier to extract information from the message, compared to when it is only shown once (Perse, 2001). The audience tends to experience feelings of familiarity when encountered with the same type of frame more than once, due to frequency and recency of knowledge structure activation (Price & Tewksbury, 1997; Shen, 2004; Bennett & Iyengar, 2008). As frames are repeated in the media, they can gain more momentum and become stronger (Perse, 2001; Chong & Druckman, 2007)— where the media and the audience influence each other in the process of social construction of the perceived truth (Kepplinger, 1997; Neuman et al., 1992; Rhee, 1997; Durham, 1998; Scheufele, 1999).

The study is trying to capture and quantify relationships within the participants that are only measurable through constructs. This means that the procedure and relationships are used as tools to facilitate understanding of human behaviour— which is hard to measure. This is due to the fact that human behaviour can be motivated by a number of factors that are hard to directly measure (Neuman et al., 1992; Sternberg & Sternberg, 2012). It is difficult to be totally certain that the results really measure what they are supposed to measure, as there can be other factors which influence participants' behaviour that are not taken in consideration in this study. In addition, there might be other theories and literature that very well might describe the observations that are not included in this study. However, in terms of framing literature and resonance, the observations are explained and do correspond according to established and existing theories.

7.2 DISCUSSION
7.2.1 Acceptance and salience
The time it took to read the different texts can give an indication for how "heavy" and information dense the frame articles were. Texts that are perceived as boring and factual may result in a longer reading time, as the participants are trying to decipher and extract the meaning out of it (Kubal, 1998; Druckman & Bolsen, 2011). There can be something as too much information, as more information will not always lead to more understanding or acceptance of a message (Moser, 2009; Stoknes, 2014). Additionally, the interpretation and processing of information presented in the frame articles will be influenced by the

frequency and recency of schema activation, or cognitive structure, in the participants' minds (Shen, 2004; Bennett & Iyengar, 2008). Information that has been observed in the media more often than others, can be more readily available and understood by the participants, as they have encountered the information, or similar information, before (Price and Tewksbury, 1997; Perse, 2001; Lecheler & de Vreese, 2011). Observations from the results show that the NEUframe took the shortest time to read, followed by the ENVframe, PRIframe and last the GGEframe. Looking at the different frames, the PRIframe and GGEframe contained more graphs, numbers and facts, which can contribute in making the text more information dense.

Moreover, how interesting the participants found the different frame articles can also indicate the level of resonance between the reader and the text. Resonance is described as the level of fit between a message and the audience's perception of reality (Gamson & Modigliani, 1989; Ettema, 2005; McDonnell et al., 2017). In the results, resonance was measured and indicated by the cognitive reactions (positive and negative) that arises in the participants' minds while reading the frame article. Frames that led to higher amounts of positive thoughts indicate that they were received more warmly, and have a stronger experienced resonance (Gross & D'Ambrosio, 2004; Gross & Brewer, 2007). The PRIframe lead to the fewest positive cognitive responses, while the NEUframe lead to the most. Different frames can induce different emotions— the experienced emotions can be seen as a product of their cognitive judgments and evaluations about an issue (Gross, 2008). In addition, the NEUframe, which had the most positive cognitive responses was the only frame that had a positive undertone, something that can contribute in the acceptance of a message (Stoknes, 2014; McDonnell et al., 2017).

Ettema (2005), Buijs et al., (2011) and Kubal (1998) identified factors that can explain why resonance occurs between a message and the audience. First of all, the problem captured in the frame must be believable— there must be some empirical credibility and salience of the beliefs and values in the text. Next factor is connected to the everyday-experiences of the audience, and how the message fits into their past experiences. This is also influenced by the third factor, which is the resonance of the message frame to the audience's cultural narratives, or dominant storylines. Hence, whether a frame article is deemed to be accepted or not depends not only on the culture and environment they are emitted in, but also determined by the subjective judgments of the participants (Festinger & Canon, 1965; Hamill et al., 1985; Fiske et al., 1990; Neuman et al., 1992; Kepplinger & Daschmann, 1997; Gerbaudo, 2013). In line with what is said earlier, it may be a better strategy to focus on the more positive sides of climate change, as the NEUframe did, in order for the communication to be more effective. Positive solutions will result in less counter-arguing in the participants, as it provides a tangible future outcome and a less gloomy way of looking at the world— which can be beneficial for acceptance (Moser, 2009; Stoknes, 2014).

Furthermore, familiarity of a frame— and a sense of naturalness of the arguments and facts will increase acceptance (Kubal, 1998; Ferreira, 2004; McDonnell et al., 2017). Elements from a frame that can resonate with ideologies and the larger culture, can make the perception of the frame to be more compelling (Semetko & Valkenburg, 2000; Ferreira, 2004; Ettema, 2005; Van Gorp, 2005; Sternberg & Sternberg, 2012). When looking at issue salience, this can be seen from two perspectives. Personal salience, and indicates how much oneself think an issue is important and interesting for oneself, personally. The other perspective is social salience, and indicates how much one thinks the issue is important for society in general, or for many people— but not necessarily oneself. The salience of a frame article will be determined by situational and emotional elements, that in a combination will be unique to each individual— and culture. Salience is about the accessibility of concepts in one's cognition (Price & Tewksbury, 1997), and frames that are present in public discussions have a greater chance to be established in the audience's minds as salient (Chong & Druckman, 2007).

In general, the scores for personal issue salience were higher (average of 3.90 points) compared to the scores for social issue salience (average of 2.50 points). Only the NEUframe article got a personal issue salience score above the general (3.95)— the other frame articles scored below the average. Whereas for the social issue salience, all the frames scored below the average. In both issue salience groups, the lowest score was produced when the participants were presented with the ENVframe. This means that the issue presented in the ENVframe was perceived as both less important

for the participants personally and socially. This finding was a little surprising, as the ENVframe article addresses topics such as the untouched nature in Norway which is a topic that is deeply ingrained in the larger culture. Perhaps the issue has not been too visible in recent media coverage, making the issue salience less prominent in the participant's minds. Interestingly, the NEUframe article, which addresses growth and opportunities in Norway scored the highest for both personal and social issue salience. Perhaps this frame was perceived as more important as it served to solve some of the issues regarding climate change, instead of being overly focused on the negative aspects. Solutions to an issue can help in reinforcing issue salience and acceptance (Chong & Druckman, 2007; Gross, 2008; Stoknes, 2014; Clayton et al., 2014).

Acceptance of a message will also depend on the core attitudes within individuals, that exist to fulfil certain individualistic needs (Heider, 1946; Rosenberg, 1965). Individuals when encountered with an attitude object or subject will judge it based on their schematic function, or frame of reference. This is linked to one's core values and self-concept (Shah et al., 1996) and can influence an individual's decision-making strategy (Kubal, 1998). This function can explain how individuals judge issues as important (personal issue salience) for themselves, based on what they value as individuals. Stoknes (2014) also links it to a sense of identity, and how attachments can activate cultural filters that override facts and information that are not in line with previous beliefs. When the schematic function is aggregated to a social level, also referred to as social attitudes, it describes how different social groups understand an object/subject— and based on this the individuals will communicate and behave according to their understanding and given value of a given object/subject (Buijs et al., 2011). This will determine how individuals judge issues as important for the society and local group (social issue salience).

7.2.2 Frame reception and recall

To assess whether or not the participants paid more attention to those aspects of the long article that match the theme of the short article, recall of frame-related information and arguments were observed. Valkenburg et al. (1999) argue that exposure to different frame articles can influence the participants ability to recall the information presented in the stories. Recall can indicate the level of understanding which the participants have after reading a text. Moreover, selecting and highlighting information, making them salient, can have a powerful impact on audience interpretations of issues and events, making them remember different aspects of a story that are emphasized (Shen, 2004; Bennett & Iyengar, 2008). From the results, the scores which show the true positives, which is the correct recognition of information present in the frame received, show that the participants were able to recognize the information correctly. This means that they were able to remember, after reading the frame article, which information they received. Hence, the participants understood the text they read, indicated by the correct assessment of information presented.

As for the true negative scores, which is the correct recognition of non-occurrence, it was harder for the participants to choose which information were not present in the frame article correctly. To elaborate, as the participants were asked about information that was related to and associated with the frame, but was in fact not present in the frame article. It was harder to distinguish which piece of information was not in the frame. This can be due to the construct activation that the frame articles induced in the participants, making them remember associated information and thinking they were present in the frame article (Price & Tewksbury, 1997; Rhee, 1997). Moreover, adding the scores for the true positives and the true negatives result in the score for accuracy, which is the recognition of information that was present in the frame article and the correct recognition of information that would have fit the frame but was not present in the frame article. The trend shows that the participants have higher scores for each frame-group they belong to, and thereby indicate that the participants have understood the text and are able to remember information present, and not present, in the frame articles. Recall accuracy is linked to both understanding, processing of information and effect of attention (Petty & Cacioppo, 1986; Scheufele, 1999; Chong & Druckman, 2007).

The hypothesis of this study is stated as: *"The participants exposed to the nature frame (ENVframe) will exhibit the best recall accuracy".* Observations from the result show that for recall accuracy (TP + TN) the environment group had the highest score (3.18) compared to the other groups. In addition, the environment group scored the highest (1.36) for frame-consistent memory— meaning that the group participants were able to correctly recognize the information from the frame article, and mix it up with information that would have fit the frame (associated information), but was in fact not part of the frame article. Frame-induced knowledge activation can influence problem-solving and decision making by shaping the information that enters the minds of the participants (Price et al., 1997). Moreover, Price et al. (1997) state that by activating certain constructs, frames can influence what enters the mind of the participants, and influence how the information should be processed and remembered. For associated information in the frame article, recent or frequent exposure to frames, in for instance prior media coverage, can induce a given knowledge activation construct and help to increase the accessibility of information and associated information that are related to the frame (Hamill et al., 1985; Gamson et al., 1992; Pan & Kosicki, 1993; Rhee, 1997; Price & Tewksbury, 1997; Perse, 2001).

However, when tested for recall of arguments from the frame articles, the scores for the environment group show a negative score (−0.26), meaning that the recall of arguments for the environment group would be worse rather than better. This may be due to the fact that in the ENVframe, the appeal and focus was not logically tailored arguments— rather it was emotionally charged, wanting to provoke feelings in the participants. Messages that appeal to feelings and emotions, playing on the personal dimension of the participants, may evoke stronger beliefs and ideas regarding the issue (Gross & D'Ambrosio, 2004; Chong & Druckman, 2007; Gross, 2008). However, the logical line of argument that was used to make the statements may be mixed up and partially ignored due to the strong emotions the frame stirs up (Stoknes, 2014). The audience can be influenced to interpret the information with respect to the frame— even if the reasoning device is not explicitly stated (Shah et al., 1996; Price et al., 1997; Valkenburg et al., 1999). Hence, for assessing frame receptivity, accuracy recall and frame-consistent memory would probably be a better indication than recall of arguments, as to whether the participants have been influenced and receptive of a given frame.

The frame reception of the different frame articles varies from frame to frame— as the frames may contribute to different levels of experienced resonance in the participants. According to the theory, frames that are able to connect through cultural values and have a strong perceived credibility connected to them, will have a stronger frame reception and acceptance (Gamson, 1992; Berbrier, 1998; Kubal, 1998; Semetko & Valkenburg, 2000; Van Gorp, 2007; Gerbaudo, 2013). However, Perse (2001) and Borah (2011) argue that framing effects can be reduced if an individual has strong predispositions regarding an issue. This will increase one's resistance to discomforting information. Yet again, knowledge can enhance framing effect due to a higher probability that the considerations emphasized in a frame will be comprehensible to the individual (Petty & Cacioppo, 1986; Fiske et al., 1990). Since not all beliefs are accessible at a given moment— recent or frequent exposure to frames that induce a given consideration can help to increase accessibility (Price & Tewksbury, 1997). Information that is readily accessible is more likely to be activated (Perse, 2001), and the more an individual knows, the higher the likelihood that a belief will be retrieved and become available upon a given stimulus (Chong & Druckman, 2007). In addition, the context of the consideration will contribute in influencing which consideration is perceived the most applicable (Lecheler & de Vreese, 2011).

7.2.3   Energy policy preferences

The participants who belonged in the ENVframe group *increased* the support for fossil fuels and *decreased* support for renewable and nuclear power. With this frame article 12.4% less fossil fuel is desired, compared to the baseline of 28.7%. This can be due to the perceived dangers and destruction of unspoilt nature caused by windmills, hydropower and potentially nuclear power plants, which was mentioned in the frame article. The participants were presented with information on how the power plants can destroy nature. Since the Norwegian people value the outdoor environment and lifestyle,

any measures that can be taken in order to prevent its destruction might seem logical. The participants may have felt compelled to support the already existing fossil fuels infrastructure, instead of building new infrastructure in untouched nature to expand the use of renewable energy and nuclear energy power plants. This can perhaps be explained through a value and attitude preference, where the need for unspoilt nature triumphs over the need for sustainable energy sources (Perse, 2001).

Furthermore, the arguments in the ENVframe article might have caused the participants to reach conclusions that do not increase the support for renewable energy policy changes, as the arguments were more focused on other aspects (Petty & Cacioppo, 1986). The attitude change, if the goal was to have a strengthened position in renewable energy preferences, backfired and had a negative change instead. Due to the prevalence of the outdoor lifestyle in the Norwegian culture, the context/story in which the frame article presented can also influence the readers interpretations on which consideration was perceived more applicable (Chong & Druckman, 2007; Lecheler & de Vreese, 2011). Additionally, there have been a lot of cases in the media in Norway where the framing focuses on how renewable energy power plants, such as windmills, can cause damage to animal life and the nature around— which can contribute to decreased support for renewable and nuclear power amongst the participants of this frame. According to Scheufele (1999), the media and the audience will together through intertwined processes create frames that can generate and change attitudes, behaviour, and attributions of responsibility— and the frequency of a topic in the media can cause the audience to perceive it as collectively important (Pan & Kosicki, 1993; Price & Tewksbury, 1997; Durham, 1998; Scheufele, 1999).

The ENVframe focused on the negative impact of renewable energy such as hydropower (since this is widespread in Norway). This can contribute to the attitude that keeping the status quo would be beneficial for the unspoiled nature, and arguments to reduce fossil fuel energy would not matter as much when presented with this type of message and frame. Perhaps focusing on the negative impacts will generate strong feelings toward protecting nature, but it also generated a decline in wanting to reduce renewable energy sources such as hydropower and wind power. As seen in the results this type of frame would not be beneficial when urging the Norwegian participants to have an attitude change towards wanting less fossil fuels. Norwegians associate their identity with unspoilt nature and pride in the outdoor lifestyle for leisure activities. Information that helps in contributing to the uprising of uncomfortable sensations can result in attitudes and problem-solving that would be in line with the arguments of the message (Petty & Cacioppo, 1986; Shen, 2004; Chong & Druckman, 2007; Stoknes, 2014).

One can discuss whether prior knowledge on energy, and whether they are economically viable, can influence the attitudes of the participants— especially with the PRIframe. Since all energy sources and technology have a reputation, this may contribute in influencing what is accepted by the public and not (Price & Tewksbury, 1997; Druckman & Bolsen, 2011). Whether or not an energy source has a reputation of being economically viable or not will influence the perceived safety and stability of that energy source (Lecheler & de Vreese, 2011). In Norway hydropower is perceived as extremely stable, due to the weather and access to water. However, in recent years the weather has been more varying and unstable from year to year due to changes in the climate. This can perhaps contribute in making the safe and stable reputation of hydropower shakier, which can further influence the preferences for other energy sources and discussions about electricity prices in Norway. Observations from the results regarding energy policy preferences show that with the PRIframe 25.1% less fossil fuels is desired, compared to the baseline of 28.4%. In addition, not much changes in policy preferences were observed regarding the demand for renewable energy and nuclear energy.

Bearing this in mind, the bigger culture and prior knowledge about a topic can have a lot to say in how the participants will reach conclusions (Petty & Cacioppo, 1986; Kepplinger & Daschmann, 1997; McDonnell et al., 2017). Any new knowledge that might be a threat to existing beliefs, values and ideas can be subject to mental sparring and cause uncomfortable sensations— hence, new ideas and attitude changes may take some time if the new information is not in line with what is common belief (Kepplinger & Daschmann, 1997; Clayton et al., 2014). Shen (2004) argues that messages that disrupt and shake the audiences' world views might not gain much momentum, as it is far too different from what they

already know and perceive as the truth. Prior knowledge and experience regarding electricity prices in Norway is perceived as stable— if this "truth" is about to change, the participants may find the information unsettling, or even unbelievable, as it is not in line with prior experiences, media coverage and the larger culture (Buijs et al., 2011; Krippendorff, 2017).

Observing the PRIframe, the results does not deem the frame article especially effective in communicating about climate change to the Norwegian public. Since Norway is a country of affluence, arguments regarding price will maybe not gain much momentum, as it is not life-threatening information (Moser, 2009). In addition, the Norwegian public is used to low inflation, and expects prices in all areas to slightly rise with time. One can observe from the media as well, that price-related arguments and debates are not the primary focus within Norway, especially electricity prices. What the media pushes out in terms of issues and stories will influence what the public deem important (Price & Tewksbury,1997; Scheufele, 1999). From the results in the study, applying this frame article will also make the participants want marginally less renewable and nuclear energy, which will be counterproductive when wanting to implement energy policy changes in favour of increased use of renewable energy sources.

Both the PRIframe and GGEframe involved a lot of numbers, facts and information which can have the opposite effect of acceptance by the reader— that "too much" information makes the message unclear and hard to capture (Moser, 2009; Stoknes, 2014). In addition, frames that cause the readers to perceive the message as boring and/or excessive will have a harder time for being accepted and interpreted accurately (Druckman & Bolsen, 2011). Numbers and statistics can make it harder for the reader to connect to the message compared to when the message includes human experiences to relate to (Chong & Druckman, 2007; Gross, 2008). Observing the GGEframe, the results show that no significant change in policy preferences appeared within the participants of this group. Reasons could be that the GGEframe did not really resonate with the Norwegian people, making the arguments ineffective when wanting to communicate about climate change (Ettema, 2005; Buijs et al., 2011). However, it did not have a negative effect either— possibly due to perceived cognitive distance with the message in the GGEframe (Van Gorp, 2007; Gross, 2008; McDonnell et al., 2017).

Moreover, the NEUframe article was the only frame presented that had a positive title and outlook on the message, i.e. "Growth in Norway". There was no mention of any difficult challenges that the public have to face, rather, the frame article points out the possibilities of a country in growth. This frame article was categorized as a neutral frame, but looking at it more carefully it should be categorized as a positive frame, due to the presentation of the message and title. The whole feeling of the frame is more positive than neutral. This may have had an impact on the results with the participants, as this frame had the most appeal out of everyone. This can be in line with what Stoknes (2014) and Clayton et al., (2014) discuss as one of the aspects in communication about the climate— the urge to action often springs out of messages that focus on the positive rather than a negative outlook. When observing the results from the NEUframe, the desire for renewable energy is 17% higher (compared to the baseline of 9.4%) and a desire for 38.3% reduction of fossil fuels (compared to the baseline of 28.7%). This frame produced the best results out of all the frames, if the goal were to reduce fossil fuel and increase renewable energy sources. Giving the frame and message a positive outlook can help in mobilizing the public, create resonance and acceptance (Wexler, 2009; Gerbaudo 2013; Clayton et al., 2014; Newman & Head, 2017). This will again be important when wanting to implement policy changes (Head, 2008; Cann and Raymond, 2018).

Framing has the capacity to tell the public *how* to think about certain issues and events (Valkenburg et al., 1999). All the other frames (ENVframe, PRIframe and GGEframe) had negative headlines— which do not necessarily lead to an attitude change in the preferred direction and/or desirable behaviour change from the participants (Petty & Cacioppo, 1986). As seen from the results it will be best to not communicate about climate change in a negative manner, as this can contribute in the process of mental-counterarguing— where the individual blocks out messages he/she doesn't want to hear (Katz, 1947; Gamson, 1992; Chong & Druckman, 2007; Van Gorp, 2007). Stoknes (2014) and Clayton et al. (2014) argue that in order to increase the possibility of a message to be accepted by the public, the framing must be perceived as hopeful, and the message constructive— in addition to also

containing a solution to the problem at hand (Van Gorp, 2007; McDonnell et al., 2017). This way the message can overcome cognitive barriers and reduce denial and dissonance (Gamson & Modigliani, 1989; Cann & Raymond, 2018). Positive emotions will be better for ambiguous topics in order to contribute in stirring up motivation and collective action (Kubal, 1998; Clayton et al., 2014).

Whether or not a frame is perceived as strong in the public eye will contribute in making the frame and message more accepted (Van Gorp, 2007; Buijs et al., 2011). Strong frames have the potential to draw in the public from the "other side", meaning that these frames are capable of changing opinions and beliefs (Kubal, 1998; Ferreira, 2004). According to Chong and Druckman (2007) and Perse (2001), everyone is susceptible to understand the different sides of competing messages and the opposing beliefs of a topic. However, Kubal (1998) and Shen (2004) found evidence that the public tends to choose an alternative that is already in line with their existing values and beliefs. It might seem that if one energy source is deemed good, then another one must be bad. This can mainly be because of the perceived reputation of each energy source in their respective environment and energy culture (Moser, 2009; Wise & Brewer, 2010; Sternberg & Sternberg, 2012). Indirectly, perhaps, in the public's eye if something is seen as good then something else must be seen as bad in relation to it. However, the priorities of which variable that influences whether something is good or bad can vary, making the outcome different (Petty & Cacioppo, 1986).

Hopefully, opposing frames and perspectives will bring out good discussions in the public in reaching solutions that can benefit more people. Good discussions about difficult topics with different perspectives will be one of the foundations for a well-functioning democracy (Chong & Druckman, 2007; Wise & Brewer, 2010). Clayton et al. (2014) have some recommendations regarding how to engage the public on climate change: (1) give people confidence that they can prepare for and mitigate climate change, (2) communicate specific solutions, (3) highlight co-benefits, (4) acknowledge emotions, (5) use personal stories, (6) be careful with imagery, (7) focus on local conditions and customs, (8) emphasize the power of collective action, (9) and help people to accurately interpret their experiences. As human beings have a limited capacity for what to worry about, solutions that seem manageable and meaningful will often create more positive outcomes than issues that one cannot relate to (Moser, 2009). Messages that are able to appeal to feelings, and that contain arguments that are perceived as personal, near and urgent will play a greater role when communicating about climate change (Gross & D'Ambrosio, 2004; Chong and Druckman, 2007; Gross, 2008; Stoknes, 2014).

7.3   AFTERTHOUGHTS

As seen in the study and according to literature, framing can be a powerful tool in trying to create a lens to perceive reality through (Gamson, 1992; Entman, 1993; Van Gorp, 2007; Krippendorff, 2017). The public is constantly under the influence of the media, and vice versa, both consciously and unconsciously— and will most likely do so in the future (Pan & Kosicki, 1993; Kepplinger and Daschmann, 1997; Durham, 1998; Scheufele, 1999). Framing processes can influence messages and their essence, influencing and reinforcing attitudes, beliefs, problem-solving and decision-making (Shah et al., 1996; Price et al., 1997; Valkenburg et al., 1999; Chong & Druckman, 2007). Understanding this mechanism is advantageous when wanting to implement communication strategies, and for it to be more effective (Berbrier, 1998; Buijs et al., 2011; Gerbaudo, 2013; Cadwalladr, 2018; Goldhill, 2019; Merrill & Goldhill, 2020). With this comes the responsibility to conduct communication in an ethical manner— but then again, who decides what is ethical and what is not? Framing as a tool can be effective, and the results can be massive. However, one must distinguish a line for where framing is just communication and lobbying, versus where it is manipulation of the population to reach a goal. Regardless, public discussions are important in a well-functioning democracy (Chong & Druckman, 2007; Wise & Brewer, 2010).

Which type of frames applied to different stories can influence how the public discusses issues. As for climate change, positive stories, such as the NEUframe, that includes solutions will serve best to motivate the public in collective action and overcome psychological barriers (Kubal, 1998; Moser, 2009). Since climate change is a wicked problem (Head, 2008), the communication of energy policies outward

will be especially important— and to tailor it in line with the larger energy culture. To shift how contemporary human societies, interact with the environment, policy changes are needed (Steffen et al., 2015), and to foster change, one needs support from the larger public.

As a tool, framing can also influence what the public judges as good and bad. Framing done right, can engage the public in collective action and create movements, based on stories and messages that the public perceive as "truth". We can ask ourselves the question: Are the "truths" we know of, really the truth? And how true is the perceived truth? As we live our everyday lives, we organize ourselves and tell stories according to the frames that exist within us and around us. Our society, culture and policies are all built on stories and collective frames, which we perceive as the truth. It is beyond this paper to delve into these questions, however, it serves us good to ponder on these things and become more aware of the effects of communication within our society.

Chapter 8: Conclusion

When investigating the power of stories and messages, and how these have the capability of influencing beliefs— previous research has proven that how a message is framed will affect how that message is received and perceived (Entman, 1993; Shah et al., 1996; Price et al., 1997; Valkenburg et al., 1999). On the other hand, how messages are perceived and understood will also rely and be determined by existing cognitive constructs (Hamill et al., 1985; Gamson et al., 1992; Pan & Kosicki, 1993; Rhee, 1997). Through this paper, observations regarding under which conditions a message is more likely to be accepted by the public, has been tested through an experimental survey. Moreover, the topic of climate change is highly ambiguous (Rittel and Webber, 1973; Wexler, 2009; Newman & Head, 2017), which has no apparent solution (Stoknes, 2014; Cann & Raymond, 2018), making the communication about it difficult— as it involves with it an array of aspects to consider (Head, 2008; Clayton et al., 2014). In order to be able to mitigate the risks of climate change, public support is needed when wanting to make changes (Head, 2008; Cann & Raymond, 2018). Collective consensus and action need to be built upon a common belief that the public regards as the "truth" (Berbrier, 1998; Kubal, 1998). For a behaviour change to occur, there must be an underlying understanding of what will enable this change— namely, motivation and intent, ability and opportunity (Tukker et al., 2008). To achieve this, communication can be an important tool in mobilizing the public (Gerbaudo, 2013; Stoknes, 2014).

The question is then, how can this be done in the most effective way in order for a message to be accepted by the public? However, tailoring effective communication strategies does not limit the use to only one side— as it can be weaponized by the other side of an issue. Both supporters and opponents of climate change can take use of the strategies that work to influence its audience. Moreover, every culture is different, containing different cultural frames (Van Gorp, 2007; Buijs et al., 2011)— messages should be crafted and tailored differently in order for it to be received accordingly for its purpose, accepted by the public (Kubal, 1998; Ferreira, 2004; Matz et al., 2017), and create resonance (Gamson, 1992). The media, the audience, and the culture will simultaneously work in an intertwined web of continuously influencing one another in constructing a perceived "truth" (Pan & Kosicki, 1993; Rhee, 1997; Durham, 1998, Scheufele, 1999; Van Gorp, 2007). The messages that "fit" with the audiences' beliefs and values will rarely be subjected to mental-counterarguments, dissonance and denial (Gamson & Modigliani, 1989; Ettema, 2005; Chong & Druckman, 2007; McDonnell et al., 2017). The stronger the attitude towards an issue, and once a set of attitudes and beliefs are held as the truth, the less susceptible the audience is to new information that can override the beliefs with new and disruptive information (Kepplinger, 1997; Chong & Druckman, 2007).

People cognitively deal with multifaceted issues with regard to their own cognitive frames (Hamill et al., 1985; Fiske et al., 1990; Neuman et al., 1992; Entman, 1993; Pan & Kosicki, 1993; Rhee, 1997; Druckman & Bolsen, 2011), cultural frames (Durham, 1998; Scheufele, 1999; Kubal, 1998; Van Gorp, 2007; Gerbaudo, 2013), and the message frame itself (Shah et al., 1996; Shen, 2004; Schuck & de Vreese, 2008; de Vreese & Elenbaas, 2008; Dardis et al., 2008; Matthes, 2009; Wise & Brewer, 2010). How a message is presented will influence how the audience process the information— even small changes in the presentation of a message can create large framing effects that endure even after exposure (Perse, 2001; Chong & Druckman, 2007; Lecheler & de Vreese, 2011). This can be seen in the results of this study, where the framing of the different articles indicates that the participants were influenced in terms of attitudes concerning preferred energy-mix in Norway. In addition, the participants paid more attention towards those aspects of the long article that match the theme of the frame article they were presented with. All in all, the results of this study show interesting trends. However, since the study is a pilot-study with relatively weak power, the results will only be an indication, and one cannot say anything for certain. It will be interesting to follow up on the actual study which will be conducted in four countries, as not all messages will work the same in different societies with different cultures and their own respective perceived "truths" (Buijs et al., 2011; Krippendorff, 2017).

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Appendix
A1.   Frame articles
　　1.   Environment/nature frame:

HYDROPOWER **EVERYWHERE**

Power station > 10MW
Power station with pump
Pump
Power station 1-10 MW
Power station < 1MW

Data source: Norwegian Water Resources and Energy Directorate (NVE)
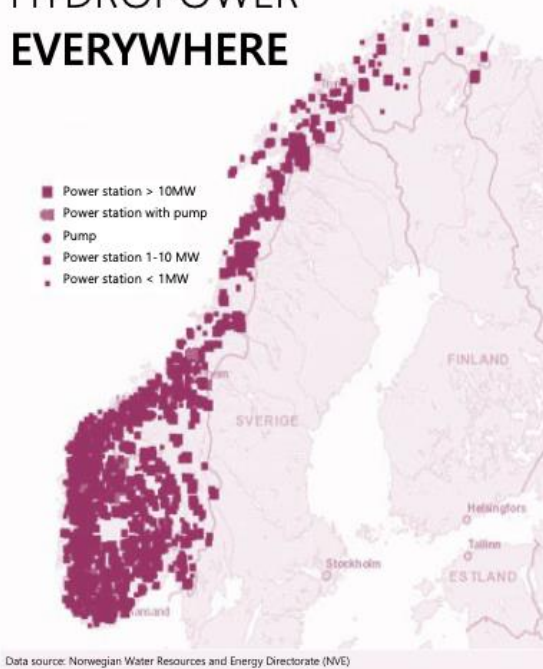
«Power Stations Spoil Our Untouched Nature»

If last retreats are exploited, unrepairable damage to animals, plants, and waters will result, Tourism Commission claims.

Hydropower stations are almost everywhere in Norway, and despite efforts to minimize impact on rivers, plains, and fishlife, the impact is significant. A current research project by UiB found that a run-of-river power station reduced the fish population by 70% within 10 years. Fighting climate change by spoiling one's environment is as logical as "fucking for virginity", says Martin Nansen, head of Norway's environmentalist group "GrønnMiljø". The Norwegian Tourism Association (DNT) shares the skepticism regarding the shrinkage of untouched nature in Norway: «For tourists at home and from abroad, untouched nature plays an important part. We should not risk losing it forever». DNT cited a study predicting a 30% shrinkage of revenues in the tourism industry in Norway if no restrictions to building renewable power stations were implemented. The map displayed on the left speaks more than a thousand words: it is hard to find any gaps between the spots with hydropower stations. And the German experience shows that wind power is not better for the environment. In particular, bird life has suffered a lot from wind power built-up in Germany, NABU (Association for the Preservation of Nature) spokesman André Wiesner says. Local residents are paricularly concerned about effects of wind turbine low-frequency sounds on human health. But also countries like Poland spotted with coal power plants and France covered by nuclear power plants struggle with protecting nature, people's well-being and health against increasing hunger for ever more electricity

■ *Kamilla Grendahl Foss*

2.   Economic consequences/price frame:

ON THE **RISE**

FORECAST OF CONSUMER ELECTRICITY PRICES

RANGE OF PRICE INCREASES

HIGH +90%
MID +55%
LOW +38%

Consumer electricity price (Øre per KWh)

Data source: Statistics Norway. Predictions: Ministry of Petroleum and Energy.
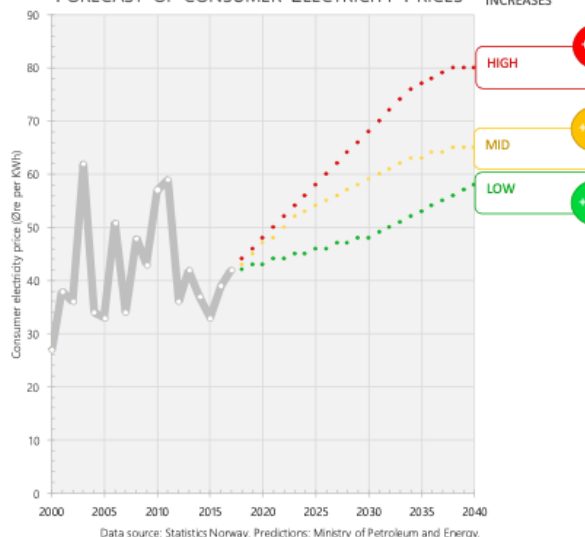
Electricity prices in Norway up by 20%

Forecasts are pessimistic. The amount of increase fundamentally relies on energy policy

In the last two years, electricity prices in Norway increased by 20%. This increase is not unprecedented, but since the demand for electricity is predicted to increase, prices will increase and we need to produce more electricity to cover the additional demand: all those new electric cars need their fuel.

In response to an inquiry by the opposition, the Norwegian Ministry of Petroleum and Energy has specified three scenarios for the future price development. They vary in projections regarding electricity consumption, share of electric cars, and choice of how to expand Norway's electricity production—and some risks that may or may not materialize.

If Norway is making the wrong decisions and lots of risks materialize, the price increase may be as high as 90% until 2040. In case of right decisions, price increases may be only as high as 38%. The more realistic middle scenario forecasts a cost increase of 55%.

Unfortunately, the ministry cannot advise which energy sources to invest in—which will be cheapest will depend on a variety of future developments and are therefore associated with great uncertainty.

■ *Kamilla Grendahl Foss*

3.   Greenhouse gas frame:

49

WRONG DIRECTION

Data source: World Bank. Predictions: International Energy Agency.

Flags: +72% (Norway), −37% (Germany), PARIS GOAL, −47% (UK), −35% (Sweden), −75% (Denmark)
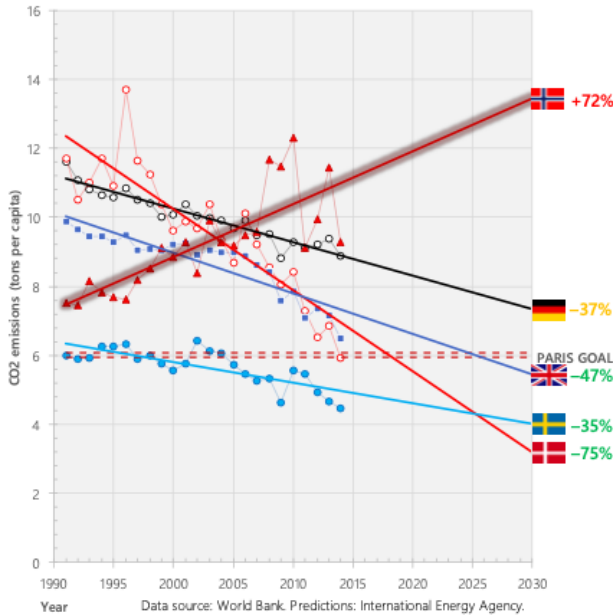
CO² Emissions in Norway still on the rise

Forecasts are pessimistic. Paris goals threatened.

Norway has been at the forefront of the debate on climate change for many years and has been one of the first countries world-wide to sign the Paris agreement, with the goal of reducing greenhouse gas emissions substantially.

The actual CO² emissions per Norwegian citizen, however, has increased tremendously since 1990, and is expected to grow further, experts say, leading to an increase of 50-80% compared to the level of 1990.

Disturbing is that other countries, much less favored by the blessings of availability of large amounts of hydropower per capita, have managed to reduce their CO² emissions per capita. For Germany and Sweden, a decline by 37% and 35% between 1990 and 2030 is predicted, respectively, whereas the UK might almost have their CO² emissions. Even more stunning, the Danes may reduce their CO² emissions to one forth of the level of 1990.

How could this happen? It does not seem like Norwegian households were responsible for the increase, but rather the oil and gas industry. As oil and gas fields deplete more and more, greater CO² emissions are caused in the extraction process, accounting for higher emissions though production of oil and gas has stagnated or even declined.

■Kamilla Grendahl Foss

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4.   Growth in Norway/neutral frame:

A COUNTRY WORTH LIVING IN
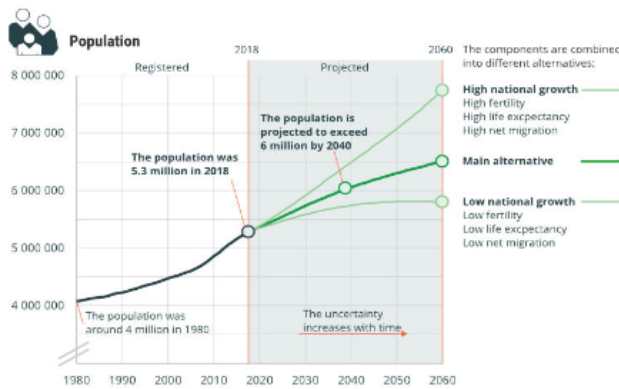
Data source: Statistics Norway (SSB)

Norway is growing

In contrast to many other western industrial nations, Norway is projected to grow further until 2060. This will bring chances and challenges.

Statistics Norway has published its newest projections for the development of Norway's population size. Depending on changes in fertility, life expectancy, and migration, they forecast a modest or a strong increase.

Compared to countries like Germany or Italy with very low fertility rates over many decades, Norwegians have continuously had almost two children per woman. As a consequence, Norway does not only grow, but also has a healthy «population pyramid» where a good mix of younger, middle-aged and elderly people coexist. Other countries suffer from a growing dominance of older people. In the Brexit debate, a divide between the young (preferring to «stay» in the EU) and the older (predominantly voting «leave») generations emerged.

Beyond that, Norway remains an attractive country to immigrants — both to asylum seekers and to skilled and highly educated workers. This poses challenges for integration, but also contributes to the dynamics of Norwegian economy, which is growing more and more independent from the oil and gas sector.

What oil and gas did for Norway was build its pension fund that is another asset for current and future generations of Norwegians. The country seems well-prepared for the challenges of the future. ■ Kamilla Grendahl Foss

A2.   Long article

AT THE CROSSROADS

SERIES *The arguments behind the debate*

Every week, our fact checker team provides in-depth insights into the pro's and con's behind the large debates in Norway, Europe, and the World. This week, they have collected arguments and facts around the energy debate.

Transportation goes electric, consumption increases: Norway needs 50% more electricity until 2040, experts and politicians, across party lines, agree. Politicians, industry officials, and citizens quarrel over the choices, however – again, across party lines.

by NATALIE FORSBERG, MORTEN GRØNVOLD & RASHID PALMGREN

The government's new electricity and power report has fueled the debate about Norway's energy future, an "important part of our vision of Norway's future as a whole, acknowledging that energy is needed virtually everywhere and anytime", prime minister Erna Solberg declared. Initiatives, strategies, and scenarios have sprung up from various politicians and lobbyists who want to shape Norway's energy future. Each technology has its pro's and con's. This next part of our series «The arguments behind the debate» is designed to help our readers get the facts straight and form their opinions, apart from ideologies and party politics. As always, we ranked the alternatives—fossil, nuclear, and renewable power—on several important criteria: technology development, jobs and economy, safety, climate and environment, and last but not least: the costs for consumers. But the nuanced whole picture is hardly expressed by one simple ①②③ ranking.

AT THE CROSSROADS
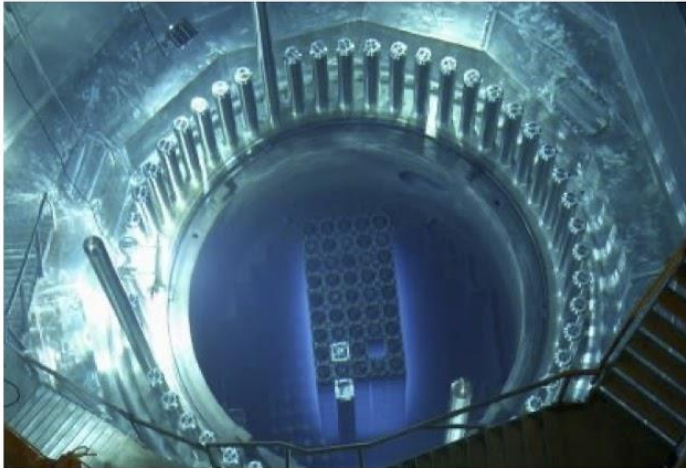
Safer, cleaner, Nordic? Using Thorium in nuclear reactors produces less and less dangerous radioactive waste–with almost no zero CO² emissions. Norway has plenty of resources and is a world technology leader.

Technological development

① **Nuclear power** Nuclear power plants generate electricity by splitting atoms. Developed commercially in the 1950s, there are two promising new developments in nuclear power technology. Thorium-based nuclear power may reach market maturity in the near future. Thorium resources would last much longer, reactors could be designed to be 100% meltdown proof, there would be less nuclear waste and its radioactive components would turn harmless within 100 years. Nuclear fusion—creating energy like the sun does, by merging Hydrogene atoms— would effectively solve all of the world's energy problems once and for all, but there has hardly been any technological progress in the last decades. Nuclear power is driven by great visions but when and how they will materialize is less clear.

② **Renewables** Solar, hydroelectric, and wind power are established technologies, and their future will be gradual evolution rather than technological revolution. Windmills, hydropower plants, and solar panels will become cheaper and more efficient by and by.

③ **Fossil fuels** Drill and mine, refine, burn, generate electricity from heat. A complex industry implements this simple principle. Still, great technological leaps are not to be expected as the industry has exploited most potentials for increasing efficiency.

Overall, nuclear power has the greatest potentials in terms of game-changing technological developments. As of now, developments in renewable and fossil energy production are more gradual and more predictable, but also less revolutionary.

Jobs and expertise

① **Fossil fuels** Mining coal or drilling for oil and gas has sustained a great number of well-paid jobs for blue collar workers, highly valuable in a world that increasingly relies on high-education workers and provides less and less jobs for the less educated. Norway's expertise in oil and gas rigs is sought-after around the world.

② **Nuclear power** Nuclear energy produces blue-collar jobs in Uranium mining and white-collar jobs in the research and development sector, also to run and maintain existing power plants. If Norway can take a leading role in research and development of the Thorium technology, considerable exports could strengthen the Norwegian economy.

③ **Renewables** Constructing and maintaining renewable power plants will necessitate fewer jobs than other power plants, most of them white collar jobs for engineers. In hydroelectric power, Norway is among the world leaders in technology and expertise, and has a strong export industry.

While all energy sources come with additional jobs and potential export revenues, the fossil sources involve the highest amount of labor and the greatest workforce and provide jobs for the less-educated and less well-off that may not be compensated easily by the other means of electricity generation.

Security and Risks

① **Renewables** Wind power and solar power plants are very safe technologies with no considerable risks. The risk of failing dams render hydroelectric power one of the more hazardous ways of electricity production.

Fossil fuels – coal, oil, natural gas – are the cheapest sources of energy available. And the mining industry provides well-paid blue-collar jobs.

AT THE CROSSROADS

Nuclear waste disposal has proven a major problem for states using nuclear power. Safely storing the waste for thousands of years is challenging, and yet no conclusive solution is in sight.

② **Nuclear power** Contrary to intuition, nuclear power is one of the safest ways of generating electricity. In such statistics it is hard to estimate the number of deaths due to long-term effects of radiation, be it in the aftermath of the Chernobyl and Fukushima disasters or the radiation emitted in normal business. Anyway, the danger of a nuclear meltdown and the imminent threat of long-term radiation of whole regions lead to a very high subjective risk, tied to great uncertainty.

③ **Fossil fuels** It's dangerous business, mining coal, drilling for oil and gas. In terms of deaths per electricity unit produced, fossil fuels cost the most lives. This is also due to the adverse health effects of using the fuels: poisoning, cancer, lung insufficiency, etc. Long-term exposure reduces life expectancy by months or even years.

Generating energy from fossil fuels is very dangerous and has cost many lives in the past. Surprisingly, hydroelectric power is relatively dangerous due to the risks of dam breaks and ensuing floods .

Climate Change

① **Renewables** Wind, solar, and hydroelectric power are very climate-friendly ways of generating electricity. In the process of electricity generation, all renewable sources produce no emissions of CO_2 or other greenhouse gases. Hydroelectric power, however, is suspected of increasing methane emissions by creating better conditions for methane-producing plants.

② **Nuclear power** Nuclear power is a climate-friendly way of producing electricity, but in contrast to renewables, the extraction of nuclear fuel is associated with substantial greenhouse gas emissions. Compared to fossil fuel burning, nuclear power is much more climate-friendly, however.

③ **Fossil fuels** There is no doubt that burning fossil fuels is the main contributor to man-made climate change, which is the swiftest climate change recorded or observed in world history. Carbon capture and storage are attempts to reduce the impact on the climate, but they are too costly and too rarely used to make a real difference on a global scale.

From the climate perspective, wind, solar and hydroelectric power are certainly the best energy solution, whereas fossil-fuel firing causes immense CO_2 emissions.

Environment

① **Nuclear power** Nuclear power plants are very unpopular – they may be detrimental to health (leukemia may be more frequent in the surrounding area) but also pose the risk of accidents and even nuclear meltdown. There is no convincing evidence that regular operation of nuclear power stations harms plants and animals. Also, nuclear power plants have no negative impact on air, water, or ground quality as far as we know.

② **Renewables.** Renewable energies take up a lot of space and are scattered throughout the country even in formerly untouched nature. Wind power has been criticized for loud sound and unattractive looks, hampering residential value and possibly human health, and for irritating and killing birds. Hydroelectric power affects bodies of water and irrigation, and can have significant negative effects on fish populations. Solar power stations are also perceived as unaesthetic by many, and they often replace agriculture. Compared to the damages done by fossil fuel burning, these effects are not harmless but are more limited in their scale and scope.

③ **Fossil fuels** Fossil fuels are dirty, destroying nature and landscapes, harming the health of animals and humans. Luckily, mines, rigs, refineries, and power plants do not cover the whole country but concentrate in industrial areas. But the affected communities suffer: residences lose in value, tourism gets ruined, ground, water, and air are contaminated.

There is widespread concern regarding the negative impact of wind parks and hydro-power plants (and builtup of additional grid capacities) on the environment and quality of living. However, compared to the impacts of mining and fossil fuel firing, these impacts appear less far-reaching.

Champion of the global climate: Renewable energy sources such as wind power, solar power and hydroelectric power are key in reducing emissions of greenhouse gases.

A3.   Online survey

NTNU

Page 01

R

Welcome to our study on "Comprehensibility of high information density news stories". We are interested in what features of newspaper and news site presentations help readers in understanding complex arguments and which hinder it.

Page 02

Q1

First, we want to learn more about you and your personal preferences.

1. Would you say that you are ...

(4) very interested in politics

(3) fairly interested in politics

(2) only slightly interested in politics

(1) not interested in politics at all

PS01

Would you consider a scale with

○ (4) very interested in politics

○ (3) fairly interested in politics

○ (2) only slightly interested in politics

○ (1) not interested in politics at all

○ Don't know

54

Page 03

PS04

2. Which party has, in your opinion, the best policy concerning energy policy?

○ Arbeiderpartiet (Ap)

○ Høyre (H)

○ Fremskrittspartiet (FrP)

○ Senterpartiet (S)

○ Sosialistisk Venstreparti (SV)

○ Venstre (V)

○ Kristelig Folkeparti (KrF)

○ Miljøparti de grønne (MDG)

○ Rødt (R)

○ Other party

○ Don't know

Page 04

PS03
in the
Maybe
change
"more
rarely"

3. We would like to hear whether you have participated in political discussions or talks about energy in the last three months. How often did you talk about energy problems or energy policy in the family or with friends and acquaintances. Would you say about ...

○ Daily

○ A couple of times a week

○ A couple of times a month

○ Less than once a month

○ Never

○ Don't know

Page 05

PS05

4. Where would you place yourself on the scale below where the left pole means left and the right pole means right, in a political sense?

Page 06

SD01

5. Your gender?

○ Female

○ Male

○ Other

○ Don't want to answer

SD02

6. Your age?

Please provide your answer in years

I am [ ] years old

Page 07

S1

Now, we ask you to read an article and provide some evaluations to it.

Please read this short article.

PHP code

```php
$code = value('RN01');
$bild = value('RN01', 'label');

if ($code == 1) {
    html('<img src="frame-neu_v2.png" width="1000"> ');
    }

if ($code == 2) {
    html('<img src="frame-co2_v2.png" width="1000">');
    }

if ($code == 3) {
    html('<img src="frame-cost_v2.png" width="1000">');
    }

if ($code == 4) {
    html('<img src="frame-env_v2.png" width="1000">');
    }

if ($code == 5) {
    goToPage('Q3');
    }
```

56

Please read this article. This is page 1/5.

Page 1 of 5

AT THE CROSSROADS

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CONTINUED ON NEXT PAGE

Please read this article. This is page 2/5.

AT THE CROSSROADS

1) Climate Change

No surprise: From the climate perspective, wind, solar and hydroelectric power are certainly the best energy solution, whereas fossil-fuel firing causes immense CO_2 emissions. Nuclear power is much less CO_2 intensive than fossil fuels but also not emission-free.

Champion of the global climate: Renewable energy sources such as wind power, solar power and hydroelectric power are key in reducing emissions of greenhouse gases.

① **Renewables**   In the process of electricity generation, all renewable sources produce no emissions of CO_2. Despite some "hidden" emissions, renewables are the best solution for reducing greenhouse gas emissions.

② **Nuclear power**   Nuclear power is a climate-friendly way of producing electricity, but in contrast to renewables, the extraction of nuclear fuel is associated with substantial greenhouse gas emissions. Still, nuclear power is much more climate-friendly than fossil fuels.

③ **Fossil fuels**   There is no doubt that burning fossil fuels is the main contributor to man-made climate change, which is the swiftest climate change recorded or observed in world history. Carbon capture and storage (CCS) can effectively reduce the impact on the climate, but CCS is still too costly and too rarely used to make a real difference on a global scale.

Please read this article. This is page 3/5.

AT THE CROSSROADS

2) Security, pollution and health

Generating energy from fossil fuels is very dangerous and has cost many lives in the past. Surprisingly, hydroelectric power is relatively dangerous due to the risks of dam breaks and ensuing floods.

Lignite („brown coal") mining and firing devastates landscapes, pollutes the air, and drives global warming. Other fossil fuels are only a little less destructive.

① **Renewables** Wind power and solar power plants are very safe technologies with no considerable risks. In contrast, the risk of failing dams render hydroelectric power one of the more hazardous ways of electricity production.

② **Nuclear power** According to the numbers, nuclear power is one of the safest ways of generating electricity. Anyway, the danger of terrorist attacks, nuclear meltdown and the imminent threat of long-term radiation of whole regions lead to a very high subjective risk, and great uncertainty. The long-term storage of nuclear waste for millions of years. Moreover, there are promising technological developments in nuclear power: Thorium-based nuclear power may reach market maturity in the near future. Thorium resources would last much longer, reactors could be designed to be 100% meltdown proof, there would be less nuclear waste that would turn harmless within 100 years.

③ **Fossil fuels** It's dangerous business, mining coal, drilling for oil and gas. In terms of deaths per electricity unit produced, fossil fuels cost the most lives. This is also due to the adverse health effects of using the fuels: poisoning, cancer, lung insufficiency, etc. Long-term exposure reduces life expectancy by months or even years.

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Please read this article. This is page 4/5.

AT THE CROSSROADS

3) Nature and environment

Renewables consume large areas and invade untouched nature, harming biospheres, wildlife, nature experience and the tourism industry. Fossil fuels harm the nature through pollution and contamination of air, water, and ground.

Renewable power plants invade into nature and landscape of formerly untouched nature. Expanding the power grid for efficient transportation, in addition to ruining landscapes, is very expensive.

① **Nuclear power** Nuclear power plants are very unpopular. But there is no convincing evidence that regular operation of nuclear power stations harms human health. Also, air, water, and ground quality do not suffer from nuclear energy production. The plants usually consume very little area compared to other technologies; so there is almost no impact on landscapes and tourism.

② **Fossil fuels** Clearly, fossil fuels cause lots of pollution, contaminating ground, water, and air. But mines, rigs, refineries, and power plants concentrate in industrial areas, do not consume large areas, and do not invade untouched nature – tourism and nature experience do not suffer directly from fossil fuel burning.

③ **Renewables.** Renewable energies take up a lot of space and are scattered throughout the country even in formerly untouched nature. Additional power grid construction will also damage nature. Opponents fear that building more wind farms will ruin tourism and nature experience in Norway. Hydroelectric power also impacts the environment: it affects bodies of water and irrigation, and can have significant negative effects on fish populations.

Please read this article. This is page 5/5.

AT THE CROSSROADS

4) Consumer costs

Regarding the costs, fossil fuels are still the cheapest large-scale solution for most countries. Nuclear power is cheap in generating electricity, but the necessary investments for constructing plants make them more expensive than fossil fuel burning. Wind and solar power lead to higher consumer costs due to expenditures for grid and storage capacities.

Fossil fuels – coal, oil, natural gas – are the cheapest sources of energy available.

① **Fossil fuels** 80% of global energy is from fossil sources, and the major reason is: it's cheapest.

But the great hunger for fuel is at the same time a great weakness: the planet Earth will be running low on coal, oil and gas in the next decades. Before that, fuel will grow scarce and therefore much more costly than we are currently ready to admit. Carbon taxes or costs for carbon capture and storage may also lead to higher consumer prices.

② **Nuclear power** Nuclear power is expensive in terms of construction and deconstruction—a result strict safety measures to prevent dangerous accidents. In contrast, producing the electricity from nuclear fission is cheap. If run for the normal life-time of a nuclear power plant, costs are moderate.

Nuclear power's «eternity costs»—

③ **Renewables** Hydroelectric power—being more reliable than wind and sun—is usually the cheapest source of electricity at ideal spots. But most countries can only cover a very limited share of their energy demand using hydroelectric power. Even in Norway—with its unique geography—most good spots are already used or cannot be exploited for legal or environmental reasons.

Wind and solar power are available around the globe in abundance. However, the costs are still significantly higher. In particular, painful investments into the grid infrastructure are necessary for wind and solar power. A high-capacity grid is necessary to efficiently transport wind and solar power to where it is needed to avoid shortages.

Overall, switching to renewable sources of energy will cause prices to increase.

Page 14

Q2

MC01

7. What were your thoughts during reading the longer article? Below, you find a list of thoughts others told us they had during reading the text. Please tick how often you had that or similar thoughts.

	never, not at all	once	two or three times	four or more times
"The authors seem to be biased towards fossil energy sources, portray them too positively"	○	○	○	○
"That is a reasonable argument I should consider (more)"	○	○	○	○
"This argument oversimplifies matters"	○	○	○	○
"That argument is correct, but not very relevant"	○	○	○	○
"That is good to know."	○	○	○	○
"That is just blah blah, what's the point here?"	○	○	○	○
"The source is not credible"	○	○	○	○
"I really do not like this argument"	○	○	○	○
"This is exciting to read"	○	○	○	○
"I do not understand a thing"	○	○	○	○

	never, not at all	once	two or three times	four or more times
"That argument will lead people to draw wrong conclusions"	○	○	○	○
"I would like to know where this information is from, what the source is."	○	○	○	○
"I already knew that."	○	○	○	○
"The authors are biased towards nuclear energy, portray it too positively"	○	○	○	○
"That argument overlooks more important considerations"	○	○	○	○
"I think the authors are biased towards renewable energies, portray them too positively"	○	○	○	○
"This is dull and boring"	○	○	○	○
"This is surprising, I did not know that."	○	○	○	○
"I do not believe that, that can't be true"	○	○	○	○
"I really like this argument"	○	○	○	○

	never, not at all	once	two or three times	four or more times
"That argument is based on wrong or misleading facts"	○	○	○	○
"This clarifies things for me"	○	○	○	○
"That's nonsense, it is just not true. I do not believe that"	○	○	○	○

"This whole piece is seriously flawed, they got it all wrong"   ○   ○   ○   ○

"I would like to know more about that. Pity that there is not more
information on this in the text."   ○   ○   ○   ○

"This argument is very superficial"   ○   ○   ○   ○

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Q3

PHP code

```
$order = value('RN02');

if ($order == 2) {
    goToPage('TRTCHK');
    }

if ($order == 1) {
    goToPage('Q32');
    }
```

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8. **If it was your decision alone: how would you change the spending on energy in Norway's state budget? Compared to how the government invests the money right now: Please indicate in which technologies and branches you would invest more money and in which you would invest less money over the next 20 years?** Remember that expanding the budget for many technologies and branches will make necessary spending cuts in other parts of the state budget or tax raises.

Move the slider to the right to indicate that the budget should shrink or move it to the left to indicate that it should grow.

The budget should increase (+) or decrease (-) by...

muhc less spending   much more spending

fossil fuel sector / coal, oil, and gas industry

hydroelectric power sector

nuclear energy sector

carbon-capture and storage

national electricity grid

international electricity grid (Nordic, UK, EU)

wind power sector

solar power sector

public transportation sector

electric mobility (e.g. electric cars)

9. Electricity and power we use everyday comes from a variety of sources. What do you think, what share of the energy used in Norway every year comes from which sources, approximately? This is not only about electricity, but includes e.g. vehicles (cars, buses, trucks, airplanes, ships). Please do not search the Internet for the answer, just guess if you are not sure.

EM23

The sliders below will automatically take values that sum up to 100%.

Fossil fuells (oil, gas, coal)

Nuclear power

Renewable energy (hydro, wind, solar, geothermal, biomass)

10. Each source of energy has advantages and disadvantages. If you could make the political decisions for energy policy in Norway in the next 20 years, what share of the energy used in Norway would come from which sources, approximately? Again, include not only electricity, but e.g. also energy used in cars, buses, trucks, airplanes or ships. Choose a composition you think is acceptable. Please consider all the factors you think are important (e.g. costs and investments, environment, safety, etc) in making the decision.

The sliders below will automatically take values that sum up to 100%.

Fossil fuels (oil, gas, coal)

Nuclear power

Renewable energy (hydro, wind, solar, geothermal, biomass)

11. Now we would like to know more about how you view different sources of energy. Please read the
following statements one could make about energy sources. Please rate how much you agree or disagree
with that statement about the respective source of energy.

IM02

Fossil fuels (coal, oil, gas)...

	strongly disagree	disagree	neither agree nor disagree	agree	strongly agree	don't know
Strongly damages the environment (animals and/or plants)	○	○	○	○	○	○
Is a threat to human health	○	○	○	○	○	○
Damages the earth's climate	○	○	○	○	○	○
Is cheap to produce	○	○	○	○	○	○
Spoils vast landscapes	○	○	○	○	○	○
Are loud and/or dirty	○	○	○	○	○	○
Plants in my neighborhood would unsettle or bother me	○	○	○	○	○	○
Makes energy more expensive	○	○	○	○	○	○
Can cover a large share of energy demand in Norway	○	○	○	○	○	○
Can always supply enough power when it is needed	○	○	○	○	○	○
Additional power storage or better grid is necessary	○	○	○	○	○	○

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12. Let's continue with renewable energy sources. Please rate how much you agree or disagree with that statement about renewable energy.

Renewable energy sources (wind, solar, hydro, tidal, geothermal, bio power)...

	strongly disagree	disagree	neither agree nor disagree	agree	strongly agree	don't know
Strongly damages the environment (animals and/or plants)	○	○	○	○	○	○
Is a threat to human health	○	○	○	○	○	○
Damages the earth's climate	○	○	○	○	○	○
Is cheap to produce	○	○	○	○	○	○
Spoils vast landscapes	○	○	○	○	○	○
Are loud and/or dirty	○	○	○	○	○	○
Plants in my neighborhood would unsettle or bother me	○	○	○	○	○	○
Makes energy more expensive	○	○	○	○	○	○
Can cover a large share of energy demand in Norway	○	○	○	○	○	○
Is not always produced when needed	○	○	○	○	○	○
Additional power storage or better grid is necessary	○	○	○	○	○	○

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13. And now finally: nuclear energy sources. Please rate how much you agree or disagree with that statement about nuclear energy.

IM04

Nuclear power...

	strongly disagree	disagree	neither agree nor disagree	agree	strongly agree	don't know
Strongly damages the environment (animals and/or plants)	○	○	○	○	○	○
Is a threat to human health	○	○	○	○	○	○
Damages the earth's climate	○	○	○	○	○	○
Is cheap to produce	○	○	○	○	○	○
Spoils vast landscapes	○	○	○	○	○	○
Are loud and/or dirty	○	○	○	○	○	○
Plants in my neighborhood would unsettle or bother me	○	○	○	○	○	○
Makes energy more expensive	○	○	○	○	○	○
Can always supply enough power when it is needed	○	○	○	○	○	○
Is not always produced when needed	○	○	○	○	○	○
Additional power storage or better grid is necessary	○	○	○	○	○	○

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14. Please read the following statements about energy policy. Please tick how much you agree to each statement.

	strongly disagree	disagree	neither agree nor disagree	agree	strongly agree	don't know
I personally think this issue is important	○	○	○	○	○	○
Policymakers find this issue is important	○	○	○	○	○	○
Large parts of society find this issue important	○	○	○	○	○	○
This is an interesting topic	○	○	○	○	○	○
I often find myself thinking about that issue	○	○	○	○	○	○
I think about energy policy several times a day	○	○	○	○	○	○
Currently, interesting things happen in energy policy	○	○	○	○	○	○
There is nothing particularly interesting going on in energy policy at the moment	○	○	○	○	○	○

PD03
I am wondering whether this

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15. In energy policy, not all goals can be reached at the same time. What goals should politicians pursue when making decisions about energy policy?

PD04

Please rate the following goals regarding their importance from your personal perspective

not important at all   extremely important

Low energy consumer prices

Low greenhouse gas emissions, climate-friendliness

Low environmental damage (animals, plants, air, ground, water)

Preservation of landscapes and nature experience

Everybody can use as much energy as needed, at any time

Educate consumers to use less energy

Produce as much energy as possible, e.g. for export

Save and create job in the energy sector (and adjacent industries)

Increasing energy-efficiency

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16. Concerning those problems and challenges in the energy sector you find most troublesome for our society, there are usually multiple reasons or causes. Please rate which actors and reasons you think are more important, at the root for those problems and challenges.

AT02

The most important problems in the energy sector are caused by...

	strongly disagree	disagree	neither agree nor disagree	agree	strongly agree	don't know
Local and regional politics	○	○	○	○	○	○
National politics	○	○	○	○	○	○
EU-level politics, EU countries	○	○	○	○	○	○
non-EU countries	○	○	○	○	○	○
International politics	○	○	○	○	○	○
Home consumer behavior (heating, electricity, home electronics)	○	○	○	○	○	○
Transportation and commuting behavior (cars, trucks, rail)	○	○	○	○	○	○
Energy industry	○	○	○	○	○	○
Car industry	○	○	○	○	○	○
Other industry or business	○	○	○	○	○	○
Scientists and experts	○	○	○	○	○	○
Environmental NGOs	○	○	○	○	○	○
Current and recent decisions and behaviors (in the last 5 years)	○	○	○	○	○	○
Decisions and behaviors long past (more than 5 years ago)	○	○	○	○	○	○

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17. And who do you think has the best capabilities to solve these problems and challenges? Please rank the following agents regarding their problem-solving capacity regarding those challenges in energy policy that you believe are most troublesome for our society

The major problems in energy policy can be solved by changing...

	strongly disagree	disagree	neither agree nor disagree	agree	strongly agree	don't know
...local and regional policies	○	○	○	○	○	○
...national policies	○	○	○	○	○	○
...EU-level policies, EU countries' policies	○	○	○	○	○	○
...non-EU countries' policies	○	○	○	○	○	○
...international policies	○	○	○	○	○	○
...home consumer behavior (heating, electricity, home electronics)	○	○	○	○	○	○
...transportation and commuting behavior (cars, trucks, rail)	○	○	○	○	○	○
...energy industry business decisions	○	○	○	○	○	○
...car industry business decisions	○	○	○	○	○	○
...other industry or business decisions	○	○	○	○	○	○
...science and research	○	○	○	○	○	○
...environmental NGOs' actions	○	○	○	○	○	○

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18. Please complete the following sentences.

Do not use more than 10 or 20 words, if possible.

The electricity grid in Norway should be... [_____]   The energy prices in Norway should...

[_____]   To protect the animal and plant life, Norway should... [_____]   The development of

Thorium-based nuclear power or nuclear fusion power should... [_____]   The dependency on oil and

gas from the OPEC and Russia should... [_____]   The energy consumption in Norway should...

[_____]   To decrease greenhouse gas emissions, Norway should be... [_____]   Electric

cars in Norway should... [_____]   The renewable power capacity in the EU should be...

[_____]   The fossil power capacity in the EU should be... [_____]   The nuclear power

capacity in the EU should be... [_____]

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19. Let's look again at the list of considerations about energy policy and energy technology that are arguments for using a particular energy source. Please tell me how important you think the argument should be for policymakers in making decisions about the future energy policy in Norway?

That argument is...

Not important at all   Extremely important

(+) Create jobs

(+) Low greenhouse gas emissions

(+) Cheap energy, low consumer prices

(+) Safe and clean

(+) Available anytime, anyplace

(+) Create jobs for blue-collar workers, less well-educated people

(+) Can be used easily in transportation, e.g. cars, lorries, or busses

(+) Leaves no significant waste

80

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20. Let's look again at the list of considerations about energy policy and energy technology that are counterarguments against using a particular energy source. Please tell me how important you think the argument should be for policymakers in making decisions about the future energy policy in Norway?

AE06
same comment as previous. Since this

That counter-argument is...

Not important at all

Extremely important

(–) Needs better electricity grids to work efficiently

(–) Has high disaster potential, could lead to a catastrophe

(–) May be an attractive target for sabotage and terrorist attacks

(–) Leads to high long-term costs in the future ("eternity costs")

(–) Regular operation can cost many human lives

(–) Severely impacts landscapes, animal or plant life

(–) Is bad for the tourism industry

(–) Is bad for recreation and nature experience

(–) We will run out of fuel in a few decades

(–) If we run low on fuel for that, prices will increase a lot

(–) Creates unwanted dependency on unreliable countries

(–) Leaves waste that needs to be stored for hundreds of thousands of years

(–) Tremendous investments are needed to build the plants necessary to supply enough energy for the whole country

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PHP code

```php
$order = value('RN02');

if ($order == 2) {
    goToPage('Q4');
    }

if ($order == 1) {
    goToPage('TRTCHK');
    }
```

81

PHP code

```
$code = value('RN01');
$bild = value('RN01', 'label');

if ($code == 5) {
    goToPage('QX1');
    }
```

M111

21. Before reading the long article, we showed you a short article with one large graphic. Here is a list of claims. Some of these were featured in the small article, other claims were not.

Can you please indicate which arguments you think were in the text and which were not in the text?

If you are not sure what was in the text, you can choose the intermediate options. It does not matter whether you believe the claim is true or false, just whether the text mentioned it or not.

Here, the statements will be displayed, one by one.
Press (1), (2), or (3) to begin.

IN THE TEXT	NOT IN THE TEXT	unsure
(1)	(2)	(3)
(y)	(n)	(u)

PHP code

```
$code = value('RN01');
if ($code==2) {question('M106');}
if ($code==2) {question('M107');}
if ($code==3) {question('M103');}
if ($code==3) {question('M104');}
if ($code==3) {question('M105');}
if ($code==4) {question('M108');}
if ($code==4) {question('M109');}
```

question('M106')

M106

22. Which country in projected to have the strongest decrease in per capita greenhouse gas emission (1990–2030)?

○ Germany

○ Norway

○ Denmark

○ Sweden

○ UK

○ Don't know

question('M107')

M107

23. How much greenhouse gases would Norway emit in 2030?

The Paris treaty demands reducing the emissions to 6 tons per capita

○ ca. 7 tons per capita (17% too much)

○ ca. 9 tons per capita (50% too much)

○ ca. 13 tons per capita (117% too much)

○ ca. 15 tons per capita (150% too much)

○ ca. 18 tons per capita (200% too much)

○ Don't know

question('M103')

M103

24. How much are energy prices projected to increase until 2040, approximately, as a minimum (lowest projected increase), approximately?

○ 20%
○ 40%
○ 60%
○ 90%
○ 120%

○ Don't know

question('M104')

M104

25. How much are energy prices projected to increase until 2040, approximately, according to a realistic scenario (medium projected increase), approximately?

○ 20%
○ 40%
○ 60%
○ 90%
○ 120%

○ Don't know

question('M105')

M105

26. How much are energy prices projected to increase until 2040, approximately, as a maximum (highest projected increase), approximately?

○ 20%
○ 40%
○ 60%
○ 90%
○ 120%

○ Don't know

question('M108')

M108

27. How much was the population of [fish] reduced in one hydroelectric power research project?

Fish population decreased by...

○ 10%

○ 30%

○ 50%

○ 70%

○ 90%

○ Don't know

question('M109')

28. How much would continued building of hydropower stations reduce the revenues of the tourism industry until 2030?

M109
both
questions
about
Fischsterbe

The tourism industry would shrink by...

○ 10%

○ 20%

○ 30%

○ 40%

○ 50%

○ Don't know

BT01

29. How do you rate the short article with the information graphics you read first? In each row, you can place the article between two opposite characteristics. Please indicate what characteristics you feel describe your views on the article.

Use the intermediate scale points to grade your response

The shorter article [with infographic] was...

uninformative	○	○	○	○	○	informative
amateurish	○	○	○	○	○	professional
unbelievable	○	○	○	○	○	credible
partisan	○	○	○	○	○	non-partisan
not well-researched	○	○	○	○	○	well-researched
inconsistent	○	○	○	○	○	consistent
not persuasive	○	○	○	○	○	persuasive
uninteresting	○	○	○	○	○	interesting
boring	○	○	○	○	○	enjoyable
hard to understand	○	○	○	○	○	easy to understand

M112

30. You also read a long article with plenty of information about the pro's and con's of various energy generation technologies. Below you find some pieces of information that were included in the text and other statements that were not part of the text.

Can you please indicate which arguments you think were in the text and which were not in the text?

The wording in the question and in the text may be different, and still refer to the same argument.

If you are not sure what was in the text, you can press "3" = unsure. It does not matter whether you believe the claim is true or false, just whether the text mentioned it or not.

Here, the statements will be displayed, one by one.
Press (1), (2), or (3) to start.

IN THE TEXT	NOT IN THE TEXT	unsure
(1)	(2)	(3)
(y)	(n)	(u)

PHP code

```
$order = value('RN02');

if ($order == 2) {
    goToPage('Q32');
    }

if ($order == 4) {
    goToPage('Q4');
    }
```

Last Page

Thank you for completing this questionnaire!

We would like to thank you very much for helping us.

Your answers were transmitted, you may close the browser window or tab now.

Prof. Dr. Stefan Geiss, NTNU (Norwegian University of Science and Technology) – 2019

A4.   R-script

```
setwd("m:/users/stefange/OneDrive - NTNU/2-Data/COSENSO")
load("cosenso_2.RData")

# Install packages
install.packages("car")
install.packages("psych")
install.packages("multcomp")

# Load libraries
library(car)
library(psych)
library(multcomp)

# Save data under new name: co
co <- co_pre[12:129,]

# Experimental Group variables
co[,"group"] <- Recode(co$RN01,"1='NEUframe';2='GGEframe';3='PRIframe';4='ENVframe';5='CTRL'")
co$group <- Recode(co$RN01,"1='NEUframe';2='GGEframe';3='PRIframe';4='ENVframe';5='CTRL'")
Recode(co$RN01,"1='NEUframe';2='GGEframe';3='PRIframe';4='ENVframe';5='CTRL'") -> co$group
co$gr <- factor(co$group)
co$exp2 <- Recode(co$group,"'CTRL'=NA")
co$exp <- Recode(co$group,"'NEUframe'=NA;'CTRL'=NA")

# COMPUTE reading time
co$ReadingTime <- co$TIME008+co$TIME009+co$TIME010+co$TIME011+co$TIME012+co$TIME013

######### Manipulation check:

Anova(lm(trt_gge.tp~group=="GGEframe",data=co))
summary(lm(trt_gge.tp~group=="GGEframe",data=co))

### More true positives for the GGE frame.

Anova(lm(trt_nat.tp~group=="ENVframe",data=co))
summary(lm(trt_nat.tp~group=="ENVframe",data=co))

### More true positives for the ENV frame.

Anova(lm(trt_pri.tp~group=="PRIframe",data=co))
summary(lm(trt_pri.tp~group=="PRIframe",data=co))

### More true positives for the PRI frame.

Anova(lm(trt_pop.tp~group=="NEUframe",data=co))
summary(lm(trt_pop.tp~group=="NEUframe",data=co))

### More true positives for the NEU frame.

### The respondents accurately remembered the information from the frames they had read.
### Manipulation successfully checked. It worked!
```

```
######### Test Hypothesis 1: Do groups differ in their reading time?

Anova(lm(ReadingTime~group,data=co))     # Gives the overall test whether any significant groups exist between any of
 the groups.
summary(lm(ReadingTime~group,data=co))  # Linear regression analysis that tells you which groups deviate from the
 overall average.
glht.ReadingTime <- glht(aov(ReadingTime~group,data=co),linfct=mcp(group="Tukey")) # Prepares the next step.
summary(glht.ReadingTime,test=adjusted("single-step")) # Pairwise comparison of each group to all other groups. Tells
 you which groups differ from which, significantly.
    # This second step with "glht" can be done for each of the following analyses separately if "group" is the
 independent variable.

# Result: F(2,65)=.863; p=.465; not significant.
# The Neutral frame group has the lowest reading time; then comes Environment Frame; then comes Price Frame; the
 longest reading time is observed for the GGE Frame Group

######### Test Hypothesis 2: Does the Environment Frame Group recall environment arguments better?

Anova(lm(ENV.recall~group=="ENVframe",data=co))
summary(lm(ENV.recall~group=="ENVframe",data=co))

# Result: F(1,55)=2.533; p=.117; not significant.
# Also, the effect is in the wrong direction: even if it was significant, the recall would be worse rather than better.

######### Test Hypothesis 3: Does the Price Frame Group recall price arguments better?

Anova(lm(PRI.recall~group=="PRIframe",data=co))
summary(lm(PRI.recall~group=="PRIframe",data=co))

# Result: F(1,55)=1.199; p=.278; not significant.
# Also, the effect is in the wrong direction: even if it was significant, the recall would be worse rather than better.

######### Test Hypothesis 4: Does the GGE Frame Group recall GGE arguments better?

Anova(lm(GGE.recall~group=="GGEframe",data=co))
summary(lm(GGE.recall~group=="GGEframe",data=co))

# Result: F(1,55)=0.004; p=.953; not significant.
# There are no differences at all.

######### Test Hypothesis 4: Does the GGE Frame Group recall GGE arguments better?

Anova(lm(GGE.recall~group=="GGEframe",data=co))
summary(lm(GGE.recall~group=="GGEframe",data=co))

# Result: F(1,55)=0.004; p=.953; not significant.
# There are no differences at all.

######### Test Hypothesis 5: Does any of the frames lead to more positive cognitive responses?

Anova(lm(mc.pos~group,data=co))
summary(lm(mc.pos~group,data=co))

# Result: F(3,58)=4.821; p=.005; highly significant.
# The price frame leads to fewer positive cognitive responses compared to the neutral group.
# The other two groups did not differ significantly from the neutral group; if anything, they show more positive
 responses compared to the neutral group.

######### Test Hypothesis 6: Does any of the frames lead to more negative cognitive responses?

Anova(lm(mc.neg~group,data=co))
summary(lm(mc.neg~group,data=co))

# Result: F(3,58)=0.961; p=.417; not significant.
# The three frame groups really do not differ from each other or the neutral group.
```

```
######### Test Hypothesis 7: Does any of the frames lead to more higher issue salience?

Anova(lm(issuesalience.personal~group,data=co))
summary(lm(issuesalience.personal~group,data=co))

# Result: F(4,76)=2.546; p=.046; significant.
# Generally, an average of 3.90 on a 1-5 scale.
# When environment frame is presented, average is 0.47 points lower (totalling 3.43 points).
# When the neutral frame is presented, it is 0.05 points higher (totalling 3.95 points)
# When the price frame is presented, it is 0.14 points lower (totalling 3.76 points)
# When the GGE frame is presented, it is 0.15 points lower (totalling 3.75 points)

######### Test Hypothesis 8: Does any of the frames lead to more increased demand for renewable energy?

Anova(lm(dre~group,data=co))
summary(lm(dre~group,data=co))

# Result: F(4,78)=1.041; p=.392; not significant. But still, the trends look interesting.
# Generally, 9.4% points more renewable energy is desired.
# When environment frame is presented, the percentage is 8.1% points lower (totalling 1.3% points).
# When the neutral frame is presented, it is 7.6% points higher (totalling 17.0% points)
# When the price frame is presented, it is 1.8 percentage points lower (totalling 7.6% points)

######### Test Hypothesis 9: Does any of the frames lead to more decreased demand for fossil energy?

Anova(lm(dfo~group,data=co))
Anova(lm(dfo~group,data=co))

# Result: F(4,78)=2.370; p=.060; marginally significant.
# Generally, 28.7% points less fossil energy is desired.
# When environment frame is presented, the percentage is 16.3% points higher (totalling -12.4% points).
# When the neutral frame is presented, it is 9.6% points lower (totalling -38.3% points)
# When the price frame is presented, it is 3.6 percentage points higher (totalling -25.1% points)

######### Test Hypothesis 10: Does any of the frames lead to more decreased/increased demand for nuclear energy?

Anova(lm(dnu~group,data=co))
summary(lm(dnu~group,data=co))

# Result: F(4,78)=0.463; p=.763; not significant.
# Generally, 19.3% points more nuclear energy is desired.
# When environment frame is presented, the percentage is 8.2% points lower (totalling 11.1% points).
# When the neutral frame is presented, it is 2.1% points higher (totalling 21.4% points)
# When the price frame is presented, it is 1.8 percentage points lower (totalling 17.5% points)


######### There is a few more dependent variable you could look at, if you want, analogous to the 10 analyses above :

Anova(lm(prio.env~group,data=co))
Anova(lm(prio.prod~group,data=co))
Anova(lm(issuesalience.personal~group,data=co)) # This one looks interesting.
Anova(lm(issuesalience.social~group,data=co))
Anova(lm(budget.re~group,data=co))
Anova(lm(budget.grid~group,data=co))
Anova(lm(budget.hy~group,data=co))
summary(lm(dnu~group,data=co))
```