Bachelor's thesis

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The Power of social norms and psychological distance to flooding in shaping Norwegians´ risk perception of climate change

Bachelor's thesis in Psychology
Supervisor: Amanda Elizabeth Lai
May 2022

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Norwegian University of
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NTNU
Kunnskap for en bedre verden

Foreword

I did not attend our supervisor´s introduction lectures in the beginning of the semester due to an acute injury and hospitalization. In order to establish my research question I read the articles that supervisor shared with us, and conduced independent search for relevant literature on Pubmed, ScienceDirect, Google Scholar, Sprinker Link, Frontiers and Apa PsycNet. I came up with the research question on my own. The research question comes from identified gaps in existing relevant literature.

For this project we conducted an online survey. Before the survey was distributed, I and the other students in this project translated supervisor´s questions from English to Norwegian. The supervisor constructed the overall survey structure, while I was responsible for adding extra questions that were relevant for my bachelor thesis. The question selection and wording was independent work. Each student has been responsible for recruiting as many respondents as possible. Everyone shared the survey on different facebook groups, and with friends and family. Supervisor paid for advertising on facebook, and transferred respondents answers to a rich dataset.

Furthermore, the choice and execution of the quantitative analysis was independent work, as was the interpretation of results. The writing process, and the work of connecting the results with the literature used in this bachelor thesis was also done independently. I have generally received less supervising than originally intended. It is important for me to clarify that it was not my request to have as little supervising as I did. Circumstances around my illness at the outset of the project, combined with supervisor´s own illness at the time I was constructing my thesis is probably mostly responsible.

Per Helge Haakstad Larsen has provided constructive feeback and answered my questions expediently throughout the semester.

Finally, I want to thank Amanda Elizabeth Lai and Per for giving me constructive and helpful feeback after they read a draft of my bachelor thesis on May 26th.

Abstract

The Intergovernmental Panel on Climate Change emphasized that the world will face unavoidable climate change hazards if global warming exceeds 1.5 degrees (IPCC, 2022). Despite the warnings, researchers have documented a knowledge-behavior gap: even if people are aware of the threats posed by climate change, they are not engaging in sustainable actions (Wyss & Berger, 2022). Considering the literature (e.g.,Steynor et al., 2021; O´Connor, Bard & Fisher 1999) demonstrating that risk perception guides behavior and that people prioritize personal and close risks before abstract ones, the aim of this paper is to examine some of the psychological and social factors that could attenuate or amplify peoples´ risk perception of climate change. The data are based on a nationwide sample ($N = 293$), conducted through a cross-sectional survey. By using a correlational analysis and a hierarchical regression analysis did the results from the current study indicate that descriptive and prescriptive social norms are statistically correlated with, and predicting risk perception of climate change. However, psychological distance to flooding did not correlate or predict risk perception of climate change. Furthermore, the results from the paired t-test suggested that the respondents perceive climate change as somewhat more societal than personal. The results herein imply future research should consider investigating if communicating climate change hazards as local in their effect can lead Norwegians to perceive climate change risk as more personal and urgent, and that social norms have the potential to amplify Norwegians´ climate change risk perception – bot implication can help decrease the knowledge-behavior gap.

The power of social norms and psychological distance to flooding in shaping Norwegians´ risk perception of climate change

Climate change is a huge threat to human wellbeing and health of the planet. According to the UNs climate change report we have ten years to alter our course (IPCC, 2022). If we choose the wrong paths, the report states, the world will face more pandemics, loss of biodiversity, collapsing ecosystems, more extreme weather hazards, acidification of oceans, greater inequality, air pollution, decreased mental and physical health and species driven to extinction (IPCC, 2022).

To address these challenges efficiently, changes are required in both individual and communities´ patterns of behavior (Perry et al., 2021; Nielsen 2021). This is because human activities not only contribute substantially to causing climate change, but also play a key role to its reduction (Nielsen et al., 2021; Bradley et al., 2020; Trenberth, 2018). To illustrate, Green et al., (2015) argue that it is possible to cut up to 40% of greenhouse gas emissions through individuals' actions if people substitute meat and dairy with plant-based foods. However, the literature has for decades highlighted a knowledge-behavior gap (Wyss & Berger, 2022; Nielsen et al., 2021; Bradley et al., 2020; Gifford & Chen, 2017; Carrington, Neville & Withwell, 2014), meaning that even though most people are aware of the ongoing climate change and accept that their actions are of importance, people don´t change towards a more pro-environmental behavior. Moreover, has studies consistently shown that risk perception guide behavior, and that individuals who perceive the risk of climate change as more severe prioritize pro-environmental behavior (Xu, Cao & Li, 2020; van der Linden, 2015; Spence, Poortinga & Pidgeon, 2012; Brewer et al., 2007, O´Connor, Bard & Fisher 1999). Hence, to limit climate change there is a need for psychological insight about the psychology behind people´s risk perception of climate change.

But despite the important role of individuals decisions and behavior in everyday life, have researchers paid less attention to factors influencing people at the individual level, than factors at the societal level (Wyss & Berger, 2022; Clayton et al., 2015). This is a fact even though a top-down approach to direct individual behavior, which involves sanctions through legislative frameworks, is not sufficient to encourage people to be more pro-environmental (Perry et al., 2021). As a consequence, there has been an increasing amount of studies looking at what motivates people to change behavior at the individual-level (e.g., Wyss & Berger, 2022; Perry et al., 2021; van der Linden, 2015; Clayton et al., 2015). This implies looking at how psychological and social factors can amplify and attenuate individuals risk perception of climate change.

<div align="center">**Literature review**</div>

Knowledge is not enough to make people perceive climate change as a risk

The ways humans react and respond to information about climate change and its possible consequences is, according to a growing scientific consensus**,** a result of individuals risk perception (Xu, Cao & Li, 2020; van der Linden, 2015; Clayton et al, 2015; Spence, Poortinga & Pidgeon, 2012; Brewer, et al., 2007; O´Connor, Bard & Fisher 1999). To illustrate, has the health and psychology literature found a consistent relationship between risk perception and willingness to invest in pro-environmental behavior, and demonstrated that behavioral changes are strongly motivated by personal perception of risk (e.g., Steynor et al., 2021; Clayton et al., 2015; van der Linden, 2015; Petrovic, Madrigano & Zaval., 2014; Spence, Poortinga, & Pidgeon, 2012; Brewer et al., 2007). Furthermore, is risk perception defined by van der Linden as:

> *"a mental construct where people interpret signals from diverse sources regarding uncertain events and forming a subjective judgement of the probability and severity of current and future harm associated with these events. Risk perceptions are shaped not only by the objective threat but also by multiple personal and social factors"* (van der Linden, 2015).

Various theoretical models have historically been proposed to understand the determinants of risk perception. However, arguably none of them had especially good explanatory power. Therefore, van der Linden proposed an integrated theory of risk perception of climate change, namely the climate change risk perception model (CCRP) (van der Linden, 2015). By combining the cognitive, experiential, socio-cultural and socio-demographic dimensions, the CCRPM managed to explain nearly 70% of the variance in individuals risk perception of climate change (van der Linden, 2015). Van der Linden found that humans´ risk perception of climate change is a function of 1) cognitive factors (i.e., knowledge about climate change), 2) experiential processing (personal experience and affective evaluations), 3) socio-cultural influences (including social norms and broad value orientations), and 4) socio-demographic characteristics. He also found that experiential and socio-cultural processes were the most influential (van der Linden, 2015).

Furthermore, risk perception of climate change is more complex and multidimensional than other risk information people meet in their everyday lives (van der Linden, 2015). This is firstly a fact because human cognition is evolutionary designed to be motivated to perceive threats that are visible, certain, and close in time and space to the self. Secondly because people evaluation of risks is strongly impacted by cultural and social factors (van der Linden, 2015; Gifford, 2011). So, risk judgements about climate change and its potential consequences varies between individuals and countries.

One chief concern in relation to the knowledge-behavior gap is hence, as the literature highlights, that psychological factors are much more influential than objective information in shaping

human risk perception of climate change. This highlights the importance of understanding the underlying predictors that shape individuals risk perception of climate change in more countries.

Psychological distance attenuates the perceived risk

Several European and American studies have highlighted that people perceive climate change to be a global and societal threat, but not personally threatening or urgent (van der Linden, Maibach & Leiserowitz, 2017; Lorenzi & Pidgeon, 2006). In line with this, the latest results from "norsk medborger panel" (2021) showed that 68% answered that they see climate change as a severe threat, while only 36% said they consider it a personal threat (Norsk medborgerpanel, 2021). Thus, a key problem with climate change is that it is psychologically distant as a phenomenon. The concept of psychological distance comes from Trope and Liberman´s (2010) Construal Level theory (CLT). CLT propose that psychological distance from an object or event is directly linked to the subjective way people mentally represent risk (Loy & Spence 2020; Spence, Poortinga & Pidgeon, 2012; Liberman & Trope, 2010). The theory describes psychological distance as including four dimensions: spatial (where an event occurs), temporal (when), social (to whom), and uncertainty (whether it happens) (Loy & Spence, 2020; Spence, Poortina & Pidgeon, 2011).

As the perceived distance to the threat increases, so does the abstractness, and the risk perception attenuates (Van Lange & Huckelba, 2021). Studies have shown that climate change is perceived as being distant on all four dimensions), consequently, accounting for people's risk perception of climate change as less urgent than other threats in their daily lives (e.g., Van Lange & Huckelba, 2021; Spence, Poortina & Pidgeon, 2011**).** Moreover, the abstract nature makes here-and-now self-interests and other more present and local threats (e.g., health and social acceptance) more prominent than the long-term consequences for the earth (Van Lange & Huckelba, 2021). For example, many people find it more convenient and pleasant to drive instead of walk to work, buy the cheaper rather than the environmental or ethical products and choosing fast fashion clothes even though they last shorter and climate footprint bigger. People do this because here-and-now benefits are more prominent than the perceived probability of unwanted long-term consequences linked to their behavioral choices (Nielsen et al., 2021; Van Lange & Huckelba, 2021; van der Linden, Maibach & Leiserowitz, 2017). However, have IPCC stressed that people all over the world will be, and are already, affected by climate change (IPCC, 2022). For instance, have researchers emphasized that communities in Norway face an increasing flooding and precipitations threat because of the ongoing climate change. If severe, such events can lead to, e.g., loss of loved ones, economic disruption, or post-traumatic stress disorder, which all have the potential to impact mental health and quality of life negatively (Clayton et al., 2015; Lujala, Lein & Rød, 2015; Rød, Opach, Neset, 2015).

A growing body of evidence has hence recommended a need for communicating the risk of climate change as local, closer and personal consequences, instead of remote, to decrease the psychological distance and increase humans risk perception (e.g., Van Lange & Huckelba, 2021; Spence, Poortinga & pidgeon, 2011). To date, studies points to this recommendation as promising in motivating people to personally engage in sustainable actions (Nielsen et al., 2021, Loy & Spence, 2020; van der Linden, Maibach & Leiserowitz, 2017). This is because psychological research has found that psychological distance serves as a predictor for the way individuals perceive the risk of climate change (Van Lange & Huckelba, 2021; Loy & Spence, 2020; Maiella et al., 2020; Spence, Poortinga & Pidgeon, 2011). For instance, Maiella et al.,´s (2020) review emphasized that people who perceive climate change and its related consequences as more personal, closer and local had a higher tendency to intend to act sustainable. Hence, the psychological distance research indicates that psychological distance is influencing peoples´ perceptions of climate change as a risk.

The social construction of risk

Humans´ risk perception and evaluation of the likelihood of unwanted consequences are also influenced by social norms (Steynor et al., 2021; van der Linden, 2015; Schultz et al., 2007). Meaning that the way people perceive risks are shaped by what they think other important referents (e.g., friends and family) think, feel, and do, and if they think their planned behavior will be socially approved or not (Perry et al., 2021; Renn, 2011; Schultz et al., 2007; Cialdini 2003). The few quantitative studies that have investigated social norms´ role in predicting risk perception of climate change, indicate that social norms impact how threatening people perceive climate change to be (van der Linden, 2015; Renn, 2011).

Despite years of controversy over social norms´ role in predicting individuals´ behavior, research has demonstrated that social norms serve as a guide for actions and as a reason for people's departure from rational choices (Goldstein, Cialdini & Griskevicuis, 2006; Schultz et al., 2007). The Social Amplification of Risk Framework (SARF) which is an explanatory tool to interpret human responses, suggest that social amplifiers (e.g., social norms) significantly influence the way humans process incoming risk information and relate to potential risks in their everyday lives. In relation to risk perception of climate change, social amplifiers can either amplify the perceived risk and motivate pro-environmental behavior or attenuate the risk which in turn makes humans more insensitive to the actual risk (Renn, 2011). In line with Goldstein, Cialdini & Griskevicuis (2006), Schultz et al., (2007) and Renn (2011), climate change research suggests that social norms function as a key role in predicting individuals' risk perception of climate change and their intention to enact pro-environmental or not (van der Linden, 2015; Perry et al., 2021). To illustrate, van der Lindens CCRPM found that 22% of

the variance in risk perception to climate change can be explained by social norms (van der Linden, 2015).

Social norms are divided into descriptive and prescriptive social norms, and arise from the need for approval, expectations about how others will behave, and the perceived consequences of conforming to or departing from them (Perry et al., 2021; Cialdini, 2003). Descriptive norms refer to an individual's perception of what most people in a group think, feel, or do in specific situations (Cialdini, 2003). For example, if people similar to oneself do not change their travel or eating habits, the probability of becoming motivated to change behavior themselves decreases. Additionally, could observing the inaction of others lead people to perceive the ongoing climate change as a less severe threat (Steynor et al., 2021). This will in turn make people perceive climate change as more uncertain, and the psychological distance to the phenomena increases (Perry et al., 2021).

Prescriptive social norms refer to the belief about which behavior is socially accepted and rewarded and which are not (Cialdini, 2003). For example, people can, in fear of being judged negatively, continue with eating meat in social situations even though they want to reduce their meat consumption to help reduce the greenhouse gas emissions. In fact, have studies found that perceived social disapproval serves as a potential barrier for people to adopt pro-environmental behavior, as loosing social acceptance is perceived as a personal and prominent risk (Perry et al., 2021; Gifford et al., 2011). Thus, the fear of doing a socially "inappropriate" behavior leads to the persistence and maintenance of unsustainable behavioral choices, and the perception of climate change risk stays low compared to the objective risk (Perry et al., 2021).

The current study

Most studies to date have been conducted in the United Kingdom and the United States (e.g., van der Linden, 2015; Spence, Poortina & Pidgeon, 2011). But as risk judgements vary from individual to individual and country to country, it is pivotal to increase knowledge about how and which psychological factors influence risk perception of climate change in other nations. The fact that nearly two thirds of global emissions are caused by human consumption stresses how important it is to increase knowledge about predictors that can motivate people to perceive climate change as a priority risk in everyday life. The goal of this study is hence to investigate if psychological distance to flooding, and social norms influence Norwegians´ risk perception of climate change, and map how they relate to the climate change threat.

Firstly, and in line with literature on psychological distance highlighting that perceiving climate change as a threat or not can be explained by how people relate to the probable consequences, this study explores if Norwegians´ relation to flooding correlate with their risk perception of climate

change. To my knowledge, it has never been investigated whether Norwegians´ psychological distance to flooding correlates with risk perception of climate change. The literature demonstrates the expected increase of annual precipitations and flooding are among the most destructive climate change consequences taking place in Norway (Lujala, Lein & Rød, 2015; Rød, Opach, Neset, 2015). Thus, flooding serves as a potential local, proximal, and personal threat that is partly a consequence of climate change. Flooding and the increasing risk could therefore motivate Norwegians to perceive climate change as a severe threat. Moreover, I hypothesize that (H1) psychological distance to flooding correlates negatively with risk perception of climate change and conversely.

Secondly, researchers emphasize that social norms – both descriptive and prescriptive – play a key role in predicting risk perception (van der Linden, 2015; Lo, 2013; Valkengoed & Steg, 2019). However, are social norms relation with risk perception of climate change an understudied factor (van Valkengoed & Steg, 2019; van der Linden, 2015; Gifford, 2011). It is therefore this paper´s goal to explore if Norwegians´ risk perception of climate change is strengthened if 1) they perceive that important referents act sustainably and recognize the climate change risks, and 2) if they perceive that important referents expect them to act pro-environmentally. I hypothesize that (H2) both descriptive and prescriptive social norms correlate positively with risk perception of climate change.

Thirdly, I hypothesize that (H3) psychological distance to flooding and descriptive and prescriptive social norms predicts and explains some of the variance in Norwegians´ risk perception of climate change.

Finally, considering work on risk perception, psychological distance and social norms (e.g., Steynor et al., 2021; van der Linden, 2015; Spence, Poortinga & Pidgeon, 2012) indicating that people form their risk perception after how personal, close and local objective risks are perceived. This study explores if people perceive climate change as a more societal risk or personal risk. Hypothesizing that (H4) the respondents are more concerned about the climate change impacts for the wider society than for their personal lives. If the respondents distinguish between the two dimensions of risk as hypothesized, could it offer insight about how Norwegians perceive climate change, and thus point to future research directions to investigate how to make climate change risk more personalized.

Method

Participants

For the current project we were interested in Norwegians´ perception of being at risk in relation to climate change and floods and the psychological mechanisms behind risk perception. The data is based on a nationwide sample ($N = 293$) of the population of Norway living in different

landscapes. The respondents, either living in places where the risk of flooding is high or not, chose to participate in the survey by themselves. One hundred sixty of the participants were women (55%); one hundred twenty-six were men (43%); one was non-binary (0.3%); and six participants preferred to not share their gender (2%). Age ranged from 18 to 79 years, women ($M = 44.69$, $SD = 15.77$); men ($M = 44.27$, $SD = 18.04$); non-binary (21 years old); didn´t want to share gender ($M = 47.12$, $SD = 10.38$).

Procedure

Participants were recruited in April 2022. We conducted an online cross-sectional survey. And sent it out to our own facebook-pages, to 60 subgroups on facebook living in places where flooding is at high risk, paid for having an advertisement on facebook and sent the survey directly out to relatives and friends. The project was presented as a study about flooding, climate change and what it takes to invest in protective actions against weather hazards such as floods. The survey included self-administered questionnaires, meaning the respondents were given a set of questions to which he or she was asked to respond. The survey took about 15-20 minutes to complete. The first page consisted of a more in-depth presentation of the project, an assurance that their responses would remain anonymous and a consent form. The data collection ended late April. The study was submitted for approval from Norwegian Centre of Research Data (NSD) March, 2021.

Measurment instruments

We designed the survey in order to examine Norwegians´ perception of flooding and climate change risk, and to get insight into underlying predictors and barriers of climate change adaptation. The survey included a range of constructs related to flooding (e.g., flood experience, risk acceptance, place attachment, safety measures and identity threat). Here, I will focus on the constructs examining respondents risk perception of climate change as an outcome variable, and psychological distance to flooding and social norms as potential predictors and barriers.

Outcome variable – risk perception of climate change

The risk perception of climate change construct ($M = 4.30$, $SD = 1.60$) measured respondents' subjective evaluation of how severe they perceive climate change to be as a risk. Risk perception of climate change was constructed out of six items from the survey following principal components analysis in SPSS. The internal consistency was good, $\alpha = .95$. Five of the items were created by Van der Linden, while one was created by Kellstedt, Zaharan & Vedlitz (van der Linden, 2015; Kellstedt, Zaharan & Vedlitz, 2008). Based on face value I included six items. I specifically selected these

items because I wanted to examine if there were any differences in respondents' perception of climate change as a personal risk and as a societal risk. Van der Linden (2015) created three indexes´ for analysis - a global/societal risk perception index (α = .95); a personal risk index, (α = .87); and a holistic index, (α = .96). Drawing on these distinctions, two of the items measured how strongly respondents perceive climate change as a societal risk (*M* = 4.51, *SD* = 1.67), α = .88. An example of a question is "how serious would you estimate the impacts of climate change for Norway". The four remaining items measured how strongly respondents perceive climate change as a personal risk (*M* = 4.20, *SD* = 1.64), α = .92. Examples of questions are "how likely are you, sometimes during your life, to experience serious threats to your health or overall well-being, as a result of climate change?" and "how serious of a threat do you believe that climate change is to you personally?". 7-point Likert-scale were used to assess the respondents risk perception. Response alternatives ranged from 1 to 7. High scores reflected self-reported perception of understanding climate change as a more serious and severe risk.

Predictor variable – psychological distance to flooding

Respondents´ psychological distance to flooding (*M* = 3.37, *SD* = 0.91) were assessed through four items adapted from "*reducing, and bridging, the psychological distance of climate change*" (Loy & Spence, 2020). The internal consistency was highly reliable, α = .83. To measure psychological distance to flooding we changed the word "climate change" in Loy & Spence´s items to "flooding". Loy & Spence (2020) psychological socio-spatial distance items, α = .95, consisted of 14 questions (three assessing psychological social distance; four assessing psychological spatial distance; three assessing psychological temporal distance; and the assessed psychological hypothetical distance). Based on face value we included four of them. Two questions measured the psychological social distance, e.g., "serious consequences of flooding primarily impact other people", and two were questions measuring spatial distance, e.g., "floods are primarily affecting other parts of the world". Psychological distance to flooding was constructed out of the four items using principal component analysis in SPSS. We used a 5-point Likert-scale to assess the respondents´ psychological distance to flooding. Higher scores reflected increasing psychological distance to flooding. Lower scores reflected decreasing psychological distance.

Predictor variable – social norms

Social norms were assessed through seven questions constructed by van der Linden (van der Linden, 2015). The first three questions assessed descriptive social norms (*M* = 4.08, *SD* = 1.48*)*. The internal reliability was excellent, α = .90. Descriptive social norms measured respondents'

perception of how likely they think it is that important others (e.g., friends and family) are recognizing climate change as a risk and if they intend to act sustainable. An example of one question that was included in the survey is "most people who are important to me, are personally doing something to help reduce the risk of climate change". The remaining four questions related to prescriptive social norms ($M = 4.60$, $SD = 1.169$), and the internal reliability was good, $\alpha = .77$. These four items measured respondents' perception of feeling socially pressured or not to personally engage in helping to reduce climate change. E.g., "it is generally expected of me that I do my bit to help reduce the risk of climate change"; "I feel that helping to tackle climate change is something that is NOT expected of me". To check the internal reliability, I reversed the negative item in SPSS. The two variables were constructed using principal component analysis in SPSS. 7-point Likert-scale were used. Response alternatives ranged from (1) strongly disagree, to (7) strongly agree.

Statistics

To test the hypotheses, data were submitted to and analyzed with the statistical analysis program, IBM © SPSS © Statistics. Since the questionnaires were mandatory to answer, there was no missing data. Reliability analyses were carried out to check the internal consistency of the items. Principal component analysis was performed to extract the components. Descriptive statistics were provided to get an overview of the constructs. Correlation analyses (Pearon´s r bivariate correlations) were then carried out for the purpose of measure the relationships between the variables. A hierarchical multiple regression analysis was used to see if the predictor variables explained a statistically significant amount of variance in the outcome variable. A principal component analyses were then conducted to check if the one dimensional climate change risk perception construct could be two components. And a paired sample t-test was carried out.

To make valid inferences from the test statistics the assumptions of the quality of the data were tested. The shapes of the distributions were examined by visually using histograms and P-P plots (Field, 2018). Overall, the data points indicated that the risk perception of climate change, personal - and societal risk perception of climate change, and prescriptive social norms variables were slightly left skewed. And compared to the normal distribution, the climate change risk perception, personal - and societal risk perception variables was found to be slightly more light-tailed. The prescriptive social norms kurtosis indicated a nearly normal distribution. Further, the data points showed that the psychological distance to flooding and descriptive social norms had a nearly normal distribution. The kurtosis was found to be light-tailed for both variables. Because the sample was relatively large and the kurtosis was light-tailed the central limit theorem applied to the data, meaning that the assumption of normality matters less. The homogeneity of variance assumption was assessed trough plots of

standardized predicted values against standardized residuals (Field, 2018). The scatterplot showed homoscedasticity.

In order to assume that the results for the hierarchical regression could be generalized beyond the sample, I then tested for multicollinearity and the normality - and homoscedasticity of the residuals. Multicollinearity was computed through the Variance Inflation factor (VIF) and the tolerance statistics. VIF for all predictors had an average at 1.36, and the tolerance for all predictors had an average at 0.76, both gives an indication that it is not multicollinearity between the predictors (Field, 2018). The normality of the residuals were assessed through visually looking at the P-P plots. They showed that the residual points basically fall straight on the normal distribution line, indicating a normal distribution of residual. Lastly, the residual scatterplot was used to test the assumption of homoscedasticity. The scatterplot showed that the assumption for homoscedasticity was met (Field, 2018).

Results

Table 1

Summary of the principal component analysis of the risk perception of climate change items (N=293)

	Risk perception of climate change	Communality
"How concerned are you about climate change"	.88	.77
"Climate change will have noticeably negative impact on my economic and financial situation"	.91	.82
"How likely are you, sometimes during your life, to experience serious threats to your health or overall well-being, as a result of climate change?"	.87	.76
"How likely do you think it is that climate change will have very harmful, long-term impacts on you community?"	.92	.85
"How serious of a threat do you believe that climate change is to you personally?"	.90	.81
"How serious of a threat would you estimate the impacts of climate change for Norway?"	.88	.79
Eigenvalue	4.80	

Total % of explained variance	79.98	
Cronbach´s alpha	.95	

*Note. E*xtraction method was PCA (principal component analysis).

Table 2

Summary of the principal component analysis of the psychological distance to flooding items (N=293)

	Psychological distance to flooding	Communality
"Serious consequences of floods are primarily impact other people"	.85	.72
"Flooding is a significant problem mainly for others"	.84	.70
"Floods do mostly affect other parts of the world"	.83	.68
"Flooding is a significant problem mainly in distant locations"	.74	.55
Eigenvalue	2.65	
Total % of explained variance	66.14	
Cronbach´s alpha	.83	

*Note. E*xtraction method was PCA (principal component analysis).

Table 3

Summary of the principal component analysis of the social norms items items (N=293)

	Descriptive norms	Prescriptive norms	Communality
"Most people who are important to me, are personally doing something to help reduce the risk of climate change"	.94		.84
"Most people I care about are doing their bit to help slow climate change"	.95		.85
"How likely do you think it is that people close to you are taking personal action to address climate change? "	.82		.79
"It is generally expected of me that I do my bit to help reduce the risk of climate change"	.46	.43	.59
"People that are important to me, would support me if I decided to help reduce climate change"		.53	.49
"People whose opinion I value, think that I should personally act to reduce climate change"		.88	.69
"I feel that helping to tackle climate change is something that is NOT expected of me"		.80	.64
Eigenvaule	3.80	1.08	
% of variance	54.19	15.46	
Total % of explained variance		69.65	
Cronbach´s alpha	.90	.77	

Note. Component loadings <.30 not reported; extraction method was PCA (principal component analysis); rotated with oblimin direct and Kaiser Normalization

The principal component analyses (PCA) of the variables are reported in table one to three. The Bartletts tests of Sphericity was found to be significant in all of the analyses, $p < 000$. All had an acceptable KMO greater than .70. The first two analyses did not rotate the items as the PCA extracted one component. Table 1 shows that the six items that measured risk perception of climate change explained 79.98% of the variance. The scree plot showed a break at the second component.

The first component had an eigenvalue at 4.80, while the next had an eigenvalue at .36, indicating that one component should be retained. Table 2 shows that psychological distance to flooding, which was comprised of four items, explained 66.14% of the total variance. The scree plot had a break at the second component. But only the first component had an eigenvalue over Kaiser´s criterion of 1. The third PCA showed that two components had an eigenvalue over 1. And the scree plot had a break at the second component. Table 3 demonstrates that component one explained 54.19% of the variance, with a component loading ranging from .46 to .95. The second component explained 15.46% of the variance, with a component loading ranging from .43 to .88. The items with component loadings over 0.4 was clustered into the same component. Item number four was placed in component 2.

Table 4

Descriptive statistics and Pearson´s correlation coefficients ($N = 293$)

Variable	1	2	3	4
1. Risk perception of climate change	-	.01	.48***	.61***
2. Psychological distance to flooding		-	-.11	.04
3. Descriptive social norms			-	-.57***
4. Prescriptive social norms				-
M	4.30	3.37	4.08	4.60
SD	1.61	0.91	1.48	1.17

Note. ***$p < .001$

Table 4 presents an overview of the correlations, means and standard deviations of the variables used in this study. The correlation analysis showed a significant positive correlation between risk perception of climate change and descriptive social norms, $r(291) = .48, p < .001$. There was a significant positive correlation between risk perception of climate change and prescriptive social norms, $r(291) = .61, p < .001$. There was no correlation between risk perception of climate change and psychological distance to flooding as the result was not significant, $r(291) = .01, p = 836$.

Table 5

HIerarchial Regression Analysis Summary for predicting risk perception of climate change (N = 293)

Variable	b	$SE\ b$	β	R^2	ΔR^2
Model 1				.00	
Psychological distance to flooding	0.02	0.10	0.01		
Model 2				.24***	.24***
Psychological distance to flooding	0.12	0.10	0.07		
Descriptive social norms	0.53***	0.06	0.49***		
Model 3				.40***	.16***
Psychological distance to flooding	0.02	0.08	0.01		
Descriptive social norms	0.21***	0.06	0.20***		
Prescriptive social norms	0.69***	0.77	0.50***		

Note. ***$p < .001$

A hierarchical regression analysis was used to evaluate how much psychological distance to flooding, descriptive social norms and prescriptive social norms predict risk perceptions of climate change. The analysis is reported in table 5. Model 1 included the psychological distance to flooding variable and explained 0% of the variance in risk perception of climate change, $R^2 = .00$, $p = .844$. When the variable descriptive social norms was added to model 2, the explanatory percentage increased to 24%, $\Delta R^2 = .24 = p < .001$. In model 3, the variable prescriptive social norms was added, and the explanatory percentage increased to 40%, $R^2 = .40$, $p < .001$, $\Delta R^2 = .16$. Model 3 showed that prescriptive social norms was the strongest climate change predictor, $\beta = 0.69$, $p < .001$, followed by descriptive social norms, $\beta = 0.21$, $p < .001$. Psychological distance to flooding did not predict risk perception of climate change, $\beta = 0.02$, $p = 768$.

The two dimensions of risk perception of climate change

Table 6

Summary of the principal component analyses of the two dimensions of risk perception of climate change items (N=293)

	Personal risk perception of climate change	Societal risk perception of climate change
"How concerned are you about climate change"	.90	
"Climate change will have noticeably negative impact on my economic and financial situation"	.92	
"How likely are you, sometimes during your life, to experience serious threats to your health or overall well-being, as a result of climate change?"	.87	
"How serious of a threat do you believe that climate change is to you personally?"	.91	
"How likely do you think it is that climate change will have very harmful, long-term impacts on you community?"		.96
"How serious of a threat would you estimate the impacts of climate change for Norway?"		.96
Eigenvalue	3.25	1.77
Total % of variance	81.20	89.28
Cronbach´s alpha	.77	.88

Note. Extraction method was PCA (principal component analysis).

The component loading of the personal and societal risk measures are presented in Table 7. The Bartletts tests of Sphericity was found to be significant in both analyses, $p < 001$. Table 7 shows that the four items that measured personal risk perception of climate change explained 81.20% of the variance. Only the first component had an eigenvalue over Kaiser´s criterion of 1. These items had a high KMO, .83. The table additionally shows that the PCA of the two items that measured societal climate change risk perception explained 89.28% of the variance, and that the component had an eigenvalue at 1.77. The two items had a low KMO, .50.

The paired sample t-test showed a significant difference between societal risk perception of climate change ($M = 4.51$, $SD = 1.67$) and personal risk perception of climate change ($M = 4.19$, SD

= 1.64), t(291) = 7.26, $p < .001$. The difference in mean scores shows that people are a bit more concerned about climate change at the societal level than at the personal level.

Discussion

For the world to avoid thousands of climate change related deaths and catastrophic impacts on the planet, the Intergovernmental Panel on Climate Change (IPCC) concluded that global warming must not exceed 1.5 degrees (IPCC, 2022). As nearly two thirds of the total greenhouse gas emissions are caused by human consumption, changes are required at the individual level. The problem is that people fail to behave pro-environmental in their personal lives, even though they are aware that their actions are of importance (Wyss & Berger, 2022; Nielsen et al., 2021; Bradley et al., 2020; Gifford & Chen, 2017; Carrington, Neville & Withwell, 2014). To decrease this knowledge-behavior gap have psychological researchers highlighted that psychological and social factors influence peoples risk perception more than objective information, and that risk perception underlies behavioral intentions (e.g., van der Linden, 2015; O´Connor et al., 1999). Thus, the field of psychology plays an important role to reduce the worlds emissions by providing insights into the factors that shape and drive people´s risk perception of climate change and thus behavioral intentions.

Based on psychological research (e.g., Xu, Cao & Li, 2020; Brewer et al., 2007, O´Connor, Bard & Fisher 1999) highlighting the role of risk perception in motivating choice of behavior, the aim of the current study was to investigate if psychological distance to flooding and descriptive and prescriptive social norms correlated with, and predicted, Norwegians´ risk perception of climate change. Additionally, based on the research (e.g., Steynor et al., 2021; van der Linden, 2015; Spence, Poortinga & Pidgeon, 2012) indicating that the people consider which behavior to choose based on which risks they perceive as personal, close and proximal, the study explores if Norwegians perceive climate change as a more societal or personal risk.

Using a correlational analysis, this study examined whether there was a relation between psychological distance to flooding and risk perception of climate change. The non-significant result did not support the hypothesis (H1), suggesting that there was no statistical correlation between the two variables. In contrast, the hypothesis (H2) stating that it is a positive correlation between descriptive social norms and risk perception of climate change, and between prescriptive social norms and risk perception of climate change was supported. Moreover, the results from the hierarchical regression analysis indicate that prescriptive social norms explained most of the variance of risk perception of climate change, followed by descriptive social norms. While psychological distance to flooding did not. To summarize, model 1 did not support the hypothesis (H3), while

model 2 and 3 supported it. Lastly, the results from the paired sample t-test showed that it was a significant difference in mean between the respondents' perception of climate change as a societal threat and personal threat. As the respondents scored slightly higher on societal risk perception of climate change than personal risk perception of climate change, the hypotheses (H4) was supported.

The relation between psychological distance to flooding and risk perception of climate change

The absence of the expected correlation between psychological distance to flooding and risk perception of climate change can be due to methodological limitations within the study. Firstly, to my knowledge, was psychological distance to flooding operationalized for the first time in this study. Future research should consider exploring how to empirically capture the concept with an exploratory research design. Secondly, were four items included to measure psychological distance to flooding. Compared to other studies, like Loy & Spence (2020) who used 12 items and Spence, Poortinga & Pidgeon (2011) who used 10 items to measure respondents´ psychological distance to climate change, four is drastically less. Thus, the result can be due to a survey scope error. However, the reliability analysis showed that the internal consistency was good, meaning that the items that were included in the survey were highly correlated. But that doesn't give an indication of the construct´s validity, which relate to if the four items capture the phenomena that exists in the real world. Thirdly, since the data are based on self-reports and the main focus in the survey was questions asking about the respondents' attitudes towards potential safety implementations in their community and their willingness to invest in protective behavior in relation to flooding, response biases can have affected the results. Thus, an option order effect bias might be a reason for the lack of correlation between psychological distance to flooding and risk perception of climate change.

On the other hand, it is possible that the hypothesis was incorrect. A plausible explanation for the negative finding can be that the items measuring risk perception had a more general focus, while the items measuring psychological distance to flooding focused on one very specific consequence of climate change.

To compare, Construal Level theory proposed that psychological distance from an object is directly linked to the subjective way people mentally represent risk (Loy & Spence 2020; Spence, Poortinga & Pidgeon, 2012; Liberman & Trope, 2010). In line with the theory, have previous studies documented 1) that people who perceive climate change as proximal and personal perceive the risk of climate change as more severe, and 2) a consistent negative correlation between psychological distance to climate change and pro-environmental behavior (Nielsen et al., 2021, Loy & Spence, 2020; Maiella et al., 2020; van der Linden, Maibach & Leiserowitz, 2017).

Moreover, since the current study measured psychological distance to flooding, and previous research have measured psychological distance to climate change, is it somewhat difficult to compare existing results directly with this study. The growing body of literature (e.g., Nielsen et al., 2021, Loy & Spence, 2020; van der Linden, Maibach & Leiserowitz, 2017) saying that the observed knowledge-behavior gap can partly be explained by the ways people consider the different risks in their everyday life. A plausible explanation for the statistically non-significant result might be explained by methodological limitation and that Norwegians don´t associate flooding as a symptom on climate change that can have personal and proximal consequences. This interpretation is supported by for example Spence et al., (2011) who found that people who have experienced flooding perceive climate change as a stronger risk.

The relation between social norms and risk perception of climate change

The statistical correlational analysis showed a strong positive relationship between descriptive social norms and risk perception of climate change, and between prescriptive social norms and risk perception of climate change. The results are supported by existing literature (e.g., van der Linden, 2015; Lo 2013; Van Valkengoed & Steg, 2019) which have documented that there is a positive correlation between the social norms variables and risk perception of climate change. Causality between the variables cannot be determined by testing the statistical correlation between the variables. And previous studies (e.g., Lo, 2013) indicate that the relationship between both social norms and risk perceptions is complex and probably bidirectional. When applying the Social Amplification of Risk framework, and the literatures´ dominant view holding that social norms influence the formation of risk perception to interpret the results, can the results herein indicate that the stronger Norwegians´ believe other important referents prioritize environmentally friendly behavior, perceive the risk as urgent, and perceive it as socially accepted to act sustainable, the more strongly do they perceive climate change as a risk (Steynor et al., 2021; Perry et al., 2021; van der Linden, 2015; Gifford, 2011; Renn, 2011; Perry et al., 2021).

The impact of psychological distance to flooding and social norms on risk perception of climate change

The hierarchical regression analysis showed that prescriptive- and descriptive social norms predicted a significant amount of the variance of the respondents´ risk perception of climate change, and that psychological distance to flooding did not predict the variance. The finding supports the interpretation of the results from the correlation analyses suggesting that higher scores on social norms predict higher risk perception of climate change. In addition, it is supported by other studies (e.g.,

Steynor et al., 2021; van der Linden and Van Valkengoed & Steg, 2019) that have found social norms to be a highly influential predictor. Thus, this study adds to the literature that stresses the important role of social norms in predicting individuals risk perception of climate change.

Furthermore, considering existing studies and SARF (e.g., (Perry et al., 2021; Gifford, 2011; van der Linden, 2015; Renn, 2011), prescriptive social norms statistical explanatory power in the present study indicates that Norwegians´ risk perception is partly shaped by which behavior they perceive as appropriate and not. A plausible explanation for its influential role can be that people are highly motivated to be socially accepted. Thus, the fear of not fitting in is a prioritized personal risk which guide risk perception and behavioral intentions. Moreover, the present study also found descriptive social norms to explain a substantial amount of the variance in Norwegians´ risk perception of climate change. Based on existing studies, and SARF (e.g., Steynor et al., 2021; van Valkengoed & Steg, 2019; Lo, 2013, Renn, 2011), can the results herein indicate that humans´ perception of climate change as a more or less urgent risk is partly driven by descriptive social norms.

On the other hand, the hierarchical regression analysis did not find a linear relationship between psychological distance to flooding and risk perception of climate change. The finding was not unexpected as the correlation analysis did not support H1. As previously discussed.

The difference between societal and personal risk perception of climate change

Furthermore, the paired sample t-test suggested that the respondents perceived climate change to be a bit more societal risk than personal risk. Even though a statistical difference in the mean was found between the two variables, and thus the hypothesis (H4) was supported, the t-value was quite small. The results herein indicate that the respondents, to an extent, perceived the two dimensions of risk as not so different, which is a bit unexpected when compared to other studies. For example, Norsk medborgerpanel (2021) and van der Linden (2015) found significant differences. In contrast to van der Linden (2015) who included four items to measures societal risk perception of climate change, the survey used in the current study included only two. Hence, survey scope error can have impacted the result. Other potential explanations can be social desirability, meaning that people answer what they think is socially appropriate. On the other hand, can that the main focus in the survey about flooding contextualized their responses and interpretations of the questions. Despite the potential limitations within the study's method, the result showed that a difference existed. This aligns with several decades of research on psychology of risk perception demonstrating that people differentiate between the effects of climate change on their personal lives and on society (Lorenzi & Pidgeon, 2006).

Strengths and limitations

Naturally, there are some limitations and strengths to the present study. First, it should be noted that this study was based on correlational designs, which cannot be used to infer causal relationships (Field, 2018). The presentation of the effects between the variables of interest as linear, uni-directional and non-interactional, is hence an overly simplistic depiction of how psychological distance to flooding, descriptive- and prescriptive social norms relate to risk perception of climate change. On the other hand, did the correlational design fit into the current study´s executive goal, which was to investigate if it was any relationships between specific variables of interest, and see if the predictor variables predicted risk perception of climate change.

Secondly, as the literature have found many socio-psychological factors, is the formation of risk perception far more complex and multidimensional than the variables of interest in the current study. However, the study addressed important links between descriptive- and prescriptive social norms and Norwegians´ risk perception of climate change, which was one of the main goals of this paper. In contrast, can methodological limitations serve as potential explanations for the negative finding between psychological distance to flooding and risk perception of climate change. The same concerns the difference in mean between societal- and personal risk perception of climate change, which was lower than one might expect. The limitations for both findings are discussed previously. However, it should be emphasized that this study had a large sample from one nation, and it used, for the most part, highly reliable measurement scales.

Thirdly, has the use of cross-sectional research design both limitations and benefits. As this study relied on survey-based evidence, it can only say something about the way things were at a particular point of time. This makes it difficult to reveal the dynamic relationship between the psychological distance to flooding and risk perception of climate change and between the social norms variables and risk perception of climate change - which in the real world are dynamic in nature**.** For example, if mass media began to write more about the increasing risk of flooding and precipitation as a more severe threat at the society- and personal level after the survey was conducted, might the relation between the variables ended up different.

Finally, should it be noted that the effects found in this article are limited to self-reported data. Since responding to a survey require cognitive effort, does motivational factors, contextual factors and characteristics of the survey, e.g., the order of the questions and social desirability, impact respondents' interpretation of the questions and answers. On the other hand, did the cross-sectional design and self-reported measures make it possible to collect a great deal of data, increase the likelihood that respondents didn´t quit before completing the survey, investigate whether there were relationships between numerous variables in an inexpensive and fast way, and guarantee the

respondents anonymity, which perhaps promoted honest responses. All the aforementioned benefits were important for the current study.

Implications

Social norms drive individuals risk perception of climate change

The present study provides evidence for that prescriptive and descriptive social norms influence Norwegians´ risk perception of climate change. First and foremost, the finding that *prescriptive* social norms is the most influential factor indicates that peoples´ risk perception of climate change can be amplified if it is perceive as socially accepted to act pro-environmental and attenuate if such behavior is perceived as socially inappropriate. Moreover, the results herein imply a need for making it more socially inappropriate to prioritize other short-term self-interests over long term interests for the planet – like prioritizing the newest clothes or choosing cheaper products over climate friendly products, as this might motivate people to act more pro-environmental.

Secondly, the results pointing to descriptive social norms as a predictor indicate that *descriptive* social norms are reliable sources of to which degree people perceive climate change as a risk,. This means that if people perceive that important referents prioritize sustainable behavior and recognize climate change as a risk, will people perceive the risks more strongly. And conversely. But, according to studies (e.g., Van Lange & Huckelba, 2021 Perry et al., 2021, Gifford, 201) is a major hurdle for increasing peoples risk perception, psychological distance: the abstract nature of climate change might make it unclear how much people should prioritize it relative to other short-term self-interests. When uncertainty about this is present, do people rely more heavily on descriptive norms in weighing the relative importance of a risk and potential behaviors. Conversely observing other people´s inaction can make us insensitive to climate change risk and make us choose behaviors that fuel climate change. And the perception of climate change risk attenuates as long as unsustainability is the norms.

To summarize, by realizing social norms as important socio-psychological factors behind peoples´ risk perception of climate change, Norwegian communities can strengthen their citizens risk perception of climate through a cascade – it starts by fostering pro-environmental social norms, which in turn makes people perceive the climate change threat more strongly, which in turn closes knowledge-behavior gap. For example, by making people aware of what others like themselves do to reduce greenhouse gas emissions.

Furthermore, it should be noted that future research could consider building on the findings herein by using experiential designs and longitudinal designs to substantiate the hypotheses, provide better insight into real world cause-and effect relationships, look deeper into bidirectional relations,

and further explore how descriptive and prescriptive social norms potentially influence Norwegians´ formation of risk perceptions of climate change and how they impact behavioral choice.

Communicating flooding as a consequence of climate change

As this was a first study to apply construal-level theory to examine psychological distance to flooding, the negative findings of its lack of correlation with risk perception of climate change and predictive role offer directions for future research. As mentioned previously, Liberman and Trope´s (2010) CLT stated that psychological distance included four dimensions. As all dimensions, spatial, temporal, social and uncertainty, may be relevant to how Norwegians relate to the threat of flooding, it would be interesting to examine all four and see if the results ended up differently. Moreover, based on studies indicating that people are more likely to perceive climate change as a more urgent risk they want to act on if they associate the threats to be personal, close and local (e.g., Van Lange & Huckelba, 2021; Spence, Poortinga & pidgeon, 2011), future research should consider exploring if communicating flooding as a consequence of climate change that can affect Norwegians personally will increase their perceived risk of climate change.

Personal risk perception: a psychological barrier?

Finally, the current study found that individuals slightly distinguish between the effects of climate change on their personal lives and on wider society. Considering the methodological limitations and the lower-than-expected mean difference compared to existing literature (e.g., Norsk medborgerpanel, 2021), could future research investigate this further by including more items to measure the two dimensions. On the other hand, the results indicated that the respondents perceived climate change to be a bit more societal than personal risk, meaning that they perceive that climate change affect them less on a personal level than societal level. The tiny difference found can be interpreted to imply that a reason for that Norwegians deprioritize to act sustainably is because climate change is not perceived as a strong enough personal risk. This interpretation is based on literature on risk perception that have consistently shown that people are more motivated to prioritize behavior based on what they perceive as a personal risk (e.g., Brewer et al., 2007); and on psychological distance literature stressing that people get insensitive to risks that is not perceived as personal, local, proximal and certain (e.g., van Lange & Huckelba, 2021). Moreover, as the findings herein suggest that social norms shape Norwegians´ risk perception, can future research consider investigating if social norms can help make people perceive climate change as a more personal risk. To summarize, might the results herein point to a potential psychological mechanism behind Norwegians´ perception of climate change as less severe than the scientists have warned for decades.

But longitudinal and experiential studies are needed to investigate what influence peoples' calculations of the risk as more personal or societal.

Conclusion

Despite scientists warning about the risks and consequences related to climate change, people continue to deprioritize pro-environmental behavior in their personal lives because they perceive climate change risk as less urgent and more abstract compared to other threats (e.g., health threats or social acceptance). Climate change scientists have turned to psychological to understand the mechanisms behind this knowledge-behavior gap. The aim of this study has hence been to investigate if descriptive and prescriptive social norms and psychological distance to flooding were related to and influenced risk perception of climate change, and also whether respondents perceived climate change as more societal or personal threatening, which might serve as a barrier for people to act sustainable.

The research findings from the correlational analysis and hierarchical regression analysis indicate that descriptive and prescriptive social norms significantly correlate with and predict Norwegians´ risk perception of climate change, while psychological distance to flooding is not associated with or predict risk perception of climate change. Moreover, the results from the paired sampled t-test suggest that the respondents perceive climate change as slightly less threatening to their personal lives than for the wider society. This can arguably serve as a barrier for people to act sustainably.

To conclude, the findings imply that descriptive and prescriptive social norms can, through fostering pro-environmental behavior, be used to amplify peoples risk perception of climate change, which in turn might help to close the knowledge-behavior gap.

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