Activating and strengthening other-regarding preferences to promote pro-environmental behavior

Dissertation

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Abstract

Against the backdrop of global environmental degradation and the need for structural as well as individual change in consumption and production, this dissertation addresses the question of whether and how other-regarding preferences are related to pro-environmental behavior including approval of structural change. In a review of experimental studies on this interface as well as the implementation of own experiments, it is investigated whether – as assumed by some theories –there is a causal and positive relationship between both elements, through which mechanisms, for whom and with under which conditions this link becomes effective. It can be concluded that strengthening and activating other-regarding preferences can lead to more pro-environmental behavior, moderated by various factors such as existing preferences and behavioral costs. From the comparison with interventions for more environmental protection that address people's self-interest, no clear result could be drawn as to which approach is more effective. In an online study with a German sample, we showed that perspective-taking with a person affected by environmental degradation is not sufficient to influence costly behavior, but increases valuation of and perception of oneness to the person – partly depending on who and where this other person is. Further, we showed that people in Germany were less likely to sign a petition for more climate protection if the affected person lived in India rather than Germany. We found preliminary evidence that people with strong racist attitudes began to reject policies when the name of the person involved was of non-German origin, even if the person lived in Germany. In a second experiment in the context of corporate sustainability, neither a discourse around corporate responsibility nor a discourse around a "business case" for sustainability led to greater pro-environmental engagement among participants. At the same time, we were able to show that the "business case" discourse reduced the willingness to bear costs for environmental protection that could not be justified by indirect profits.

Zusammenfassung

Vor dem Hintergrund globaler Umweltzerstörung und der Notwendigkeit struktureller wie individueller Veränderung von Konsum und Produktion beschäftigt sich die vorliegende Dissertation mit der Frage, ob und wie prosoziale Präferenzen mit umweltfreundlichem Verhalten inklusive der Zustimmung zu struktureller Veränderung zusammenhängen. In einem Review experimenteller Studien zu dieser Schnittstelle sowie der Umsetzung eigener experimenteller Studien wird untersucht, ob es – wie von einigen Theorien angenommen – einen kausalen und positiven Zusammenhang zwischen beiden Elementen gibt, über welche Mechanismen, für wen und mit welchen Rahmenbedingungen er wirksam wird. Es wird deutlich, dass die Stärkung und Aktivierung prosozialer Präferenzen zu mehr Umweltverhalten führen kann, dies jedoch von verschiedenen Faktoren wie bestehenden Präferenzen und verhaltensbezogenen Kosten abhängt. Aus dem Vergleich mit Interventionen für mehr Umweltschutz, die den Eigennutz von Menschen ansprechen, ließ sich kein eindeutiges Ergebnis ablesen, welche Herangehensweise wirksamer ist. In einer Online Studie mit einem deutschen Sample zeigte sich, dass die Perspektivübernahme mit einer Person, die von Umweltdegradierung betroffen ist, nicht ausreicht, kostspieliges Verhalten zu beeinflussen, allerdings die Wertschätzung von und Verbundenheit mit der anderen Person erhöht – teilweise in Abhängigkeit davon, wer und wo diese Person ist. Weiterhin konnten wir zeigen, dass Menschen in Deutschland weniger oft bereit waren, eine Petition für mehr Klimaschutz zu unterschreiben, wenn die betroffene Person in Indien lebte und nicht in Deutschland. Wir fanden vorläufige Hinweise darauf, dass Personen mit starken rassistischen Einstellungen anfingen Politikmaßnahmen abzulehnen, wenn der Name der betroffenen Person nicht-deutscher Herkunft war, auch wenn die Person in Deutschland wohnte. In einem zweiten Experiment im Kontext unternehmerischer Nachhaltigkeit führte weder ein Diskurs um unternehmerische Verantwortung noch ein Diskurs um einen „business case“ für Nachhaltigkeit zu größerem umweltfreundlichem Engagement der Teilnehmenden. Gleichzeitig konnten wir zeigen, dass der „business case“ Diskurs die Bereitschaft minderte, Kosten für den Schutz der Umwelt zu tragen, die sich nicht durch indirekte Profite rechtfertigen ließen

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Abbreviations

BC	Business case
CLT	Construal Level Theory
Coeff.	Coefficient
CPR	Common-pool resource
CSR	Corporate social responsibility
DV	Dependent variable
EXP	Experiment
H	Hypothesis
IOS	Inclusion of Other in Self
IRI	Interpersonal Reactivity Index
LaER	Laboratory for Economics Research (Osnabrück University)
M	Mean
MWU	Mann-Whitney-U Test
NGO	Non-governmental organization
Obs.	Observed
OLS	Ordinary least squares
ORI	Other-regarding intervention
PEB	Pro-environmental behavior
RESP	Responsibility
RQ	Research question
SD	Standard deviation
SRI	Self-regarding intervention
T	Treatment

VBN	Value Belief Norm theory
VIF	Variance inflation factor

Extended summary

This PhD thesis was dedicated to examine the potential of activating and strengthening other-regarding preferences to promote PEB. It focused on individual behavior, but put a spotlight on corporate decision-making. A second spotlight was put on the potential effect of distance. Four research questions (RQs) were at the core of this PhD thesis: It asked if (RQ1) and how (RQ2) other-regarding preferences can be addressed to promote PEB. Furthermore, the thesis compared approaches addressing other- versus self-regarding preferences to promote PEB and looked at the (dis)advantages of each (RQ3). Last, it was investigated whether the distance to affected parties mattered for the willingness to engage in PEB (RQ4).

To these ends, a systematic literature review and two online experiments were conducted. The literature review synthesized the findings of the existing experimental literature from various social sciences covering interventions that addressed other-regarding preferences to promote PEB. The first experiment with a German non-student sample (n=557) was carried out to investigate the potential of perspective-taking to promote costly PEBs and its mediators for the context of climate change (EXP 1A). Moreover, the effect of distance on PEB was examined by altering the name and residence of the affected party in the experiment (EXP 1B). The second experiment compared self-and other-regarding intervention for a business context (EXP 2). Participants were business professionals from various English speaking countries (n=227) who were exposed to either a business case or a responsibility-based discourse. We examined how the different discourses affected the business professionals' perceptions and sustainability efforts, including if participants were willing to incur costs without indirect benefits to the company.

RQ1: Does addressing other-regarding preferences promote PEB?

RQ1.1: Which insights does the existing literature provide with regard to the question if PEB can be promoted by activating or strengthening other-regarding preferences? *(Chapter 2)*
From the reviewed literature, it can be clearly derived that addressing other-regarding preferences in various forms has the potential to effectively promote PEB, more specifically consumption behaviors and non-activist public sphere behaviors like policy support. Various experimental studies using different other-regarding interventions, samples and operationalizations of PEB have shown this causal link.

RQ1.2: Can perspective-taking with people negatively affected by climate change promote actual and/or costly PEB? *(Chapter 3)* While some of the studies published so far find that perspective-taking interventions can promote stated or low-cost PEBs for global environmental challenges or costly PEBs for local environmental problems, our experiment on perspective-taking in the context of climate change (EXP 1A) did not show any effects of the perspective-taking intervention with people affected by climate change consequences on actual and/or costly PEBs. The data showed, however, that dispositional empathic concern and dispositional perspective-taking as more stable traits were highly predictive of PEB.

RQ1.3: Can a discourse based on corporate responsibility promote PEB in a business context? *(Chapter 4)* In our study with business professionals (EXP 2), we did not find evidence that a discourse based on corporate responsibility could promote PEB for a business context.

Research question 2 (RQ2) How does addressing other-regarding preferences promote PEB?

RQ2.1: Which findings does the literature so far provide with regard to which interventions are effective, through which channels they exert an effect and which factors explain when and for whom they are effective in promoting PEB? *(Chapter 2)* Effective interventions addressing other-regarding preferences worked through activating existing other-regarding preferences, raising awareness on the adverse consequences for others, increasing empathic concern, and expanding the moral circle. Determining factors for their effectiveness include pre-existing other-regarding preferences, behavioral costs and the perception of others' cooperation.

RQ2.2: Does perspective-taking increase the perception of need, valuing of the other and feelings of oneness, as suggested by Batson and Cialdini? *(Chapter 3)* We found (some) support for both theories also for an environmental context – analogous to the mechanisms working for pro-social behavior: valuing of the other is increased by perspective-taking, as predicted by Batson's theory, while the increase in perception of need fails to be statistically significant. At the same time, oneness with the other person affected by environmental degradation is raised by perspective-taking, as predicted by Cialdini's theory.

RQ2.3: Is the perceived ease to engage the business world in sustainability efforts influenced by the different discourses? *(Chapter 4)* While a discourse based on the business case seems not to affect the perceived ease to engage the business world in sustainability efforts, a discourse

based on responsibility leads to the perception of greater difficulty to engage the business world, which accounts for a significant difference between the two approaches in our study. Considering this difference was not mirrored in the pattern displayed by our PEB variables, perceived ease seems not to be a mechanism through which these discourse types affect sustainability efforts of business professionals.

Research Question 3 (RQ3): How do interventions addressing other-regarding preferences compare to interventions addressing self-regarding preferences?

RQ3.1: Which insights can we draw from the existing literature on which intervention type is more effective in comparison and which further more indirect effects attached to each intervention type need to be considered for their evaluation? *(Chapter 2)* In our review, the other-regarding interventions tended to be more effective more often in enhancing PEB, but the findings of the literature were generally ambiguous. No uniform conclusion can be drawn due to the great variety of intervention types and strengths. A definite advantage of other-regarding interventions is that they have the potential to motivate further PEBs based on regard for others and do not come at the risk of crowding out intrinsic motivation for other-regarding behavior. It seems that their combination is most fruitful by making PEB become less costly while reinforcing other-regarding motivations as the core motivator of behavior.

RQ3.2: Is a responsibility-based discourse or a business case discourse aimed at enhancing corporate sustainability more effective in increasing business professionals' motivations, intentions and actions favoring their company's sustainability efforts? *(Chapter 4)* Considering the aggregated scores for all three outcome variables, we do not find evidence that either the responsibility-based or the business case-based discourse raised motivations, intentions or actions favoring their company's sustainability efforts. This is to say, both discourses in our study were equally ineffective.

RQ 3.3: Do the two discourse types affect cost-intensive actions in favor of sustainability, when these costs cannot be justified by other benefits to the company? *(Chapter 4)* We found some empirical evidence that a business case discourse diminishes business professionals' willingness to approve of costly sustainability efforts that cannot be justified by additional gains to the company. This is to say, there is the risk of a backfire effect of a discourse based on self-regarding motives for corporate sustainability.

Research Question 4 (RQ4): Does it matter for PEB who is affected by environmental degradation?

RQ4.1: Does distance to the affected parties influence the willingness to engage in PEB? *(Chapter 5)* In our study, the willingness to sign a petition for more climate protection of the German participants was significantly lower when a person in India with a name of Indian origin was affected by climate change than when a person in Germany with a name of German origin was affected. The effect could be explained by the spatial distance dimension, while no evidence was found for an effect of social distance. For more costly behaviors, we did not find any statistical differences between the treatment groups.

RQ4.2: Does the distance to affected people moderate the effects of perspective-taking on PEB and the mediation mechanisms? *(Chapter 3)* We did not find evidence that distance moderates the effect of perspective-taking on PEB or on the perception of need and valuation of the other person. However, we found evidence for a moderation effect of distance on oneness: Only for close others did perspective-taking raise this feeling of connection, but not for far others.

RQ4.3: Does racism moderate the effect of distance on the willingness to engage in PEB? *(Chapter 5)* Our results showed weak evidence for environmental racism in form of a potentially lowered willingness to engage in PEB related to racist attitudes when distant others were affected. High racism moderated the effect of distance for policy approval, when an affected person in Germany had a name of Indian origin as compared to a name of German origin, while no interaction effect was found for the other PEB variables.

In terms of limitations of the results, it should be noted that we used convenience samples and our findings are specific to Western countries. The lack of effects of the two other-regarding interventions in the empirical studies may be explained by interventions too weak to induce the hypothesized effects. Moreover, EXP 1 was carried using the first peak of the Covid-19 pandemic so that this acute crisis may have deterred our results. More specific limitations concern the assumptions used to construct some of the outcome variables or them being proxies for what we intended to measure. In general, this thesis used a quantitative approach that should best be complemented by qualitative research methods, especially to understand the how and why people engage in PEB based on their other-regarding preferences.

Future research could address various remaining gaps as we still do not have a full understanding when and for whom other-regarding interventions exert an effect on PEB, which

would be necessary to explain why some of the interventions are effective and others are not. Additional experimental studies could apply stronger interventions of perspective-taking or distance and test for different types of PEB and for different subgroups and cultural contexts. Moreover, carrying out the protocol of EXP 1 in a time without an acute crisis would help to understand if this produced our null results. Further studies could also examine in more detail where in the chain of mediators and pre-behavioral measures effects disappear or and how approaches addressing other-regarding preferences and self-regarding preferences can best be combined to reinforce their effects instead of dampening them.

For policy conclusions, it is important to acknowledge that scientific experiments provide rigorous knowledge about causal relations and effect mechanisms of interventions, yet effectiveness alone would not be enough to legitimize their implementation in a democratic society. From the findings of this thesis, policy makers should consider several aspect for policy design: We can derive from the exiting literature that there are various possibilities to intentionally activate or strengthen other-regarding preferences with a positive effect on PEB. Beyond activating pre-existing other-regarding preferences, educating about adverse consequences on others, raising emphatic concern or expanding the moral circle could be successful approaches to do so, especially in combination. We also know from the experimental studies that such interventions have different effects for different subpopulations and thus distributional effects need to be considered for policy-making so that other-regarding actors are not left with the cost burden of these policies. Moreover, the research conducted partly supported the criticism on empathy-based approaches as bridging the gap between the self and other was effective only for close others. Even though this was not carried through into the behavioral dimensions, this finding suggests to be careful when using these approaches in the political domain. From the distance experiment, it could be derived that emphasizing local effects of climate change could help to engage people in PEB. However, it is unclear if this may strengthen self-regarding decision-making or be sufficient when effects are greatest at a distance. Further, from both the literature review as well as the empirical studies, it was evident that costs matter for PEB so that aligning behavioral costs to other-regarding preferences is an important element in levering a socio-ecological transformation. At the same time, these need to be designed so that they do not crowd out intrinsic motivation for PEB. It seems sensible to not let self-benefit become the main driver for PEB as not all situations can be turned into win-win situations.

1. Introduction

1.1 Motivation and overview

From climate change to biodiversity loss or disturbing the Earth's biochemical flows: Today's societies face many pressing environmental challenges whose effect chains span wide distances. Four planetary boundaries that mark the stability and resilience of the Earth system have already been crossed (Steffen et al. 2015). For instance, the Intergovernmental Panel on Climate Change (IPCC) estimates a temperature increase of about 1°C since the beginning of industrialization due to human activities (IPCC 2021).

This development also significantly affects human well-being. The drying out of arable soils, for example, threatens the income or livelihood of many people living in rural areas (IPCC 2019). A rising sea level endangers low-lying residential areas or even entire countries and extreme weather events destroy homes and crops, regularly causing fatalities (IPCC 2018). More generally speaking, people are highly dependent on intact and stable natural environments and the benefits they provide for human well-being – e.g. the provision of drinking water, climate regulation, recreational opportunities, etc. (in the literature often referred to as *ecosystem services* – Millennium Ecosystem Assessment 2005). According to the Millennium Ecosystem Assessment (2005), a large global survey on the status and changes of the Earth's ecosystem services, the supply of more than 60% of them decreased within the 50 years preceding the Assessment, especially the provision of the less marketable regulatory and cultural services. At the same time, the intensity of the drivers of this degradation tended to increase (ibid.). While the regulating capacity of the Earth is decreasing, e.g. when it comes to storing and filtering greenhouse gases, a significant global reduction in their emissions is not in sight, so that that limiting warming to 1.5° Celsius becomes increasingly unlikely (IPCC 2021).

What makes dealing with environmental challenges like climate change even more complex is that causes and effects are decoupled: Those with the greatest impact and thus also the greatest lever for change are often distant in terms of space, time and socio-cultural background to those who encounter the most severe consequences (Spence et al. 2012). It is a particular injustice that the population of the Global South is affected most harshly by the negative impacts of degraded environments or climate change, and, in addition, often has fewer opportunities to adapt to changing environmental conditions (e.g. Mendelsohn et al. 2006; Tol 2018). Hence, the ideal of sustainable development in the sense of an intra- and intergenerationally equitable distribution of opportunities for the satisfaction of needs (WCED 1987) can only be achieved

through massive changes of consumption and production patterns (IPCC 2021). This includes collective changes in environmentally relevant behavior in a variety of areas, especially by the citizens of the Global North, as well as agreement to more structural changes that would restrict environmentally harmful behaviors. Thus, understanding how and under which conditions such changes related to behavior and corresponding policy approval take place is of great importance.

Many of the environmental problems can be described with the economic concepts of common-pool resources or public goods. Economic theory predicts that self-regarding actors will inevitably overuse finite resources (Hardin 1968) and underprovide public goods like environmental protection (Olson 1965). These predictions operate within the standard economic model of decision-making: An actor is modelled as *homo oeconomicus* (Kirchgässner 1991), that is to say as holding purely self-regarding preferences and acting to maximize their[1] own benefit.

However, various theoretical approaches have challenged this assumption (e.g. Fehr and Schmidt 2006; Cooper and Kagel 2016). Moreover, there is a large empirical evidence base that actors also hold other-regarding preferences (Camerer and Thaler 1995; Fehr et al. 2014; Cameron 1999). The experimental economics literature, for example, provides us with numerous empirical studies with decision outcomes that cannot be explained if people acted only based on self-regarding preferences, e.g. cooperation in dictator games (Forsythe et al. 1994; Engel 2011) or altruistic punishment (Fehr and Gächter 2002). And indeed, many correlational and some experimental studies show that other-regarding preferences (or in the psychological literature *values*) are linked to pro-environmental behavior (PEB – e.g. Dietz et al. 2005; Schultz and Zelezny 1998; Verplanken and Holland 2002).

At the same time, preferences are not constant predictors of decisions. The type of preferences determining the decision outcome can vary depending on the specific decision circumstances (e.g. the role the actor takes or the decision frame that is salient in the situation – Sagoff 1988; Lindenberg and Steg 2007). Moreover, preferences can change over time, both individually (Klimecki et al. 2013) and collectively (Bowles 1998). Thus, other-regarding preferences could also intentionally be activated and strengthened to promote PEB. Curiously, efforts to increase PEB by appealing to actors' preferences have taken two different roads: Either they are appealing to self-regarding preferences by highlighting the benefits that come with

[1] They is used as a singular genderneutral pronoun throughout this thesis.

environmental protection (e.g. financial savings, health benefits etc. – Iacurci 2021; Conserve Energy Future 2022) or they are appealing to other-regarding preferences by showing the detrimental consequences for others and appealing to people's moral or empathic concern (WWF 2022). Which of these strategies is more promising remains contested and has been the subject of various academic papers (e.g. Bain et al. 2016; Bolderdijk et al. 2013b).

While much research already exists with regard to other-regarding preferences, PEB and their dynamic relation, it is especially this intersection for which various research gaps and open questions remain. For instance, in many respects the empirical literature still provides an inconclusive picture regarding the general effectiveness of addressing other-regarding preferences to promote PEB. Moreover and probably linked to this ambiguity, it is not clear how, for whom and under which conditions this actually works and how this approach compares to approaches focusing on self-interest. Last, if regard for others is a driver of PEB, it seems important to know if it matters who this other is.

Therefore, the aim of this thesis is to investigate the causal link between other-regarding preferences and pro-environmental decision-making in more depth. The first two main research questions are *if* and *how* other-regarding preferences can be activated or strengthened in order to promote PEB. This is to ask if interventions addressing other-regarding preferences are effective, and more specifically which ones are, through which mechanisms they work and under which circumstances they have an enhancing effect on PEB. Moreover, the thesis zooms in on two aspects related to these questions. First, the PhD project is interested in *comparing* self- and other-regarding approaches to encourage pro-environmental decision-making. The objective is to find out which approach is more effective and which advantages and disadvantages might come with each. Second, it aims to investigate further if and how it matters who is affected by environmental degradation, i.e. who the *other* is, for people's willingness to engage in PEB. Exemplarily, it is examined whether spatial and social distance to affected others matter for the willingness to engage in costly PEB and if and how it affects the effectiveness and mechanisms of other-regarding interventions to promote PEB.

Methodologically, the PhD project conducts a literature review as well as own empirical studies. For the empirical studies, social science experiments are chosen as the methodological approach. Experimental methodology is particularly suitable for empirically investigating causal mechanisms, making it an appropriate choice in line with the stated research aims. Two online experiments were conducted and results analyzed with statistical means (mostly non-parametric tests and regression models using the program STATA).

Altogether, four academic papers are presented as part of the cumulative PhD thesis. The first paper is a review article that synthesizes the findings from the interdisciplinary body of experimental studies related to the research subject. The results of the two online experiments are presented in three academic papers.

By investigating the potential to activate and strengthen other-regarding preferences in the context of PEB, the PhD thesis contributes to fill the prevailing research gaps. It synthesizes the relevant experimental studies in a systematic way to gain a more comprehensive and robust knowledge about what we already know on the research subject. By conducting own experiments, this thesis further advances the knowledge base on this topic through the use of sound scientific methods. Another major contribution of the thesis is that it integrates research from different behavioral and social science disciplines and is therefore able to contribute to interdisciplinary understanding and learning. Altogether, the thesis contributes to the understanding of drivers and barriers of a socio-ecological transformation process - that could be carefully used to design successful governance mechanisms.

The remainder of this thesis is structured as follows: The introductory sections elaborate on the state of literature on the research subject (section 1.2), the research aims and questions (section 1.3), the methodology applied (section 1.4) and the contribution of this thesis (section 1.5). Chapters 2 to 5 are made up of the four research articles that constitute this PhD thesis[2]: Chapter 2 is the review article titled **"Other-regarding preferences and pro-environmental behavior: An interdisciplinary review of experimental studies"** (published in *Ecological Economics* – Heinz and Koessler 2021). Chapter 3 represents the article **"Perspective-taking with affected others to promote climate change mitigation"** (submitted to *Environment & Behavior*). Chapter 4 is constituted of the article **"How to encourage business professionals to adopt sustainable practices? Experimental evidence that the 'business case' discourse can backfire"** (published in *Journal of Cleaner Production* – Rode et al. 2021). Chapter 5 corresponds to the article **"Distance to climate change consequences reduces willingness to engage in low-cost mitigation actions – Results from an experimental online study from Germany"** (submitted to *PLOS ONE*). The sixth and last chapter synthesizes the findings of the PhD project by integrating and discussing the main insights of the four articles (section 6.1), considering the transferability of results as well as the limitations of the research (section 6.2),

[2] The articles presented in Chapter 2 and 5 are main-authored by the PhD candidate. The articles presented in Chapter 3 and 4 were co-authored by the PhD candidate. Contributions to Chapter 3 were: Conceptualization, Methodology, Data Collection, Data Analysis, Writing – Original Draft. Contributions to Chapter 4 were: Conceptualization, Methodology, Writing – Original Draft.

reflecting upon the implications for academia (section 6.3) and policy-making (section 6.4) and formulating overall conclusions of the research (section 6.5).

1.2 State of the literature

1.2.1 Theoretical underpinnings: Environmental degradation between preferences and institutions

The underlying structure of many environmental problems can be well described by two economic concepts: common-pool resources and public goods. Common-pool resources (CPRs) are resources that are rivalrous, i.e. the consumption of one actor affects the consumption possibilities of others, and non-excludable, i.e. access cannot be restricted or restricting access would come at (prohibitively) high costs. Many finite natural resource pools – like forests or fishing grounds – and also sinks with limited capacity – like the atmosphere as a storage space for greenhouse gas emissions – can be characterized as CPRs. Public goods are non-excludable as well, but they are non-rivalrous, i.e. the use by one actor does not influence others' possibilities of use. This is to say, they can be enjoyed by many without competition, but also regardless of their contribution to providing them. Environmental protection, for instance, exhibits the characteristics of a public good: The benefits of an intact environment like clean air or a stable climate can usually be enjoyed by many – depending on the specific context possibly a local group or society at large – regardless of own pro-environmental choices. This also gives actors the possibility to freeride on the pro-environmental efforts of others, without bearing any costs or restrictions oneself. The standard economic prediction is that unregulated self-regarding actors, i.e. actors that pursue their self-interest, overexploit and eventually degrade CPRs (Hardin 1968) and underprovide environmental protection (Olson 1965).

However, numerous empirical examples of people who do engage in PEB raise the question as to why this is the case. They successfully self-manage (local) CPRs (Ostrom 1990) and they contribute to public goods without any tangible benefit to the providing actors (Ledyard 1995). For instance, many people voluntarily pay to internalize externally induced costs (Longo et al. 2008). Using an economic terminology, we can identify two major components – institutions and preferences – to explain the cooperative outcomes. Institutions set the action space of what people *can* do and at which *costs*: Well-designed institutions can inhibit self-regarding benefit maximization of actors, e.g. by regulating human decision-making or by altering the costs and

benefits of it, and allow for the coordination of individual action in situations of uncertainty (Ostrom 1990; Hardin 1994). Preferences on the other side express what people *want* to do: Other-regarding preferences, meaning preferences that attach value to the well-being of others as ends in themselves (other humans, species or nature as a whole), prevent at least some of the strategic dynamics predicted by game theory (e.g. Fehr and Schmidt 2006; Bolton and Ockenfels 2000).

In this thesis, the focus is laid on preferences, referring to actors' deep-seated and action-driving inner forces. The preference terminology is used in economics as standard vocabulary. As this thesis is interdisciplinary, drawing from various social sciences, the term is used as an umbrella term to also capture related notions described by a different terminology according to the respective disciplines. In the psychology literature, for instance, values (Schwartz 1996) and value orientations (Bogaert et al. 2008) are terms used to express this concept. Other-regarding preferences correspond closest to prosocial or altruistic/biospheric value orientations or self-transcending values.

1.2.2 Other-regarding preferences and pro-environmental behavior

Behavioral economics supports the claim that beside pursuing self-interest people also exhibit other-regarding preferences, e.g. in the form of inequality/inequity aversion, reciprocity or altruism (Cooper and Kagel 2016; Fehr and Schmidt 2006)[3]. For instance, people share resources even when the person they interact with has no influence on the overall decision outcome (Camerer and Thaler 1995; Forsythe et al. 1994; Engel 2011). Likewise, people are willing to punish others' behavior at own cost when they perceive it as unfair (so called altruistic punishment – Fehr and Gächter 2002). Studies show that other-regarding behavior is robust even when stakes are high (Fehr et al. 2014; Cameron 1999) and indicate that it exists globally and across different societies (Henrich et al. 2001). Moreover, an extensive body of research has shown that, indeed, as one might expect, other-regarding preferences and other-regarding behavior are linked: actors with (greater) other-regarding preferences are more cooperative and engage more in other forms of other-regarding behavior (for reviews Bogaert et al. 2008; Balliet et al. 2009).

[3] In many other disciplines outside of economics the existence of other-regarding preferences is ex ante taken for granted; there seems to be less necessity of proof.

PEB is a special type of other-regarding behavior. It can be defined as behavior that has a positive impact on the environment (Stern 2000). Engaging in PEB, or in other words contributing to the public good of environmental protection, oftentimes involves foregoing personal advantages or accepting personal disadvantages in terms of time, comfort or money for the sake of other people or nature. It encompasses various behavioral dimensions. Stern (2000) distinguishes between four: (i) private-sphere behavior like purchasing decisions, (ii) activism such as being part of a pro-environmental organization, (iii) non-activist public sphere behavior such as approving of political measures, and (iv) behavior in organizations such as decisions in the work environment.

Evidence from the experimental economics and the environmental and social psychology literature suggests that other-regarding preferences are positively linked to different dimensions of PEB (for overviews Schultz and Zelezny 1998; Schultz and Zelezny 1999; Dietz et al. 2005). People with stronger other-regarding preferences, as compared to people with stronger self-regarding preferences, have more pro-environmental intentions (Cheung et al. 2014); they show higher levels of real environmental conservation activities (Karapetyan and d'Adda 2014); they are more inclined to spend parts of their scarce resources for environmental purposes (money – Dietz et al. 2018; time – Cameron et al. 1998) and for animal welfare (Frey and Pirscher 2018); they perceive the personal costs linked to pro-environmental programs as lower (Cameron et al. 1998) and they are more supportive of pro-environmental policies (Bechtel et al. 2017). Most of these studies are correlational, thus they do not provide us with insights on the causal mechanisms or the processes of change.

We also know from numerous experiments that there is heterogeneity in the decisions people take even when the payoff structure is exactly the same (Fehr and Schmidt 2006): there seem to be different types of actors (e.g. with varying degrees of other-regarding preferences) and differences among social groups (Awad et al. 2018; Falk et al. 2015). Moreover, experiments have shown that interventions to foster the other-regarding orientation of people have increased cooperation rates over time and even altered brain structures (Singer et al. 2016). At the same time, variations in how decision situations were framed, without any alteration of the material structures, have shown to be sufficient to increase other-regarding behavior (e.g. Liberman et al. 2004). Taken together, these findings suggest that there is a dynamic aspect to (other-regarding) preferences, both long-term and with respect to the specific context. Hence, these preferences could also be intentionally addressed by specific policies or broader institutional arrangements with the aim to promote PEB.

1.2.3 Promoting PEB by addressing other-regarding preferences

There are many different ways how other-regarding preferences could be addressed. A variety of theories (e.g. Schwartz 1977; Lindenberg and Steg 2007; Sagoff 1988) claim that either more other-regarding or more self-regarding preferences can be activated through situational cues that signal the appropriateness of either preference type to guide behavior. They could be appealed to in a direct way (e.g. Gosnell 2018), thereby consciously activating other-regarding preferences, or they could be subtly primed, e.g. by linguistic or conceptual frames that implicitly reference other-regarding preferences (cf. Chong and Druckman 2007). Moreover, they could be addressed cognitively and/or emotionally. For instance, a theory by Batson (1991; 2011) posits that raising empathic concern for others, e.g. through perspective-taking with them, triggers an altruistic motivation to act on their behalf (empathy-altruism hypothesis).

Various experimental studies coming from different disciplines investigate the effect that interventions addressing other-regarding preferences have on indicators of PEB (e.g. Pahl and Bauer 2013; Gosnell 2018; Czap et al. 2018). While some studies provide empirical evidence that targeting these preferences is effective in enhancing PEB (e.g. Pahl and Bauer 2013), some others do not come to the same conclusion or show different subgroup effects (e.g. Gosnell 2018). One strand of research focusses on interventions aimed at inducing empathic concern or perspective-taking with others and finds that they are able to promote PEB (Pfattheicher et al. 2016; Czap et al. 2012; Pahl and Bauer 2013; Shelton and Rogers 1981; Berenguer 2007; Ortiz-Riomalo et al. 2020).

While the mechanisms of perspective-taking have been extensively debated in the scientific literature for prosocial behavior, it is unclear if the same mechanisms apply for environmentally relevant behavior. Although PEB can be seen as a special type of other-regarding behavior, the impacts associated with own behavior are more indirect and less tangible. At the same time, being affected by environmental degradation may be perceived as something "natural" and not trigger the same emotional response as do people who are in need due to health related reasons or economic hardships. Taking its origin in the 90s, the biggest debate centers around the question if other-regarding behavior promoted by perspective-taking is motivated by regard for others (Batson 1991) or regard for the self (Cialdini et al. 1997). According to Batson, perspective-taking increases the perception of need and the valuation of others, the two antecedents of empathic concern (Batson 2011), while Cialdini argues that it increases the perception of oneness between the self and the other, which makes other-regarding behavior to

an extent also self-regarding (Cialdini et al. 1997). Several empirical studies suggest that both mechanisms may be at play at the same time (Hodges et al. 2011; Maner et al. 2002).

1.2.4 Addressing other- vs. self-regarding preferences to promote PEB

Whether addressing other-regarding preferences or addressing self-regarding preferences is the best way to encourage PEB has been the subject of both political and academic debates (Delmas et al. 2013; Evans et al. 2013; Bain et al. 2016). The advocates of using self-regarding reasons and interventions criticize that moral appeals have been ineffective in the past to bring about substantial change and have failed to connect to the preferences of whole actor groups, leaving countries politically divided on topics such as climate change (Bain et al. 2016). By contrast, advocates of using other-regarding reasons and interventions claim that motivating other-regarding behavior through self-regarding reasoning will at best encourage the specific behavior that is beneficial to the individual, but fail to promote PEB more generally (Evans et al. 2013). Moreover, it may even crowd-out the intrinsic motivations of actors to take other-regarding decisions (Frey and Jegen 2001; Bowles 2008).

Interestingly, a similar span of strategies and a subsequent debate can also be found in the business sector. Companies are organized, i.e. collective, actors, which are likewise conceptualized as self-regarding profit maximizers. Companies unlike individual actors face market pressures that fuel this type of decision-making. At the same time, companies are also ascribed a role in society and there has been a history of corporate philanthropy and business ethics (Windsor 2006; Lee 2008). Concepts such as “corporate responsibility” (Preston and Post 1975) or “corporate citizenship” (Andriof and Mcintosh 2017) align with the more other-regarding notion of corporate decision-making. More recently, appeals to engage companies in sustainability efforts have increasingly used a “business case” for sustainability (Windsor 2006; Lee 2008). This is to say, it is shown that sustainability efforts pay off for the company, e.g. by increasing consumer and employee satisfaction, saving resources/money, improving reputation or providing competitive advantages by anticipating government regulation – hence, there is a “win-win” situation for both the company and society/the environment (Carroll and Shabana 2010; Salzmann et al. 2005). This type of reasoning has been used by a variety of actors (PwC 2011; WWF 2016; McKinsey 2011). While its advocates see it as an appealing strategy to engage the business sector, critics fear that it may diminish the willingness to accept costs when they cannot be justified by profit.

There are some experimental studies that compare the effectiveness of both intervention types with regard to encouraging PEB (e.g. Evans et al. 2013; Asensio and Delmas 2015; Dominicis et al. 2017). Some of these studies point to a greater effectiveness of other-regarding interventions (e.g. Asensio and Delmas 2015), while others come to the opposite conclusion (e.g. Dominicis et al. 2017). So far, studies that compare the effects of appealing to companies to engage in sustainability efforts based on self-regarding vs. other-regarding reasoning are missing.

1.2.5 Does it matter who is affected by environmental degradation?

Last, when it comes to other-regarding preferences or behavior, it may matter who this other actually is. Many of today's environmental challenges have a global dimension, both in terms of effect chains and regarding the necessary remedies. Causes and effects are often decoupled and distant in terms of various dimensions, e.g. occurring with a time delay or impacting people geographically and/or socially far away from those who are predominantly causing the effects. Climate change is a prime example: Most of the greenhouse gas emissions, which are responsible for global warming, stem from consumption in the Global North in the past and present (Hickel 2020). At the same time, the most severe consequences are borne by people living in the Global South (IPCC 2021; Mendelsohn et al. 2006). For instance, the risk of climate change induced extreme flood events is projected to increase most in South East Asia, India, eastern Africa and the Andean region (Hirabayashi et al. 2013).

Adding to this complexity, distance to affected others could undermine the willingness to engage in PEB, both for individual behaviors and for the approval of structural changes. For instance, Construal Level Theory uses the concept of psychological distance, comprising different dimensions of distance. It posits that the further removed an object from the self, the more abstract the level of construal, which impacts actors' decision-making (Trope and Liberman 2010). This distance, whilst not directly predicting decisions as Brügger et al. (2015a) argue, guides the courses of actions through changing, for instance, the selection of information that decisions are based on. At the same time, people living far away may be perceived as social outgroups. As it is known that social distance reduces the willingness to cooperate in laboratory settings (Lane 2016; Balliet et al. 2014), this reduced willingness to engage in cooperative behavior could likewise unfold when it comes to climate change mitigation behaviors. Moreover, the fact that the people affected most severely by climate change are people living in the Global South, i.e. predominantly people of color, might exert an effect of its own in the

presence of racism, a global power structure that systematically devaluates people of color. While the term environmental racism has been established in the context of disproportional exposition to hazardous wastes and environmental pollution of communities of color (Agyeman et al. 2016), it may be extended in this direction.

On the empirical side, several correlational studies indicate that distance is negatively correlated to concern and the willingness to engage in PEB: the greater the (perceived) distance to the climate change effects, the lower was measured concern (Singh et al. 2017; Stanley et al. 2018; Gubler et al. 2019), willingness to act (Wang et al. 2019; Stanley et al. 2018; Volland 2018; Spence et al. 2012) and policy approval (Wang et al. 2019). Some experimental studies support this idea and show that "proximizing" climate change effects through experimental manipulation indeed results in more PEB (Jones et al. 2017; Loy and Spence 2020; Scannell and Gifford 2013). However, other studies could not replicate this effect (Brügger et al. 2016; Schoenefeld and McCauley 2016; Manning et al. 2018; Rickard et al. 2016; Shwom et al. 2008). A study by Brügger et al. (2015b) even points to an effect of distance in the opposite direction. As such, the current evidence base partly supports the theoretical predictions, yet remains inconclusive.

Moreover, research indicates that also the effect of interventions like perspective-taking might depend on social characteristics of the other person, e.g. in terms of how similar or close this person is to the perspective-taker (Batson et al. 1995; Batson 2011). For close others, Batson (2011) argues, perspective-taking happens automatically, whereas this is not the case for dissimilar or far others. This is a common criticism brought forward against empathy-based approaches (Bloom 2017; Breithaupt 2017). However, the evidence base is mixed and other studies cannot find empirical support for this idea (Batson et al. 2005).

1.2.6 Research gaps

The difference in results of the interventions addressing other-regarding preferences to promote PEB could potentially be explained by the great variety of approaches taken. For instance, interventions differ in type and scope, e.g. conceptual priming (Loureiro and Lima 2019) vs. perspective-taking exercises (Pfattheicher et al. 2016). Moreover, different indicators of PEB in terms of dimension and costliness are elicited, e.g. priming pro-environmental intentions (Bain et al. 2012) vs. water consumption (Ferraro and Price 2013). Furthermore, the experimental settings are different, e.g. lab (Berenguer 2007) vs. field experiments (Gosnell

2018), and participant pools differ, e.g. student samples (Bastian et al. 2019) vs. non-student samples (Hafner et al. 2017). So far, the evidence base is difficult to interpret and the findings are scattered. A more systematic and comprehensive overview of the experimental study results is needed to make sense of the empirical findings.

Regarding the perspective-taking interventions, the findings seem to consistently point to a positive effect of these intervention types at first sight (Pfattheicher et al. 2016; Pahl and Bauer 2013; Ortiz-Riomalo et al. 2020). Taking a closer look, however, shows that several questions remain yet to be answered. For instance, most of the PEB indicators elicited by the studies are stated and/or involving little or no costs, e.g. intentions or hypothetical behaviors (Pfattheicher et al. 2016; Berenguer 2007). As there is a known gap between such pre-behavioral elements and actual behavior (Diekmann and Preisendörfer 2003; Maki et al. 2019), it is not clear whether, indeed, these types of interventions have the potential to trigger actual behavior. By contrast, studies that look at actual and costly behaviors tend to cover only local environmental challenges like river pollution (Ortiz-Riomalo et al. 2020), and thus might not be applicable for global environmental challenges like climate change. Moreover, the mechanisms by which perspective-taking has shown to work in a social context (Batson 1991; Cialdini et al. 1997) have not yet been studied with respect to environmental challenges. To get a better understanding of the potential of perspective-taking to raise PEB, research about these mechanisms needs to be conducted also for an environmental context in specific.

To evaluate whether self- or other-regarding strategies to enhance PEB are more promising, a more thorough survey of the existing studies is needed. This encompasses an examination of both direct effectiveness as well as potential side effects of each approach, which may not be intended and manifest in a more subtle way. Especially for comparing a business case approach with a responsibility-based approach, empirical studies are missing in order to judge these opposing strategies on a solid base. More empirical research is needed to investigate their effects on corporate sustainability, including its channels as well as a potential crowding-out effect on the willingness to approve costly sustainability measures that do not come with any kind of profitable advantage to the company.

Last, the results concerning an effect of distance on PEB are inconclusive. Whether an effect of distance is robust – especially when it comes to costly or actual behaviors – still remains to be confirmed. Moreover, it is unclear, through which mechanisms such effects may unfold, and which of the different distance dimensions really account for a possible effect. Likewise, so far there is a lack of empirical studies that back the hypothesis that another form of

environmental racism exists, namely a reduced willingness for PEB when climate change effects most severely hit people of color. To test both claims, experimental studies are needed to empirically probe for evidence of an effect of distance and environmental racism on PEB. More research is also needed to investigate the moderating role of distance on the effect of other-regarding interventions such as perspective-taking in an environmental context. It may be that effects of perspective-taking differ depending on how close or far the perspective-giver is to the perspective-taker. More empirical research is warranted to investigate this issue.

1.3 Research aims and questions

Against the backdrop of the above sketched research gaps, four research questions (RQs) are derived.

Research Question 1 (RQ1): Does addressing other-regarding preferences promote PEB?

First, this thesis aims to shed more clarity on the question *if* activating or strengthening other-regarding preferences can enhance PEB. For this purpose, the PhD project examines the existing experimental literature with regard to which kind of interventions have been used and which of these have proven to be effective. Moreover, the aim is to find out for which of Stern's types of PEB such positive effects have been detected. Further, the PhD thesis exemplarily looks at two specific other-regarding interventions in an individual and in a business context and asks if they are capable of triggering pro-environmental decision-making.

For answering RQ1, the following subquestions are addressed:

- ***RQ1.1: Which insights does the existing literature provide with regard to the question if PEB can be promoted by activating or strengthening other-regarding preferences?*** – Chapter 2
- ***RQ1.2: Can perspective-taking with people negatively affected by climate change promote actual and/or costly PEB?*** – Chapter 3
- ***RQ1.3: Can a discourse based on corporate responsibility promote PEB in a business context?*** – Chapter 4

Research Question 2 (RQ2): How does addressing other-regarding preferences promote PEB?

Second, the thesis aims to find out more about the mechanisms and mediators through which PEB may be enhanced by other-regarding interventions. Hence, it asks *how* PEB can be promoted by addressing other-regarding preferences. Again, it is the thesis' interest to find out which findings the literature so far provides us with. Additionally, the aim is to understand how the two empirical interventions work. For the perspective-taking intervention, possible mediators as suggested by the theories of Batson and Cialdini are investigated. For the business case example, derived from the arguments brought forward by its proponents, a closer look is taken at the perceived ease with which the business world can be engaged in corporate sustainability efforts.

For answering RQ2, the following subquestions are addressed:

- ***RQ2.1: Which findings does the literature so far provide with regard to which interventions are effective, through which channels they exert an effect and which factors explain when and for whom they are effective in promoting PEB?*** – Chapter 2
- ***RQ2.2: Does perspective-taking increase the perception of need, valuing of the other and feelings of oneness, as suggested by Batson and Cialdini?*** – Chapter 3
- ***RQ2.3: Is the perceived ease to engage the business world in sustainability efforts influenced by the different discourses on corporate sustainability?*** – Chapter 4

Research Question 3 (RQ3): How do interventions addressing other-regarding preferences compare to interventions addressing self-regarding preferences?

Third, the thesis aims to compare the effects of interventions addressing other-regarding preferences to interventions addressing self-regarding preferences. Again, the existing literature is queried on the relative effectiveness and possible side effects. Further, the effectiveness of both intervention types are empirically compared in one of the experiments, namely the responsibility discourse and the business case discourse. Moreover, the claim of a possible backfire effect of using a self-regarding discourse to induce PEB, for instance by reducing the willingness to incur costs when no benefits are involved, is empirically investigated in the business case experiment.

For answering RQ3, the following subquestions are addressed:

- ***RQ3.1: Which insights can we draw from the existing literature on which intervention type is more effective in comparison and which further more indirect effects attached to each intervention type need to be considered for their evaluation?*** – Chapter 2

- ***RQ3.2: Is a responsibility discourse or a business case discourse aimed at enhancing corporate sustainability more effective in increasing business professionals' motivations, intentions and actions favoring their company's sustainability efforts?*** – Chapter 4

- ***RQ 3.3: Do the two discourse types affect cost-intensive actions in favor of sustainability, when these costs cannot be justified by other benefits to the company?*** – Chapter 4

Research Question 4 (RQ4): Does it matter for PEB who is affected by environmental degradation?

Fourth, the thesis aims to examine if it matters for PEB who is affected by environmental degradation. To examine the effect of distance, a distinction is made between social and spatial distance in order to find out which dimension drives a potential effect. Moreover, distance to those affected by environmental degradation, that is to say distance to the *other*, could influence the effect of other-regarding interventions and therefore also have an impact on the willingness to engage in PEB in a more indirect way. Hence, distance is examined with respect to a potential moderating role in one of the experiments. Although there may be an effect attached to who is affected by environmental degradation for the willingness to engage in PEB, this effect may not be uniform for all people. As laid out above, the effect of social or spatial distance may be moderated by racist attitudes people hold. Thus, this issue is further examined in one of the empirical studies.

For answering RQ4, the following subquestions are addressed:

- ***RQ4.1: Does the distance to the affected parties influence the willingness to engage in PEB?*** – Chapter 5

- ***RQ4.2: Does the distance to affected people moderate the effects of perspective-taking on PEB and the mediation mechanisms?*** – Chapter 3

- ***RQ4.3: Does racism moderate the effect of distance on the willingness to engage in PEB?*** – Chapter 5

1.4 Methods

This thesis relies on social science experiments both as focus for the review of existing knowledge in the field (Chapter 2) and using this methodological approach for the generation of new empirical insights (Chapters 3-5). For the theoretical part as well as the review of existing empirical findings, an extensive literature analysis of experimental studies is carried out (further described in subsection 1.4.1). In the empirical part of the paper, behavioral experiments are conducted and analyzed using statistics and econometrics (see subsection 1.4.2). This is to say, a quantitative approach is chosen to investigate the research questions.

1.4.1 Literature review

For the first paper, a review of the existing literature (Xiao and Watson 2019) was conducted to synthesize the knowledge about if, how, for whom and under which conditions other-regarding interventions can promote PEB and how they compare to self-regarding interventions. Different behavioral and social sciences were included for this review. The aim was to gain a more systematic understanding about the research topic as a solid basis for this thesis' own empirical research. To be a reliable source of knowledge, the synthesis of findings of the reviewed studies needs to be coherent and follow previously defined research aims. Moreover, the process and selection of studies included in the review need to be transparent and systematic so that results can be reproduced with the same parameters and research questions (ibid.).

First, the selection criteria need to be defined ex ante. For the review, three selection criteria were predefined: Studies had to be (i) experiments that (ii) addressed other-regarding preferences with their experimental intervention, and (iii) looked at PEB as outcome variable. Web of Science was used as the search engine and only published papers in academic journals were considered.

Second, the process of defining search terms needs to be transparent. Taking into account the different terminology used in each discipline, a range of search terms was used to represent the three elements of interest as referred to by the selection criteria. For instance, the different terminology used for other-regarding preferences was reflected through using terminological variants in the search string. To inform the choice of appropriate search terms, a previous scan

of the literature was conducted in a non-systematic manner. The final search string can be found in subsection 2.3.1.

Third, the use of filters needs to be clear to the reader. For the review paper, no restrictions were put on the publication dates of studies. Selected disciplines were: behavioral sciences, economics, multidisciplinary sciences, interdisciplinary social sciences, neurosciences, political sciences, sociology and psychology including its subdisciplines applied psychology, developmental psychology, experimental psychology, multidisciplinary psychology, social psychology.

Using the search string and the specified filters, 563 published papers appeared as a result. All abstracts were then checked with regard to the three selection criteria. Cited references of the applicable papers were added if they met the criteria. The final selection included 26 papers that featured 33 single studies. Some of these studies used neutral controls, others used self-regarding interventions as controls and some employed both treatments as comparison.

From this literature base, it was possible to identify studies that showed a positive effect of the other-regarding interventions on PEB, providing an answer to the question *if* these interventions have the potential to raise PEB. Moreover, the intervention types as well as mediation channels that worked could be specified to get a better understanding of how these interventions exert their effects. Further, the types of PEB, according to Stern's (2000) classification, for which effects have been shown empirically could be examined. From the ensemble of studies, it was also possible to determine further factors explaining the effect of the other-regarding interventions on PEB. Last, the effects of self- and other-regarding interventions were separately compared to evaluate their effectiveness and scrutinize advantages or disadvantages linked to the either self- or other-regarding interventions discussed or shown in the studies.

1.4.2 Social science experiments

Besides relying on experimental study results for the review, two online experiments were conducted within the PhD project as own empirical contribution to the research subject. Experiment 1 (EXP 1) constitutes the empirical base for the two papers making up Chapters 3 (EXP 1A) and 5 (EXP 1B), for which different treatments were considered for analysis. Experiment 2 (EXP 2) constitutes the basis for Chapter 4. In this subsection, the basic elements of experiments are described and it is sketched how these elements were specified for each of the two experiments. A more detailed methodological description, including the

operationalization, is provided in the respective chapters (see also Moffatt 2016 for a comprehensive overview of economic experiments and their analysis).

In an experiment, single variables are systematically changed and compared with a control condition, so that conclusions can be drawn about the causal effect of this change (Webster and Sell 2014; Roth 1988). Experiments have a long-standing tradition to gain robust knowledge in science, especially in the natural sciences, and have been used to bring forward many technological advances (Hansson 2015). Experiments in the social sciences follow the same logic, yet what is special about them is that they are conducted with human participants taking part in the experiment (Webster and Sell 2014; Roth 1988; Falk and Heckman 2009). To prevent self-selection effects, participants are randomly assigned to one of the treatment conditions. In both experiments, we used between-subject designs (i.e. measurements are compared between the individuals assigned to the treatment groups instead of measurements obtained from the same individual before and after an intervention – Charness et al. 2012).

Experiments were a suitable choice for the formulated research aims and questions as they allow to test for causal relationships (a change in A leading to a change in B) as opposed to just correlational links (A and B are associated, but it is not clear in which direction the link goes or if a third variable C influences both factors simultaneously). Thus, with the means of experimental study design, the studies conducted as part of this thesis were able to investigate whether and how addressing other-regarding preferences as well as changes in distance to the affected parties impact the willingness to engage in different types of PEB.

Concerning the different types of experiments, field experiments and laboratory experiments can be distinguished. Field experiments use interventions in real action situations (Levitt and List 2009; Harrison and List 2004), whereas laboratory experiments use interventions under artificially simplified and rigorously controlled conditions (Webster and Sell 2014; Roth 1988).[4] Both types can be conducted face to face in a lab or field environment or they can be adapted as online experiments. Due to the realistic framework conditions, field experiments are characterized by a high external validity, i.e. the transferability of the results to (other) real-life situations. However, due to the large number of influencing factors, a change in the dependent variable cannot be interpreted with certainty as the result of the intervention. The advantage of laboratory experiments is the simulation of steady framework conditions, so that effects that are found can be attributed with greater probability to the variation of individual laboratory

[4] There are also natural experiments, i.e. naturally occurring events that serve as the "treatment". They are not used in this thesis, thus no further specifications are given.

interventions – i.e. they are characterized by high internal validity. In the review paper (Chapter 2), both lab and field experiments including online and offline variants were considered. In doing so, a larger literature base was available and for the different subdisciplinary research strands could be accounted for. For instance, many psychological studies are performed in the lab with student samples (e.g. Berenguer 2007) as are many traditional experimental economic studies that display game situations (e.g. Bastian et al. 2019). For the research subject, most of the identified previous experimental economics studies were performed in field settings (e.g. Ferraro and Price 2013). Studies linked to political or social sciences more generally or studies with interdisciplinary author teams were often conducted as online studies with non-student samples (e.g. Bernauer and McGrath 2016).

The choice of the sample is key for high quality experimental results. If a specific sample is chosen, such as undergraduate students, results may be specific to this particular sociodemographic group. By contrast, if the choices for a particular subpopulation is of interest, an appropriate method of selecting this subsample is needed. For the empirical part of this thesis, non-laboratory online settings with non-student samples were chosen. For EXP 1, which was run in 2020, we used a German non-student sample (n= 557) that was recruited from the platform *clickworker*. Even though this sample was still a convenience sample, we used it instead of a student sample to be more transferable to the real world (e.g. due to greater variety of age, income, education etc. – cf. Henrich et al. 2010). For EXP 2, which was ran in 2017, we recruited a sample of 229 English speaking business professionals from different countries from the platform Prolific.ac (Palan and Schitter 2018). As we were interested in decision-making in the corporate world, this sample allowed us to model realistic choices of real-world business decision-makers.

The most central part of the experiment is the experimental variation induced by the different treatment conditions. Is a difference in the outcome variable detected and other influences are controlled for, it can be concluded that the effect was due to the treatment (Moffatt 2016; Webster and Sell 2014). The aim was to find out if, how and under which conditions addressing other-regarding preferences increases PEB, how self- versus other-regarding discourses compared in impacting PEB in a business context and whether the distance to the affected parties mattered for the willingness to engage in PEB. In EXP 1A, participants in the perspective-taking treatment were instructed to take the perspective of a person negatively affected by climate change induced flooding, whereas participants in the stay objective treatment were instructed to stay neutral. The treatments were reinforced through a written task.

In EXP 1B, the name and residence of the person affected by the flooding was varied: Paul Weber in Germany (Close treatment), Samudra Sudarshan in Germany (Far Germany treatment) or Samudra Sudarshan in India (Far [Global] treatment). The location was depicted on a map to make distance visible to the participants. A variation of distance was also used to test for a moderation effect for the perspective-taking intervention. In EXP 2, people were confronted with either a responsibility-based discourse for corporate sustainability (circling around corporate duties, its role in society and human rights) or a business case-discourse for sustainability (pointing to the corporate benefits of sustainability like financial and reputational gains, employee motivation etc.). These discourses were transmitted through written argumentation and small videos of about the same length. Further, a third condition without any treatment was used as a neutral condition.

When it comes to the choice of dependent variables, these have to measure what they are supposed to, i.e. they have to be valid, and the measures need to minimize random error, i.e. the they have to be reliable (Kimberlin and Winterstein 2008). The intent was to capture PEB and different variables were used for this purpose, mirroring some of the different types introduced by Stern (2000). For EXP 1, three different variables were used, mirroring different facets of PEB: (1) the willingness to give up resources for climate protection, measured as the amount of money (from their remuneration for participation) actually donated to a climate NGO; (2) the willingness to sign a petition for more climate protection, measured as the participants' actual provision of their email address in order to be sent the link of the petition[5]; (3) policy approval, measured as support of a list of 12 realistic and costly political measures for climate protection. Thus, both observable and/or costly measures were included, which was important to add to the existing literature on perspective-taking and PEB, which so far has mostly shown effects for non-costly and/or stated behaviors. For EXP 2, we used (1) intentions and motivations of the business professionals to bring forward sustainability efforts in their company, and (2) a hypothetical decision task about approving corporate sustainability measures coming with different reputational and environmental benefits as well as different costs. Here, the main focus was to investigate how the different sustainability discourses affected the weighing of costs on the one hand and self- and other-regarding benefits on the other hand.

[5] For data protection reasons, we could not elicit whether participants actually signed the petition. Email addresses were stored separately from the rest of the data set to ensure anonymity.

Although in an experiment the allocation to treatment conditions is random, it might happen that different characteristics of people are unevenly distributed, for instance because of unequal drop-out rates of people linked to these characteristics. For that reason and to be able to describe our sample and deepen the analysis, we elicited further data from the participants. Sociodemographic data like age, sex and income were collected as well as more specific data according to the respective study interest like flood experience, migration background or racist attitudes.

In order to secure high data quality, the experimenter can control for attention of the participants and their serious answering (Abbey and Meloy 2017). Especially for online experiments, where no direct contact is possible between experimenter and participant, this is an important step before undertaking the analysis. To make this process transparent and reproducible, clear criteria according to which the final data set is selected should be defined. Attention checks were included in both experiments. The exclusion criteria for the data of EXP 1 also included very short answering times (defined as less than half of the average answer time) as well as the indication of non-serious answers by the participants. They were preregistered at the website *Aspredicted* together with the research questions and hypotheses.

Moreover, the experimenter can cautiously check if the treatment manipulation they used was, indeed, salient and/or capable in triggering a certain expected effect, e.g. a state of mind (Webster and Sell 2014). To check if the manipulations were salient to the participants, either the attention checks were used as indicators (EXP 2) or separate items were elicited as manipulation checks. To probe for the engagement in perspective-taking, people were asked to self-rate the degree to which they took the perspective of the affected other and to which extent they stayed objective (EXP 1A). To check for the saliency of distance, people were asked to correctly identify the country and name of the person who was interviewed about the experienced flooding (EXP 1B). From looking at these variables, it was possible to conclude that the treatment manipulations were salient to the participants or induced the desired states.

To investigate the data, the statistical analysis was performed with STATA (Acock 2018; Bittmann 2019). Mostly, non-parametric testing and regression analysis were used (Moffatt 2016). For the binary outcome variables (like making a donation or signing the petition), probit regression models were conducted. For numerical outcome variables (like approval of policies or corporate sustainability measures on a scale), Ordinary Least Square (OLS) regression was used. The independent variables were the respective treatment conditions. In addition, those variables and interaction terms were added, for which a possible moderation effect was

examined (cf. Frazier et al. 2004). Sociodemographic and further relevant data were added to the regressions as control variables.

2. Other-regarding preferences and pro-environmental behavior: An interdisciplinary review of experimental studies

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Abstract:

Pro-environmental behavior (PEB) is often promoted by reinforcing or highlighting own benefits. However, considering that actors also care about the outcomes for others (i.e. they hold other-regarding preferences), PEB may also be encouraged by addressing these other-regarding preferences. In this paper, we review the results from social science experiments where interventions addressing other-regarding preferences were used to promote PEB. Based on our synthesis, we conclude that addressing other-regarding preferences can be effective in promoting (various types of) PEB in some, but not in all instances. Whether an intervention was effective depended inter alia on the pre-established preferences, cost structures and the perceived cooperation of others. Effective interventions included the provision of information on behavioral consequences, perspective-taking, direct appeals, framing and re-categorization. The interventions worked by activating other-regarding preferences, raising awareness about adverse consequences, evoking empathic concern and expanding the moral circle. We propose to take these findings as an impulse to examine policy instruments and institutions in terms of whether they activate and strengthen other-regarding preferences, thereby enabling collective engagement in PEB.

Keywords: pro-environmental behavior, other-regarding preferences, preference activation, empathic concern, experiments, review

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2.1 Introduction

In order to promote a collective change of individual behavior so that it is compatible with the planetary boundaries, environmental policy often addresses actors' self-regarding preferences, e.g. via economic incentives. Yet, numerous studies have shown that doing so could potentially crowd-out intrinsic motivations to act (Rode et al. 2015). An alternative approach can be to address actors' other-regarding preferences to promote PEB. Other-regarding preferences are preferences that attach value to the well-being of others as ends in themselves (other humans, species or nature as a whole). Since most PEB can be understood as other-regarding behavior since it involves giving up own resources to the benefit of others, such preferences seem to be in line with PEB. Thus, unsurprisingly, it is a well-established empirical finding that other-regarding preferences (or values) are positively associated with PEB (for overviews see Schultz and Zelezny 1998; Schultz and Zelezny 1999; Dietz et al. 2005). The experimental literature goes a step further by testing interventions addressing other-regarding preferences (we will call them other-regarding interventions) aimed at promoting PEB, sometimes in comparison to interventions addressing self-regarding preferences. Thus, it provides us with insights on if and how other-regarding interventions work to promote PEB. This paper reviews the experimental results.

More specially, we focus the review on the following questions:

- Is addressing other-regarding preferences an effective way to increase PEB?
- If so, which interventions are effective, through which channels do they work and for which types of PEB do they have an effect?
- Which factors explain when and for whom these interventions were effective in promoting PEB?
- How do interventions addressing other-regarding preferences compare to interventions addressing self-regarding preferences?

To answer these questions, we review experimental findings from the different behavioral sciences. Synthesizing insights across disciplinary boundaries can be very fruitful, as for example, the advancements in behavioral economics have shown. In this review, we selected keywords from the various social sciences in order to build a broad interdisciplinary base for our review.

The remainder of this chapter is structured as follows: Section 2.2 provides a more detailed theoretical and empirical base regarding the link between other-regarding preferences and PEB.

Section 2.3 explains the review method and gives an overview of the identified literature strands. Section 2.4 presents the findings of the reviewed experiments to answer the questions laid out above. Section 2.5 concludes and discusses the results in terms of their implications for research and policy.

2.2 Other-regarding preferences and pro-environmental behavior

PEB involves private and public behaviors that have a positive impact on the environment, including environmentally friendly consumption behavior or acceptance of pro-environmental policies (Stern 2000). In the absence of policy intervention, the behaviors typically involve forgoing personal advantages or accepting personal disadvantages (in time, comfort or money) for the benefit of other people's well-being or nature as a whole. They can thus be regarded as other-regarding behaviors (Nolan and Schultz 2015). PEB can also be understood as a contribution to a public good: While the positive outcome of environmental protection can be enjoyed by many, access to its benefits cannot (easily) be restricted. Under such circumstances standard economic models predict that actors will try to freeride on the efforts of others and thus environmental protection is underprovided (Olson 1965). This is because it is assumed that self-regarding preferences determine the decision, that is (all) actors aim to maximize their self-interest with their decision-making. Following this logic, self-regarding actors are also expected to overuse natural resources and eventually degrade them (Hardin 1968).

Considering that actors have other-regarding preferences[6], i.e. they care for the well-being of others, which consequently affect their decision-making, challenges previously derived predictions based on self-regarding preferences as sole behavioral motives. People may exhibit other-regarding preferences in the form of altruism, inequality/inequity aversion or reciprocity (Cooper and Kagel 2016; Fehr and Schmidt 2006). Experimental studies show in multiple ways the existence of other-regarding preferences. For instance, people share resources even when the interaction partner has no influence on the outcomes of the decision (Kahneman et al. 1986; Camerer and Thaler 1995) and punish at own cost when they perceive others' behavior as unfair (so called altruistic punishment – Fehr and Gächter 2002). Other-regarding behavior is robust

[6] Regard for others may by understood in two ways: First, individuals may be other-regarding in the sense that they intrinsically value others and express this valuation in their actions, e.g. they act to decrease suffering of others or to increase their well-being. Second, individuals may be other-regarding in the sense that they care how others see them and evaluate their actions. While some behavior may appear to be other-regarding in the first sense, it may actually be performed only due to the latter, i.e. to avoid social sanctions or to gain social approval, as discussed in the literature on social norms – and thus be actually motivated by self-regard. In this review, we focus on other-regardingness in the first sense. For an insightful literature review on social norms and how they can motivate PEB, please see Farrow et al. 2017.

even at high stakes (Fehr et al. 2014; Cameron 1999) and takes place globally and across societies (Henrich et al. 2001). Reviewing studies from different disciplines, we needed to unify the terms of overlapping concepts that carry different names across the disciplines: we use the term preferences as an umbrella term to express actors' deep-seated and action-driving inner forces. In psychology, values are the main concept referred to in this regard, with prosocial or altruistic/biospheric value orientations (Bogaert et al. 2008) or self-transcending values (Schwartz 1996) most closely corresponding to other-regarding preferences. In the environmental context, "others" can also encompass future generations, non-human species or nature as a whole (cf. Schultz 2001).

Other-regarding preferences give reason to expect decision-making that is more pro-environmental, or in other words more other-regarding, than assumed by standard economic theory. If actors care for the well-being of others, they do not *want* them to suffer from adverse environmental effects of their self-regarding decisions. If actors care about nature itself, they do not *want* it to become destroyed. However, even if all actors had strong other-regarding preferences, uncertainty about others' behavior feeds strategic considerations to avoid being exploited by others. Overcoming this uncertainty requires a coordination of individual decisions by appropriate institutions (Ostrom 1990). But also with regard to approving these institutions, other-regarding preferences may play a crucial role. Actors who are other-regarding may approve institutional arrangements that improve the conditions for other humans or nature even when they come at a cost for themselves, which is the case for many pro-environmental policies (Drews and van den Bergh 2016).

Empirical studies from experimental economics, environmental and social psychology provide ample evidence for the positive link between other-regarding preferences and PEB (for overviews see Schultz and Zelezny 1998; Schultz and Zelezny 1999; Dietz et al. 2005). People with stronger other-regarding preferences, show higher levels of pro-environmental intentions (Cheung et al. 2014); are more likely to engage in real environmental conservation activities (Karapetyan and d'Adda 2014); are more willing to give up scarce resources for environmental protection (money – Dietz et al. 2018; time – Cameron et al. 1998) and animal welfare (Frey and Pirscher 2018); perceive personal costs of pro-environmental programs as lower (Cameron et al. 1998); and show stronger support for pro-environmental policies (Bechtel et al. 2017; Drews and van den Bergh 2016). These findings mostly come from correlational studies and thus do not provide evidence on the causal pathways or mechanisms of how other-regarding preferences enhance PEB.

The empirical findings also suggest that neither other-regarding preferences nor their impact on decision-making are stable or uniform across individuals/groups, time or situations. Facing the same payoff structure, people take heterogeneous decisions suggesting a varying degree of other-regarding preferences (Fehr and Schmidt 2006). Different types of actors exist (e.g. "proselfs" and "prosocials" – Bogaert et al. 2008) and the existence of other-regarding preferences systematically varies across social groups. Thus, other-regarding preferences seem not to be fixed, but constituted within actors' social and institutional environments (cf. Dequech 2002; Hodgson 2000). Furthermore, research suggests that other-regarding preferences can change over the long-run: Experiments have shown that practicing other-regarding thought exercises do not only increase pro-social behavior but can even alter brain structures (Singer et al. 2016; Klimecki et al. 2013). Moreover, situational differences, e.g. how situations are framed, seem to influence the role other-regarding preference take in the decision-making (e.g. Liberman et al. 2004). In summary, other-regarding preferences and the role they play for decision-making is not pre-determined and can thus be cultivated or explicitly addressed by external interventions.

In the following sections, we aim to contribute to the understanding of this potential by reviewing experiments in which other-regarding interventions – these are interventions which increase the weight of other-regarding preferences in the decision-making process – were used to enhance PEB. *Other-regarding interventions (ORI)* encompass various techniques that aim at raising the willingness to contribute to the well-being of others as an end in itself.

2.3 Review method and strands of literature

2.3.1 Review method

We conducted our literature review, covering different disciplines and using Web of Science as a search engine. Studies had to meet the following *three selection criteria* to qualify for the review: They had to be (i) experimental studies that (ii) addressed other-regarding preferences and (iii) looked at the effect on PEB.

Taking into account the particularities of the different behavioral science disciplines, the search string to identify studies to meet the three criteria contained terminological and conceptual variations of the three elements we were searching for. A first literature screening of various

disciplinary literature strands informed the choice of terms. The following search string was used:

(*"pro-social preferences" OR "social preferences" OR "other-regarding preferences" OR "social value orientation" OR "altruistic value" OR "biospheric value" OR "self-transcending values" OR compassion OR empathy OR "empathic concern" OR care OR solidarity OR altruis* OR fairness OR justice OR "environmental preferences")*

AND

(experiment OR "experimental study" OR "lab study" OR "field study" OR "lab experiment" OR "field experiment")

AND

("pro-environmental behavio" OR "environmentally significant behavio*" OR "pro-environmental decision" OR PEB OR "pro-environmental action" OR "environmentally relevant behavio*" OR "environmental practice" OR "sustainable land use" OR "sustainable behavio*" OR "conservation behavio*" OR "environmentally compatible behavio*" OR "environment-friendly behavio*" OR "green citizenship behavio*" OR "policy acceptability" OR "policy acceptance" OR "acceptance of policies" OR environment* OR sustainability)*

To reduce the number of entries, papers only from disciplines with an explicit social-behavioral link were considered: behavioral sciences, economics, multidisciplinary sciences, interdisciplinary social sciences, neurosciences, political sciences, sociology and psychology, with the subdisciplines: applied psychology, developmental psychology, experimental psychology, multidisciplinary psychology, social psychology (as classified by the Web of Science). Behavioral sciences and neurosciences were dropped as they did not show any articles related to the research topic. No specification for the publication date was set, yet most studies were published from 2000 onwards. A total of 563 studies resulted from this search (as of November 2019).

All 563 abstracts were checked for our three selection criteria, which reduced the number of applicable studies substantially. We further used cited references to find additional studies to meet our selection criteria. At the end, our review is based on 26 papers covering 33 single studies[7].

[7] The papers of Ferraro and Price (2013) and Ferraro et al. (2011) are based on the same study.

2.3.2 Strands of literature and (inter)disciplinary classification

In our review of the papers we could identify five strands of literature, which cite papers from the same strand but make little or no reference to papers cited in the other strands.[8] Table 1 gives an overview of the identified literature strands including the methods and frequently used interventions and types of PEB.

Partly, the various strands of literature reflect the different disciplinary research traditions with respect to terminology and methodological approaches, especially between economics and psychology (see Table 1, column 2 and 3).[9] The economics-based literature, for example, usually examines observed behavior (such as consumption or allocation decisions in lab or field settings) whereas psychological experiments often use stated behaviors or intentions as dependent variables, which may not become actual behavior.

2.4 Review results

In this section, we summarize the study results with respect to the questions *whether and how* addressing other-regarding preferences is effective in promoting PEB. Table 2 lists the main results.

While all studies addressed other-regarding preferences in the context of PEB, the interventions and operationalization of PEB differed across studies, as did the settings in which the studies were conducted. For example, samples ranged from 40 students in a laboratory experiment (Verplanken and Holland 2002) to more than 100,000 individuals in a field experiment (Ferraro and Price 2013). Further, the studies were conducted in different countries. [10] In the subsections 2.4.2 and 2.4.3, we identify the different types of interventions and forms of PEB operationalization, and discuss, building on these distinctions, the synthesized behavioral effects. Table A1 in appendix details for each study the type and size of the sample, the country in which the study was conducted, and describes the particular intervention as well as PEB operationalization. The studies we reviewed employed different control conditions:

[8] Three articles were not part of the identified literature strands and were added to the strand most fitting: Verplanken and Holland (2002) and Loureiro and Lima (2019) were added to the first strand due to the shared theoretical background (e.g. Schwartz's value framework). Gosnell (2018) was added to the third strand due to shared characteristic of being a large-scale field experiment.

[9] We examined literature from sociology and political sciences, yet as these disciplines only rarely apply experimental methodology, which was one of our selection criteria, those two disciplines do not appear in our listing.

[10] All studies in this review were carried out in countries of Western Europe and the U.S., meaning that the observations are based on the behavior of WEIRD samples – subjects from white, educated, industrialized, rich and democratic societies. According to Henrich et al. (2010), these observations are not necessarily representative on a global scale.

Table 1: Overview of the identified literature strands

Strand topic	Disciplines	Methods	Most used interventions	Most used PEB types		Studies
Other- vs. self-regarding motives (incl. moderation and mediation analysis)	Environmental and social psychology	Lab or online studies	Appeals, information/ feedback, framing	Consumption behaviour	9	Bolderdijk et al. 2013a; Bolderdijk et al. 2013b; Dogan et al. 2014; Dominicis et al. 2017; Evans et al. 2013; Hafner et al. 2019; Hafner et al. 2017; Loureiro and Lima 2019; Verplanken and Holland 2002
Perspective-taking, compassion and empathy	Environmental and social psychology, experimental economics	(Framed) lab experiments	Induced perspective-taking	Consumption behaviour, non-activist public sphere behaviour, organizational behaviour (in framed lab experiments)	7	Berenguer 2007; Czap et al. 2012; Czap et al. 2015; Ovchinnikova et al. 2009; Pahl and Bauer 2013; Pfattheicher et al. 2016; Shelton and Rogers 1981
Other- vs. self-regarding motives in an applied context	Experimental economics	Large-scale field experiments	Appeals, feedback, framing	Consumption behaviour	4	Asensio and Delmas 2015; Ferraro and Price 2011; Ferraro and Price 2013; Gosnell 2018
Framing and the acceptance of policies	Political and social sciences, psychology	Online experiments	Framing	Non-activist public sphere behaviour	4	Bain et al. 2012; Bernauer and McGrath 2016; Severson and Coleman 2015; Singh and Swanson 2017
Morally relevant re-categorization and moral expansion	Environmental and social psychology	Lab experiments	Information, re-categorization	Consumption behaviour, non-activist public sphere behaviour	2	Bastian et al. 2019; Bratanova et al. 2012

Some studies used a neutral control condition (e.g. with neutral framings or no intervention at all) while others only compared between self- and other-regarding interventions without a neutral control. Various studies employed both conditions. In total, out of our sample of 33 studies, 26 compared to a neutral control (Table 2, column 6) and 20 compared to a self-regarding intervention (column 7).

We proceed as follows: First, we look at all studies using a neutral control to investigate if other-regarding interventions increase PEB (subsection 2.4.1). Then, based on those studies that were effective in this regard (i.e. that state "yes" or "mixed" in Table 2, column 6), we review the interventions that worked to enhance PEB (subsection 2.4.2), report the types of PEB for which the behavioral change was detected (subsection 2.4.3) and summarize the channels through which the interventions presumably worked (subsection 2.4.4). We then inquire about the moderating factors that help to explain why some studies did and others did not find a positive effect on PEB (subsection 2.4.5). Lastly, we examine the general effectiveness and possible side effects of other-regarding interventions by comparing them to self-regarding interventions (subsection 2.4.6).

2.4.1 Does addressing other-regarding preferences increase PEB?

The majority of studies show a positive effect of other-regarding interventions on PEB (see Table 2, column 6): Out of 26 experimental studies using a neutral control condition, 18 studies found that the interventions aimed at other-regarding preferences were effective in promoting PEB (for at least one of the dependent variables). Four studies found mixed results depending on the subsample and another four studies reported null results on PEB.[11]

The potential of other-regarding interventions to promote PEB is backed by studies using different interventions, looking at different types of PEB and employing different experimental methodologies, indicating a reliable result. The experimental findings confirm the link between other-regarding preferences and PEB that is postulated by many of the existing correlational studies and show that this link is indeed causal. Moreover, they show that other-regarding preferences are not only stable predictors of PEB but could also be harnessed through (political)

[11] Considering the difficulty to publish studies that do not find effects, unsuccessful other-regarding interventions can be assumed to be underreported (Franco et al. 2014).

Table 2: Overview of study results, interventions and PEB types

Study	PEB		Results	
	Type of PEB	Behavioral measure	Significant positive effect of other-regarding intervention (ORI)	Greater behavioral effect: ORI vs. self-regarding intervention (SRI)
Raising awareness about adverse consequences on others (e.g. through providing feedback)				
Asensio and Delmas 2015	Consumption	Obs.	n.a.	ORI
Bastian et al. 2019, study 1	Consumption	Obs.	Yes	n.a.
Bastian et al. 2019, study 2	Consumption	Obs.	Yes	n.a.
Bolderdijk et al. 2013a, study 3	Consumption	Obs.	No	ORI
Bolderdijk et al. 2013b	Consumption + Public	Stated	Mixed	n.a.
Dogan et al. 2014	Consumption	Stated	Yes	Same
Hafner et al. 2017	Consumption	Stated	n.a.	SRI
Hafner et al. 2019	Consumption	Stated	Mixed	SRI
Activating other-regarding preferences (e.g. through framing, appeals)				
Bain et al. 2012, study 2	Public	Stated	n.a.	Mixed
Bernauer and McGrath, 2016, study 1	Consumption + Public	Stated	n.a.	Same
Bernauer and McGrath 2016, study 2	Consumption + Public	Stated	n.a.	Same
De Dominicis et al. 2017, study 1	Consumption	Stated	n.a.	Mixed
De Dominicis et al. 2017, study 2	Consumption	Stated	n.a.	Mixed
De Dominicis et al. 2017, study 3	Consumption	Obs.	n.a.	Mixed
Severson and Coleman 2015	Public	Stated	Yes	Mixed
Evans et al. 2013, study 1	Consumption	Obs.	Yes	ORI
Evans et al. 2013, study 2	Consumption	Obs.	Yes	ORI
Ferraro and Price 2013	Consumption	Obs.	Yes	n.a.
Ferraro et al. 2011	Consumption	Obs.	No	n.a.
Gosnell 2018	Consumption	Obs.	Mixed	Same
Loureiro and Lima 2018	Consumption	Obs.	Mixed	n.a.
Ovchinnikova et al. 2009, study 1	Public	Obs.	Yes	ORI*
Ovchinnikova et al. 2009, study 2	Public	Obs.	No	ORI
Singh and Swanson 2017	Public	Stated	No	Mixed
Verplanken and Holland 2002, study 1	Consumption	Stated	Yes	n.a.
Raising empathic concern (e.g. through perspective-taking)				
Berenguer 2007	Public	Stated	Yes	n.a.
Czap et al. 2012	Organizational	Obs.	Yes	ORI*
Czap et al. 2015	Organizational	Obs.	Yes	SRI
Pahl and Bauer 2013	Consumption + Public	Stated, obs.	Yes	n.a.
Pfattheicher et al. 2016, study 2	Consumption	Stated	Yes	n.a.
Shelton and Rogers 1981	Consumption + Public + activism	Stated	Yes	n.a.
Expanding moral the moral circle (e.g. through re-categorization)				
Bratanova et al. 2012, study 2b	Public	Stated	Yes	n.a.
Bratanova et al. 2012, study 2c	Public	Stated	Yes	n.a.
Bratanova et al. 2012, study 2d	Public	Stated	Yes	n.a.

*Note: The first column specifies the behavior type of PEB following Stern (2000)'s classification: Consumption/private-sphere behavior (consumption), public sphere behavior (public), behavior in organizations (organizational) and activism (activism). We indicate whether the behavioral measure was stated or observed (obs.). If results are ambiguous for different subgroups of participants or treatment combinations, we state results as "mixed". For two of the studies (marked with an *), the self-regarding intervention did not point to the benefits of engaging in PEB, but to the benefits of not engaging in PEB (i.e. a trade-off situation).*

interventions and institutional frameworks. The lack of or mixed results reported by some studies already give hints that effectiveness depends on further factors (see subsection 2.4.5).

2.4.2 Which interventions were effective in promoting PEB?

The experiments also provide insights into the effectiveness of specific other-regarding interventions. The interventions successfully used to promote PEB (stating "yes" and "mixed" in Table 2, column 6) consisted of the following elements or combinations thereof: (i) information or feedback on behavioral consequences, (ii) issue framing, (iii) appeals to other-regarding preferences, (iv) induced perspective-taking, and (v) morally relevant re-categorization.

Information or feedback on behavioral consequences. Several studies found that providing information about harmful impacts on others or the environment, sometimes presented also as feedback about own (altered) behavior, increases PEB.[12] Dogan et al. (2014) found a positive effect of presenting participants with the environmental benefits of eco-driving on the intentions to adopt such driving behaviors and on the rated worthiness of eco-driving behaviors, compared to a control condition without any feedback. In the study by Hafner et al. (2019), feedback on reduced CO_2 emissions of choosing an initially costlier heat pump raised PEB in combination with another treatment about social norms. The study by Bolderdijk et al. (2013a) gave information about the negative effects of bottled water and found a positive effect on PEB for subgroups of participants (see section 4.5 for a more detailed discussion on subgroup effects). Bastian et al. (2019) found that when players in a resource game were told that resource depletion leads to the death of crickets, they extracted less from the resource. The results suggest that providing information about behavioral consequences has a positive effect on PEB. As we will later discuss this is mainly due to certain types of actors reacting to the information.

Issue framing/priming. Framing an environmental issue in different ways, thereby emphasizing other-regarding aspects of the topic, has in some studies increased PEB. Looking at the policy

[12] The studies themselves do not provide empirical answers about the underlying motivations, thus we cannot say with certainty that the behavioral change was due to other-regarding preferences. However, we think that there are good reasons to believe that behavioral responses cannot be solely explained by self-regarding preferences: For instance, a positive impact of CO_2 reductions on one's own well-being cannot be felt by the individual. Thus, responding to information on behavioral consequences of reduced CO_2 emissions can likely be attributed to the desire to contribute to the well-being of other people or the environment as such.

dimension of PEB, Severson and Coleman (2015) found that two other-regarding frames of climate change (framing it in terms of economic equity and secular morality) increased policy support for regulatory climate change mitigation policies when compared to the control condition without any treatment. Another study by Evans et al. (2013) showed that reading other-regarding statements for car-sharing increased PEB in another behavioral domain (here recycling behavior). Also priming other-regarding preferences, i.e. giving people unconscious cues to make the well-being of others salient (e.g. by presenting words associated with others' well-being in a seemingly unrelated task), has shown to be effective in increasing PEB (Verplanken and Holland 2002; Ovchinnikova et al. 2009, study 1; for a subgroup also Loureiro and Lima 2019).

Appeals to other-regarding preferences. In other studies, active appeals to other-regarding preferences were able to raise PEB. In the study by Gosnell (2018), letters were sent out to over 30,000 customers of a renewable energy supplier containing information about environmental consequences of paper vs. online billing and in one treatment additionally appealing to the customer's identity as environmental steward. Whilst there was no significant effect of the environmental information alone, a slight increase of the decisions to switch to paperless billing occurred when the identity-based appeal was added (only for those not holding a doctorate degree). In the field experiment by Ferraro and Price (2013), letters with an other-regarding appeal (to save water "for preserving our environment and our economy for future generations"), sent to more than 100,000 water users, were effective in reducing water consumption the same year, compared to a control condition in which the letters only provided technical advice.

Induced perspective-taking. A further effective way to address other-regarding preferences and thus promote PEB was by inducing perspective-taking (e.g. through instructions, role reversal or personal requests). Several psychological studies found a positive effect on PEB by giving subjects perspective-taking instructions (along the lines of "try to feel what the other feels") in comparison to providing subjects with control instructions ("try to stay as neutral and objective as possible"). Perspective-taking in these studies was targeted towards entities negatively affected by environmental degradation: other humans (Pahl and Bauer 2013; Pfattheicher et al. 2016), animals (Shelton and Rogers 1981; Berenguer 2007) or plants (Berenguer 2007). Experimental economic studies on empathy used messages and role reversals that showed a positive effect on conservation

choices in a framed lab experiment (Czap et al. 2012) and prevented a drop in PEB when financial incentives were taken away (Czap et al. 2015).[13]

Morally relevant re-categorization. Last, a re-categorization of morally relevant information was effective in promoting PEB, i.e. altering the concept of what is deemed as possessing moral worth. In the studies by Bratanova et al. (2012), a simple change in the instructions (asking participants to either circle entities to which they felt morally obliged or to cross out those to which they did not feel any moral obligation) sufficed to make a significant difference in terms of which entities were considered. This, in turn, had an impact on several PEB variables, namely hypothetical money allocation decisions, policy support and intentions to engage in concrete behaviors. For the study of Bastian et al. (2019), it could be argued that the novel information about the death of crickets also added a new moral dimension to individual decisions to withdraw resources, which might have been the driver for a reduction in resource use.

2.4.3 Which types of PEB are promoted by the other-regarding interventions?

According to Stern (2000), there are four distinct types of PEB: (i) consumption behavior (e.g. purchasing decisions), (ii) non-activist public sphere behavior (e.g. policy approval), (iii) behavior in organizations (e.g. work-related decisions) and (iv) activism (e.g. active involvement in pro-environmental organizations). We hypothesized that addressing other-regarding preferences can increase PEB. Based on the specific operationalizations of PEB used as dependent variable in our sample, we can confirm this claim with certainty only for two of the four types of PEB, namely consumption behavior and non-activist public sphere behavior. The amount of studies organizational behavior and activism in our sample analyzing is insufficient to derive robust conclusions.

Consumption behavior. Our review suggests that other-regarding interventions can be successful in increasing observed or stated pro-environmental consumption behavior. Regarding observed behavior, other-regarding interventions successfully promoted recycling (Evans et al. 2013) as well

[13] In addition, Ortiz-Riomalo et al. (2020) studied the impact of perspective-taking on pro-social behavior in complex socioecological systems such as watersheds. The results of the lab-in-the field experiment demonstrate that when downstream farmers were induced to take the perspective of upstream famers, they were significantly more likely to act pro-socially and helped to redistribute the benefits gained from the resource. This study was not included in the main review since it was published after the search date.

as (for subgroups) energy saving (Loureiro and Lima 2018) and switching to paperless billing (Gosnell 2018). Further, other-regarding interventions triggered a reduction in water use in a field experiment (Ferraro and Price 2013) and resource consumption in a lab experiment (Bastian et al. 2019). With respect to stated behavior, other-regarding interventions were able to raise intentions to adopt eco-driving behaviors (Dogan et al. 2014), to help save whales (Shelton and Rogers 1981), (for a subgroup) to use less bottled water (Bolderdijk et al. 2013b), to perform PEB more generally (Pfattheicher et al. 2016; Pahl and Bauer 2013), and to increase the likelihood of a (hypothetical) purchase of a more environmentally-friendly TV set (Verplanken and Holland 2002) or heating technology (Hafner et al. 2019).

Non-activist public sphere behavior. The other-regarding interventions increased a variety of non-activist public sphere behaviors, mostly measured as (stated) policy support (Severson and Coleman 2015; Bratanova et al. 2012; for a subgroup also Bolderdijk et al. 2013a). In other studies, positive effects were found on real or hypothetical resource allocation decisions for publicly advocating pro-environmentalism. For example, the other-regarding interventions increased the stated fund allocation for environmental purposes (Berenguer 2007; Bratanova et al. 2012) as well as the observed proportion of offsets sold to a conservation NGO instead of to the stock market (Ovchinnikova et al. 2009, study 1). Furthermore, other-regarding interventions increased observed interest in environmental information (more time spent looking at material and more brochures collected – Pahl and Bauer 2013).

Behavior in organizations. The evidence base on organizational behavior is small: the only studies whose dependent variables could possibly be qualified as such were framed lab experiments with non-farmers simulating tillage decisions (Czap et al. 2015; Czap et al. 2012).[14] Here, the other-regarding interventions led participants to reduce pollution and harm to the downstream farmers at own cost (observed game decisions).

Activism. We cannot say much about activism since only the study by Shelton and Rogers (1981) operationalized PEB in this way. They found that the other-regarding intervention increased the time participants offered to help addressing envelopes for a local campaign to save whales.

[14] We note here a field experiment conducted by Czap et al. (2019) that found an increase of enrollment in conservation programs of actual farmers by using empathy messages. However, we excluded this study as the messages also included elements of descriptive social norms, which makes it impossible to say which parts of the letters induced the effect (on a discussion of interactions with social norm see subsection 2.4.5).

2.4.4 Through which channels do the interventions work?

To understand *how* other-regarding preferences can be addressed to strengthen PEB, reviewing the experimental findings helps us to identify the underlying mechanisms (i.e. mediators), by which the listed interventions likely triggered an effect on PEB: (i) activating pre-existing other-regarding preferences, and more specifically (ii) raising awareness about adverse consequences on others, (iii) raising empathic concern and thereby altruistic motivation, and (iv) expanding the moral circle. Some of the interventions likely worked through more than one channel at the same time (e.g. giving feedback on behavioral impacts can inform about adverse consequences on others and activate other-regarding preferences).

Activating pre-existing other-regarding preferences. People hold both other-regarding and self-regarding preferences (e.g. Lynne et al. 2016; Fehr and Schmidt 2006). Several theories postulate that both types of preferences can be activated by contextual factors (Schwartz 1977; Lindenberg and Steg 2007; Sagoff 1988). Two studies in our sample replicate the general finding that stronger other-regarding preferences (measured as biospheric value strength or low selfism) are associated with more PEB (Ovchinnikova et al. 2009; Bolderdijk et al. 2013a). Verplanken and Holland (2002), on the other hand, find that these other-regarding preferences alone had no effect on PEB, they needed to be activated. Direct appeals to these preferences in form of calls for action on behalf of others can be understood as a conscious activation of other-regarding preferences (Gosnell 2018). However, preference activation also happens unconsciously, e.g. by framing a situation in different ways conveying an implicit reference to either more self- or more other-regarding preferences (cf. Chong and Druckman 2007). Many of the studies in our sample, particularly the ones using framing techniques or different frames of behavioral feedback, have argued that at least one channel through which their interventions work is preference activation (e.g. Dogan et al. 2014; Bain et al. 2012; Severson and Coleman 2015; Loureiro and Lima 2019; Hafner et al. 2019; Evans et al. 2013).

Raising awareness of adverse consequences on others. Behavioral theories on other-regarding behavior (e.g. Batson's theory of altruism or Stern et al.'s Value-Belief-Norm theory) highlight the importance of being aware of adverse consequences on others (Stern et al. 1999) or perceiving their need (Batson 2011) in order to act upon one's other-regarding preferences. Several of the reviewed interventions conveyed knowledge about adverse consequences on others either as information or

as feedback linked to individual behavior (e.g. environmental and health consequences linked to electricity use – Asensio and Delmas 2015). The study results also show that learning about adverse consequences is often a necessary, but not a sufficient condition: In Bolderdijk et al. (2013a)'s study, for example, informing study participants about the negative environmental impacts of bottled water only had a positive effect on intentions and policy approval for people with high biospheric values. A similar result is found by the study of Ferraro and Price (2013); after providing households with information about the negative consequences of high water use, a reduction in water consumption was only observed for environmentally conscious consumers. In line with the theories cited above, these findings suggest that learning about the detrimental consequences on others – people and nature – linked to one's behavior can increase PEB, at least when further conditions are fulfilled (for more details on moderation effect see subsection 2.4.5).

Raising empathic concern[15]. Developing an other-regarding motivation through increased empathic concern is described as a further channel in the reviewed studies. According to Batson (1991), empathic concern means an emotional state congruent with another's well-being. His empathy-altruism hypothesis states that empathic concern results in other-regarding motivations. Taken together with the costs of behavior, this other-regarding motivation ultimately translates into behavior. According to Batson's theory, empathic concern emerges from two antecedents: perceiving the other as in need, and valuing the other. Perspective-taking, for example, is frequently discussed in the literature as a technique to increase empathic concern, addressing both of these antecedents, and has shown to be effective in many studies (for a review and also limitations see Batson 2011). The reviewed studies show that perspective-taking is also successful to foster other-regarding behavior in the environmental context (e.g. Czap et al. 2012, 2015; Pahl and Bauer 2013). Successful manipulation checks or pre-studies indicated that this effect on PEB could indeed be induced by increased empathic concern (e.g. Pfattheicher et al. 2016; Berenguer 2007), which in turn might promote a more favorable attitude towards the entire species (Shelton and Rogers 1981) or nature as a whole (Berenguer 2007, in the same direction Sevillano et al. 2013). The studies aimed at increasing empathic concern show that empathic states are not (only) attributable to fixed personality traits and predispositions, but can also be intentionally invoked through interventions.

[15] The reviewed studies sometimes also refer to the terms empathy or compassion.

Expanding the moral circle. Whether nature itself or different species are considered as morally worthy, regardless of the benefits provided to humans, is contested and varies across cultures and belief systems (Pascual et al. 2017). The greater the circle of entities considered as morally worthy – sometimes referred to as the "moral circle" –, the greater is the willingness to protect those within, also at personal cost (Singer 1981; Crimston et al. 2016). The width of the moral circle has been observed to change over time and thus can also expand (see Crimston et al. 2016 for an overview). One way to intentionally expand the moral circle is by deconstructing existing moral boundaries and re-categorizing entities in a way that makes them worthy of moral consideration. The series of experiments by Bratanova et al. (2012) showed that the moral expansion they triggered by subtle interventions, at least for the moment of the experiment, was able to increase different PEB types. The authors concluded that "the moral circle is a common motivational cause of cross-situational pro-environmentalism" (p. 455). Their study indicates that the categorization of what is morally worthy and the associated behavioral response are not stable, but receptive to changes in the situational environment.

2.4.5 Which factors explain the effect of other-regarding interventions on PEB?

Our analysis up to here described the results from studies which reported an increase in PEB after the other-regarding intervention. A substantial amount of studies (8 out of 26), however, do not find this effect or report mixed effects performing subgroup analyses. In this respect, our analysis provides insights into moderating factors, i.e. under what conditions and for whom the interventions were effective. While many factors can serve as moderating factors, we focus here on a selection that emerged directly from the analysis.

Activating other-regarding preferences requires that these preferences *already exist***.** Several studies showed that the success of the other-regarding interventions in promoting PEB was moderated by pre-existing preferences (Verplanken and Holland 2002; Bolderdijk et al. 2013a; Dominicis et al. 2017; Singh and Swanson 2017; Loureiro and Lima 2019). Most studies support the idea of preference congruence: only those individuals who already hold strong other-regarding preferences or for whom the other-regarding preferences are central to their self-concept respond to other-regarding interventions (Bolderdijk et al. 2013a; Verplanken and Holland 2002; Dominicis et al. 2017). Dominicis et al. (2017), for example, found that other-regarding appeals were only

effective for altruists while self-regarding appeals were effective both for egoists and altruists. Singh and Swanson (2017) tested different framings and found for the subgroup of political conservatives that the rated importance of climate policies even diminished when they were exposed to the other-regarding frame. This result might be driven by weaker other-regarding preferences of conservatives that several studies report (van Lange et al. 2012; Sheldon and Nichols 2009; Zettler et al. 2011). These findings are also in line with Batson's theory of altruism, which requires that the perception of others' need must go in hand with valuing them to trigger other-regarding behavior. Loureiro and Lima (2019), on the other hand, found the strongest impact of their other-regarding intervention among actors with low pre-existing other-regarding preferences. The authors see the level of required cognitive reasoning as an explanation for this difference from previous results: For less conscious decisions, lower other-regarding preferences can be compensated through situational cues, while interventions involving conscious reasoning rely more heavily on pre-existing other-regarding preferences to be successful. In sum, pre-established preferences matter for the effect of other-regarding interventions Most studies support the proposition that congruence with pre-existing preferences is necessary for interventions to be effective.

Moreover, various studies indicate that the *cost structure* of a given situation or induced by complementary policies matters for the effectiveness of the other-regarding intervention. In the experiment by Ovchinnikova et al. (2009), price changes largely drove the PEB decision patterns of participants: When behavior had higher opportunity costs (here when selling offsets on a stock market became relatively more profitable than selling them to a nature conservation agency), the effect of the other-regarding intervention vanished. Similarly, the experiment by Czap et al. (2015) showed that the effect of the other-regarding intervention could be enhanced when financial incentives were added. In the study by Ferraro and Price (2013), water reduction was weaker for below average water users. This could likely be attributed to the relative costliness of reducing an already low and therefore probably efficient resource use. Overall, these findings support the theoretical and empirical claim that relative costs of behavior in terms of money, time or attention matter for PEB in general as well as for the effectiveness of other-regarding interventions.

Further, the *perceived cooperation of others* may play an important role for the effectiveness of other-regarding interventions. In line with the general findings on social norms and PEB (Farrow et al. 2017), several studies found other-regarding interventions to be effective only in conjunction

with descriptive social norms interventions (Hafner et al. 2019; Ferraro et al. 2011). Descriptive social norms provide information on what other people of an associated group do, thereby exerting an influence on individual decisions (Cialdini et al. 1990, a well-known example is the OPOWER study by Allcott 2011). The combination of both other-regarding and descriptive social norm interventions was most effective in two experiments: Ferraro and Price (2013) added a social comparison in one treatment and observed an increased effectiveness of other-regarding appeals, in the study by Hafner et al. (2019), the effectiveness of the other-regarding intervention depended altogether on the additional social norm treatment. From research on social dilemmas, we know many people are conditional cooperators, i.e. they cooperate under the condition that others also cooperate (Fischbacher et al. 2001). The existence (or display) of descriptive social norms decreases hereby the uncertainty about others' behavior and hence allows for conditional cooperation to take place.

Short-term and subtle interventions are likely to be insignificant amidst *strong everyday frames and other powerful determinants of PEB*. Contrary to the study by Severson and Coleman (2015), several studies that employed different framings of climate change as an intervention did not find a positive effect on PEB, mostly operationalized as acceptance of mitigation policies (Bernauer and McGrath 2016; Singh and Swanson 2017; Bain et al. 2012). The lack of significant results may be explained by interventions being too weak (often short text paragraphs were used to frame the consequences of climate change in a more self-regarding or other-regarding way) in relation to strong everyday frames as portrayed through the media and public discourse (O'Neill et al. 2015). Moreover, political identities tend to be firm and are strongly linked to policy attitudes (Drews and van den Bergh 2016; Harring et al. 2017). Another aspect that points to the determining role of contextual factors is the fact that the effect of other-regarding interventions seems to be fragile. While most studies analyzed only the short-term effects, measured directly after the intervention, Ferraro et al. (2011) examined how the effects of letters with other-regarding appeals to reduce water usage had developed after two years.[16] With time, the positive effect of the other-regarding intervention vanished. Only when the appeal was combined with the descriptive social norm intervention could the reduction in water usage be maintained. In sum, this suggests that other-

[16] The immediate effect was analyzed by Ferraro and Price (2013). The follow-up paper was published before the initial study.

regarding interventions do not only need to be strong to overcome competing frames or contextual factors, but also need to be stabilized to have a lasting effect.

2.4.6 How do other-regarding interventions compare to self-regarding interventions?

In this subsection, we examine the relative effectiveness of other-regarding interventions by comparing their effects to the effects of self-regarding interventions to promote PEB, i.e. interventions aimed at the egoistic motivations of individuals (e.g. incentives or self-regarding appeals). Experiments that employ both intervention types, as complementary treatments or with one being used as the control, may provide us with insights on this matter. The results draw an inconclusive picture of which intervention type is more effective in promoting PEB (see Table 2, column 7) and point to potential side effects of either intervention type.

For situations where PEB creates also potential benefits for the decision-maker herself, six experimental studies found greater effects for the other-regarding intervention (Bolderdijk et al. 2013b; Czap et al. 2012; Evans et al. 2013, study 1, 2; Asensio and Delmas 2015; Ovchinnikova et al. 2009, study 1,2), and three a greater effect for the self-regarding intervention (Czap et al. 2015; Hafner et al. 2017; 2019). Four experiments showed equal (or equally missing) effects of both intervention types (Dogan et al. 2014; Bernauer and McGrath 2016, study 1,2; Gosnell 2018) and six found mixed effects depending on subgroup characteristics (Dominicis et al. 2017; Severson and Coleman 2015; Singh and Swanson 2017; Bain et al. 2012, study 1-3).

Interventions differ in the type of self-regarding arguments used (e.g. money, safety, convenience) and their strength (e.g. the amount of money implied by the argument or opportunity costs of the target PEB), which may explain the variation in the effectiveness of the interventions. Bolderdijk et al. (2013a) is the only study that directly compared different types of self-regarding arguments: The authors found no statistically significant differences in behavior when PEB was aimed to be induced either with arguments emphasizing financial savings or safety gains. While the result should be taken with caution due to the small sample size, it is conceivable that individuals in general respond differently to the different types of self-regarding arguments, according to their personal preferences and/or financial resources. As for the strength of the argument, the financial effects of eco-driving, for instance, are quite small (several euros per month – Dogan et al. 2014) compared to the monthly savings of choosing an initially expensive heat pump (several dozens of

euros per month – Hafner et al. 2017; 2019). In both studies, the intervention informed participants about the saving potential. The cost differences, in addition to the differences in the sample population (see subsection 2.4.3), likely explain the varying effectiveness of the two self-regarding interventions. Likewise, other-regarding interventions vary: the studies by Hafner et al. (2017; 2019), which find the self-regarding intervention to be more effective, give information about reduced CO_2 emissions of certain behaviors. For many people it is likely difficult to assess how meaningful these savings are. Asensio and Delmas (2015), by contrast, translated these numbers into more specific environmental and health effects and found stronger effects of the other-regarding intervention. Hence, the specifics of the intervention determine their relative effectiveness and may explain most of the aforementioned differences in the comparison of self- and other-regarding interventions.

Beyond direct comparisons of effectiveness, (unintended) side effects of both intervention types, which may stem from the different motivational approaches, are worth considering. For instance, motivating people for PEB with other-regarding reasons has the potential to create positive spillovers to other behavioral domains (Thøgersen and Crompton 2009; Truelove et al. 2014). In line with this literature, Evans et al. (2013) showed that the presentation of statements highlighting other-regarding reasons for car-sharing, such as less pollution, led to positive effects in other environmental domains. In contrast, the authors did not find such spillover effects when participants read statements describing self-regarding reasons, such as cost savings. Likely, this result is explained by the different preference types that were activated by the statements: When the promoted motivation for PEB is other-regarding, it can be transferred to other PEBs, whereas when self-regarding preferences are activated, other PEBs must also be beneficial – following this logic – in order to be performed. Related to this are the potential crowding effects of external interventions that focus on addressing actors' self-interest to motivate behavior, usually by changing the material conditions in a decision situation. If PEB is at least partly motivated on basis of other-regarding concerns, then introducing self-regarding reasons to motivate pro-environmental action can have detrimental effects on the original motivation to act pro-environmentally (Frey and Stutzer 2006; Rode et al. 2015) and may induce a more self-regarding mindset.[17] The results of Bolderdijk et al. (2013b) point into this direction, the economic appeal

[17] Following the findings from the crowding literature, intrinsic motivation to act pro-environmentally is strengthened if the externally provided reasons support, acknowledge and complement the pre-existing motivation to act pro-environmentally. If, however, the externally provided self-regarding reasons are perceived as substitutes for the original motivation to act

("Care for your finances? Get a free tyre check") significantly reduced PEB, compared to control. Another two studies found negative effects of priming a self-regarding mindset in trade-off situations where personal benefit stood in contrast to positive effects for the environment or other people. After priming people with self-interested thinking (e.g. by framing the game description), the study participants reduced their willingness to sell carbon offsets to a nature conservation agency (instead of to a stock market – Ovchinnikova et al. 2009, study 2) or to put land under conservation tillage (Czap et al. 2012). Just as other-regarding preferences can be activated, leading to more other-regarding behavior (in some instances); self-regarding preferences can be activated, bringing forward more self-regarding behavior.

In terms of combining self- and other-regarding interventions, results indicate a potential for both positive and negative interaction effects. Czap et al. (2015) found an amplified effect of combining financial incentives and empathy messages in their framed lab experiment on farmers' conservation behavior. They also found that the other-regarding intervention prevented a drop in conservation practice when pecuniary incentives were taken away. Their study result seems to stand in opposition to the detrimental effect of a combination reported by Evans et al. (2013): In their study, combining self-regarding reasons for PEB with other-regarding reasons eliminated the positive spillover on another PEB that occurred when only giving other-regarding reasons. One explanation of these seemingly contrary results may be the different types of self-regarding interventions: in Czap et al. (2015) the payoff structure was modified to make PEB less costly while in Evans et al. (2013) only pre-existing features of the situation were emphasized, possibly activating conflicting preferences that may explain the detrimental results.

Based on these mixed results, which can partly be explained by the variety of interventions and their varying strengths, we are not able to derive a uniform conclusion on whether self-regarding or other-regarding interventions are more effective in promoting PEB. We find some evidence in our sample that motivating PEB with self-regarding reasons can even lead to less PEB, possibly by inducing a more self-regarding mindset. Motivating PEB with other-regarding reasons may, on the other side, have positive spillover effects to other PEBs. While the intervention types can counteract each other in some instances, they can also act as complements to strengthen PEB.

(Lepper et al. 1973), and they deprive the possibility to (self)signal one's pro-social motives (Bénabou and Tirole 2006) and/or reduce the degree of self-determination (Frey and Jegen 2001), then it is likely that the original intrinsic motivation to act pro-environmentally is crowded out (for a review on crowding effects of environmental policies see Rode et al. 2015).

2.5 Conclusion and implications

Our review of the experimental studies suggests that addressing other-regarding preferences can in many, but not all cases be successful in promoting different types of PEB. Hence, we confirm the causal link suggested by various theories of other-regarding behavior and proposed by correlational studies on other-regarding preferences and PEB. The success of these interventions, however, hinges on contextual factors such as cost structures, pre-existing preferences and the perceived cooperation of others, which explains partly the divergent results in some of the studies. In comparison to self-regarding interventions, it is not clear which type of intervention is more effective per se, yet the other-regarding interventions yielded two advantages: They did not entail any negative side effects from activating a more self-regarding mindset and they were able to create positive spillovers to other environmental behaviors.

Regarding the question how other-regarding preferences can be addressed in order to promote PEB, we can summarize that effective interventions work by raising awareness about adverse consequences on others, activating other-regarding preferences, raising empathic concern or expanding our moral circle. Hence, interventions unfold their effects based on existing other-regarding preferences, or they actively cultivate or expand them. Table 3 provides an overview of our results.

Table 3: Summary of the main findings of the review

Successful other-regarding interventions	• Information or feedback on behavioral consequences on others • Issue framing/priming • Appeals to other-regarding preferences • Induced perspective-taking • Morally relevant re-categorization
Channels	• Activating other-regarding preferences • Raising awareness of adverse consequences on others • Raising empathic concern • Expanding the moral circle
Promoted PEB types	• Consumption behavior • Non-activist public sphere behavior • (Behavior in organizations, activism)
Moderating factors for intervention effectiveness (selection)	• Pre-existing other-regarding preferences • Cost structure • Perceived cooperation of others
Possible positive side effects of other-regarding interventions	• Positive spillovers to other PEB domains • Lower risk of having detrimental effects

2.5.1 Implications for future research

From the review, theoretical, methodological and more general implications can be drawn for future research.

Theoretically, the economic concept of other-regarding preferences could be enriched by more psychological insights about how other-regarding motivations emerge or develop. The dominant economic approach to model behavior is still one of a single abstract motivation aimed at increasing own utility. Even when the utility function is widened to include aspects of others' well-being, the general logic of decision-making does not change. The psychological literature, however, shows that multiple and distinct value dimensions motivate behavior that cannot be reduced to a single abstract driver of behavior. The tripartite structure of environmental concern – biospheric, altruistic and egoistic concern (Schultz 2001; Stern et al. 1999) could be taken as a starting point to develop more complex economic theories of multiple motive systems or advance existing ones (e.g. Lynne et al. 2016; Bosworth et al. 2016) to make them applicable in the environmental context.

With respect to interventions aimed at promoting PEB by addressing other-regarding preferences, the reviewed findings reveal that many interventions only work when several conditions are met (e.g. when people know about adverse consequences on others *and* value them). In addition, two studies indicated that the behavioral effects can be ensured or strengthened when the other-regarding intervention is combined with other sorts of interventions, such as e.g. descriptive social norm interventions. Another possibility could be to also combine different kinds of other-regarding interventions in order to meet the aforementioned conditions. Future research may further investigate the combination possibilities of interventions. Beneficial could be, for example, joint interventions which aim at raising awareness about the behavioral consequences and evoke empathic concern. Generally, we assume that such combinations have the potential to boost the effect on PEB, as they may be able to activate other-regarding preferences on the cognitive and affective level. However, if individuals feel controlled by the interventions (control aversion – Falk and Kosfeld 2006) or the intervention combination poses too excessive demands on the human ability to process information (bounded rationality – Simon 1972), then it can be expected that the combinations will rather dilute the effect.

Moreover, future research may expand the target group whose well-being shall be taken into account. For example, we argued in section 2.2 that also future generations can count as others.

We believe that it will be an interesting task for future research to systematically examine how behavioral effects change when the well-being of future generations is considered instead of the well-being of currently living others. For now, we can only speculate about what differences in behavior might emerge. Psychological studies suggest that the well-being of objects perceived as more distant are given less weight in the decision-making process (e.g. Spence et al. 2012). Thus, for the behavioral effects it seems to be crucial how decision-makers relate to those future others (e.g. imagine the well-being of your grand-granddaughter vs. of a generic future other).

With regard to the conceptualization and operationalization of PEB, we think that including acceptance of policies is an important type of PEB that is too often neglected in experimental designs. Measures of consumption behavior are the most prevalent both in the economic and psychological literature. Acceptance of policies, in contrast, is almost exclusively examined in the literature on framing effects related to climate change, which is informed by the social and political sciences. Hence, many economic and psychological studies could be enriched by widening their scope of what they consider as PEB by including acceptance of policies.[18] In a democracy, restrictions imposed by public policy have to be legitimized by a majority of people approving them. Understanding the conditions under which individuals are willing to accept future costs and restrictions originating from public policies is thus an important research aim. This could also help to counter a reproach made to the behavioral sciences, namely that it would shift the attention from structural changes to the individual and their consumption decisions (a point raised e.g. in Straßheim and Beck 2019).

Lastly, linking different disciplines or dealing with genuinely interdisciplinary research bears the chance to learn from the strengths of each discipline. While economists may refine their experimental methods by e.g. applying more manipulation checks, psychologists could, for example, incorporate more resource-based (observable) measures of behavior to make the study results more applicable for real life behavior. The social and political sciences have much to offer

[18] Acceptance of policies is often dismissed in the economics discourse as a stated preference indicator that does not entail real costs. While it is certainly true that people tend to state more pro-environmental preferences than they translate into action (e.g. Diekmann and Preisendörfer 2003), this does not mean these indicators are worthless. In fact, accepting policies can, in many respects, only be a stated preference indicator as voting decisions cannot be elicited (for good reasons). Furthermore, in an anonymous research setting, there are few reasons to assume that people would generally state that they would accept a certain policy when, in fact, they do not. In contrast, a gap between intentions and behavior is very plausible for consumption behavior as people have to act on their intentions themselves, which implies personal efforts and immediate costs and thus leads to reduced implementation. Such gap does not exist when anonymously stating (dis)approval of restrictions or costs imposed by policies.

when it comes to theorizing care or solidarity – other concepts related to other-regarding preferences –, yet as they usually do not use experimental methods, these concepts are widely absent in the experimental literature and thus also in the studies we reviewed. At the same time, these disciplines could widen their methodologic portfolio with experiments. It remains a challenge for science to allow for such learning opportunities while at the same time not giving up the merits of disciplinary specialization.

2.5.2 Institutional implications

When thinking about the institutional implications of our results, the nature and the methodological limitations of the reviewed research have to be considered. First, most of the experiments were short-term (both with respect to the intervention as well as the measurement of PEB) and they did not have representative samples. Second, the study results are more informative on potential channels than concrete interventions that could work to promote PEB by addressing other-regarding preferences. Even if certain interventions in the experiments prove to be effective in increasing PEB, implementing them as policies demands further justification: in a democracy, policy legitimacy is established through the approval of citizens or their elected representatives (cf. Lepenies and Malecka 2019). Moreover, distributional impacts as well as unintended consequences must be considered in the policy design process. Hence, we will discuss in the following some broader political and institutional implications instead of concrete policy instruments.

From the experiments, we can conclude that the orientation towards self and others is indeed variable and matters for PEB. When designing policies to tackle environmental problems this linkage should be thoughtfully considered. The experimental results provide us with knowledge about channels and exemplary interventions. Moreover, many of the results show that various factors such as valuing the other(s), i.e. having pre-established other-regarding preferences and learning about the adverse consequences on them, have to come together for other-regarding preferences to play out in the decision-making (e.g. Bolderdijk et al. 2013a). Another caveat is the fragility of effects as shown by the experimental interventions (Price and Ferraro 2011; 2013). Rather than an incoherent bundle of policies and short-term interventions counteracting each other, coherent and multi-faceted policy environments are needed to enable and amplify positive policy effects and stabilize them for the long run.

Further, policy environments can intentionally foster a willingness to cooperate. Allowing for conditional cooperation to take place can likely boost such a willingness. Various studies in our sample showed that cooperative decisions increased and lasted longer when people thought that (many) others were doing the same. While some certainty about others' behavior is granted by (changing) social norms in favor of PEB (Nyborg 2018), policies that go beyond voluntary compliance (e.g. regulatory approaches) are probably needed to signal that the burden of environmental protection is shared by many. At the same time, policy-makers must also be careful that policy environments do not unintentionally decrease such a willingness to cooperate. Hence, creating the conditions for a society that is willing to accept other-regarding policies, even at own costs or discomfort becomes an important policy objective. In other words, it means enabling a society to collectively orient itself toward the ideal of "environmental citizenship", which demands that people in their role as citizens take responsibility for their natural and social environment (Dobson and Bell 2006). This also implies a willingness to give up current privileges in terms of wealth and access to resources. Cultivating such a willingness will likely be a long-term cultural process linked to the question of how we want to relate to each other (cf. Adamczak 2017).

In line with the literature, our findings show that (opportunity) costs of the associated behavior or policy approval evidently matter. This finding is well-established in research (e.g. economic price theory or psychological *low-cost hypothesis*). Thus, reducing the costs of PEB for the individual, which means to make the behavior easy and cheap so people can act in line with their other-regarding preferences, becomes a core political task. But caution is needed. Alterations of costs structures often come in the form of financial incentives and these can shift focus to monetary categories strongly associated with self-regarding preferences (Gneezy and Rustichini 2000; Bowles 2008). Moreover, it is important that policy instruments do not encourage token actions that may actually have degrading net effects on the environmental quality, e.g. when low-cost and low-impact PEBs are promoted, which then license other harmful behaviors or end up to be one-off actions only (Grolleau et al. 2017). The political challenge is therefore to reduce costs and/or to increase benefits of PEB without making price incentives the main or only motivation for action.

Moreover, the reviewed studies indicate that pre-established preferences matter for the overall level of PEB as well as for the effectiveness of interventions. How the process of preference formation in a society takes place, for instance within the education system, thus becomes an important focal point, querying a critical reflection about which preferences are cultivated therein. Generally,

preferences can be activated, but are stable in the short-term. In the long-run, however, they can change and are specific to socialization and culture (Bowles 1998). This endogeneity is important from a political perspective and calls for a critical examination of our thinking patterns, institutions and disciplinary models: Which values and preferences do they capture, support and help to maintain? Possibly, replacing our paradigmatic image of human behavior, *homo oeconomicus*, which remains to be the basis of many analyses and consequent political decisions, by a more cooperative human image like the *homo cooperativus* (Rogall 2002) or *homo sustinens* (Siebenhüner 2001) could help to anchor a more other-regarding orientation of human decision-making.

Beyond that, distributional aspects must be considered. If other-regarding appeals or similar interventions are institutionalized as an environmental policy approach, people already holding strong other-regarding preferences will likely respond while people holding strong self-regarding preferences will likely not. This bears the risk of shifting the (cost) burden of solving environmental problems from the latter to the former. Such unintended distributional impacts need to be considered when designing policies aimed at promoting PEB.

Rather than concluding that political instruments are needed to "make" people more other-regarding, the consequent political question is a more general one: How can institutions be designed in such a way that *allows* people to consider others in their decisions, to develop empathic concern, to learn about adverse consequences on others and to consider them as morally worthy? How can institutions and instruments be crafted considering that they can activate either more self-regarding or more other-regarding preferences and how can this activation be stabilized to be effective over time? Direct encounters with people providing the possibility to exchange experiences and perspectives, an inclusive morality and the normalization of other-regarding thought patterns could set impulses in this direction. Fully answering these questions is way beyond the scope of this article, but we hope to have provided an interesting starting point for discussion.

3. Perspective-taking with affected others to promote climate change mitigation: not enough for costly behaviors

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Abstract:

Prior evidence suggests that perspective-taking may promote pro-environmental behavior, at least for low-cost behaviors or local environmental problems. However, climate change requires costly mitigation efforts and is a global problem encompassing distance in impacts. Thus, in this study, we examine whether perspective-taking in the context of climate change is effective to promote mitigation behaviors, including actual and/or costly behaviors, the mechanisms through which it works, and if the distance to the person adversely affected by climate change matters for the effect. We conducted an experimental online study with a German non-student sample (n=557) with three outcome measures: a climate donation, signing a petition, and approval of mitigation policies. We find that perspective-taking does not promote these mitigation behaviors, yet it raises the degree perspective-takers value and – for close others – feel connected with the affected person. Exploratory analysis shows that dispositional perspective-taking and empathic concern are correlated with the mitigation behaviors.

Keywords: perspective-taking, pro-environmental behavior, climate change, empathy, experiment

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3.1 Introduction

Taking the perspective of another person has been shown to facilitate pro-social behavior (Batson 1991; Batson 2011). Various studies indicate that this might also apply in the environmental context: research from both social/environmental psychology and experimental economics found positive effects of perspective-taking on PEB or indicators like pro-environmental intentions (see Heinz and Koessler 2021 for a review – Chapter 2). Could perspective-taking thus be used as a complement to standard environmental policy instruments in order to address global environmental challenges like climate change? The literature has so far either investigated the effect on hypothetical or low-cost behaviors (e.g. Pfattheicher et al. 2016; Pahl and Bauer 2013), while mitigating climate change clearly requires actual and costly behavioral change. By contrast, studies employing actual or costly behavioral measures have examined behavior only in the context of local environmental problems with identifiable cause-effect structures, such as water use along rivers (Ortiz-Riomalo et al. 2021; Czap et al. 2015). Thus, in this paper, as a first contribution to the literature, we ask whether perspective-taking has the potential to promote actual and/or costly PEB in the context of a more complex and global environmental problem – climate change.

To assess this potential, it is important to understand how and in which situations perspective-taking can promote PEB. This implies a need to understand whether the same mechanisms by which perspective-taking has been identified as conducive for pro-social behavior (Batson 1991; Cialdini et al. 1997) also apply for PEB, where effects on others are less clearly linked to one's own behavior. Moreover, for climate change in particular, negative consequences have to be endured largely by people distant to those who have the greatest mitigation leverage (Hickel 2020; IPCC 2018). Yet, a common reproach made against using empathy-inducing methods is that their effectiveness may be limited to close others (Bloom 2017). This could imply that the effect of perspective-taking, being closely intertwined with empathy (Batson 2011) is dampened with increasing distance.

Hence, as a second contribution to the existing literature, we examine the *mechanisms* through which perspective-taking works in our environmental context, and, as a third contribution, whether distance to the person affected by climate change moderates the effect of perspective-taking.

To these ends, we conducted an online experiment with a German non-student sample (n=557). In a 2x2 full factorial design, we altered perspective-taking: we induced participants to take the

perspective of a person affected by climate change caused floods vs. asked them to stay objective; second, we altered who was affected by the floods: a person in Germany vs. a person in India. We measured several observed and/or costly mitigation behaviors and possible mediators.

The remaining chapter is structured as follows: Section 3.2 gives an overview of the literature on perspective-taking and PEB. Thereafter, we provide the details of our study including sample and materials (section 3.3). Then, we present our study results (section 3.4), discuss them by linking them to existing theory and pointing to their limitations (section 3.5), before we conclude by drawing implications for future research and policy (section 3.6).

3.2 Perspective-taking and pro-environmental behavior: evidence and hypotheses

Perspective-taking refers to the *"active cognitive process of imagining the world from another's vantage point or imagining oneself in another's shoes to understand their visual viewpoint, thoughts, motivations, intentions, and/or emotions"* (Ku et al. 2015, p. 79). This can be a conscious or unconscious effort (Hodges et al. 2011). Thus, the effort can (at least partially) be influenced, and perspective-taking may be externally induced.

There is ample empirical evidence that perspective-taking with a person in need can foster pro-social behavior, ranging from offering volunteering work to taking electric shocks in place of someone else (for an overview Batson 1991; Batson 2011). Moreover, perspective-taking may help to overcome social divides: many studies show that it can reduce stereotypes and prejudice towards marginalized groups (e.g. Wiese et al. 2018; Dovidio et al. 2004). The link between perspective-taking and PEB is less scientifically explored, but first studies originating from different behavioral disciplines have opened this interesting research field.

3.2.1 Perspective-taking as a mean to promote pro-environmental behavior

PEB refers to a range of different behaviors that have a positive impact on the environment, ranging from consumption to activism and other public sphere behaviors to behaviors in organizations (Stern 2000). As environmental conditions are closely linked to human well-being (Millennium

Ecosystem Assessment 2005), one's PEB also has a positive impact on other people. Thus, PEB can be seen as a special type of pro-social behavior, which involves foregoing personal benefits or accepting additional costs or inconvenience to the benefit of others.

Experimental studies from social/environmental psychology and experimental economics provide evidence that perspective-taking can effectively promote PEBs or proxy indicators like intentions (for an overview Heinz and Koessler 2021 – Chapter 2). The psychological experiments report a positive effect by inducing perspective-taking via respective instructions (e.g. "try to feel what the other feels") vs. the instruction to stay neutral ("try to stay as neutral and objective as possible"). The studies report a positive effect on PEB after taking the perspective of other humans (Pahl and Bauer 2013; Pfattheicher et al. 2016), animals (Shelton and Rogers 1981; Berenguer 2007; Sevillano et al. 2013; Schultz 2000) or plants (Berenguer 2007) negatively affected by environmental degradation. The only study that did not find an effect on pro-environmental decision-making is Berenguer (2010). While in their study a behavioral effect of perspective-taking was absent, it did increase the number of moral arguments participants named for environmental protection.

All psychological studies mentioned above are lab studies with student samples and relatively low sample sizes. The dependent variables aimed at capturing PEB were generally proxies like intentions (e.g. Pfattheicher et al. 2016) or hypothetical decisions (e.g. Berenguer 2007). In research, however, it is well established that a gap exists between hypothetical and actual behavior (e.g. Diekmann and Preisendörfer 2003). Only Pahl and Bauer (2013) examined actual behavior in form of time spent looking at pro-environmental information material and the number of brochures collected. While providing initial evidence that perspective-taking can influence actual behavior, further research is warranted to assess whether it also has an impact on other costly behaviors.

First insights in this regard are provided by the experimental economic studies by Ortiz-Riomalo et al. (2021) and Czap et al. (2015). Following the principle of incentivization, all three experiments presented in the two papers use costly behaviors as outcome measures and report positive effects of perspective-taking. Ortiz-Riomalo et al. (2021) conducted a lab-in-the field experiment in a Peruvian watershed, where downstream farmers benefitted in water quantity and quality from the traditional and sustainable farming practices of upstream farmers. After downstream farmers were

induced to take the perspective of these upstream farmers, they were more willing to give up own financial resources to improve the livelihoods of the upstream farmers.

Also in the context of water conservation, Czap et al. (2015) gave participants the role of up- and downstream farmers in their framed lab experiment. Upstream farmers could choose between either intensive or conservation tillage and affected downstream farmers could send messages to their upstream fellows. When affected downstream farmers requested upstream farmers to take their perspective and "walk in their shoes", upstream farmers were found to be less likely to drop their conservation efforts when a previously installed pecuniary compensation was removed. For the same game, Czap et al. (2012) found positive effects on conservation decisions of priming participants to take the perspective of downstream farmers. Although all decisions in these experiments involved pecuniary costs, the perspective-taking results may be limited to the specific situation of local environmental interactions. In our study, we assess whether the positive effect of perspective-taking also holds for costly behaviors in the context of a more complex and global environmental problem, i.e. climate change.

Given the positive associations of perspective-taking and PEBs found in previous studies, our first hypothesis is:

Individuals who are induced to take the perspective of people negatively affected by climate change are more willing to engage in mitigation behaviors than individuals who are asked to stay objective. **(H1)**

3.2.2 Through which channels does perspective-taking work in an environmental context?

In the literature, different views exist on how perspective-taking unfolds its positive effect on general pro-social behavior (Hodges et al. 2011). The most prominent scientific debate discusses whether the pro-social effect of perspective-taking is motivated by altruistic or egoistic reasons. According to Batson (1991; 2011), perspective-taking raises empathic concern with others, which instills an altruistic motivation to act. More precisely, valuing the other and perceiving their need are the two antecedents of empathic concern. Both have been shown to be addressed by perspective-taking (Batson 1991; 2011).

A different explanation is given by Cialdini and colleagues, who theorize that perspective-taking leads to a merging between the self and the other, in other words an increase in oneness (Maner et al. 2002; Cialdini et al. 1997). By this mechanism, they argue, pro-social behavior resulting from perspective-taking has an inherent egoistic component. Also here, empirical studies provide supportive evidence that oneness increases through perspective-taking with another being (e.g. Galinsky and Moskowitz 2000; Cialdini et al. 1997). The literature also shows that this merging between the self and the other is two-directional: others are seen as more self-like and the self is seen as more other-like (for overview see Galinsky et al. 2005; Hodges et al. 2011). While it is debatable if an increased perception of oneness really means that pro-social behavior is egoistically motivated, it certainly shows that perspective-taking makes the relationship between perspective-taker and perspective-giver closer: it connects them.

So far, the empirical evidence lends support to both mechanisms to be relevant mediators (Hodges et al. 2011; Maner et al. 2002). Hitherto, in the context of PEB, these mediation pathways have not yet been explored. In our study, we investigate both theoretical underpinnings for an effect of perspective-taking in the environmental context. Consequently, our second hypothesis is:

Individuals who are induced to take the perspective of people negatively affected by climate change show greater levels of a) perception of need, b) valuing of the other, and c) oneness, compared to individuals who are induced to stay objective. **(H2a-c)**

3.2.3 Does the distance to the affected parties matter for the effect?

To judge the usefulness of perspective-taking as a mean to promote mitigation behaviors, it is important to understand whether its effect depends on whose perspective is taken. For instance, existing evidence suggests that the effect of perspective-taking on action and its ability to evoke empathic concern may hinge on personal and social characteristics of the perspective-giver, which in turn influences the valuation of them by the perspective-taker (Batson 2011). For instance, perceived similarity (e.g. Batson et al. 1995) or social systems of devaluation of people (like racism - Dietz et al. 2018) may determine to what degree value is given to the perspective-giver. In the literature, this limited scope of empathic concern is a common criticism directed towards empathy-based approaches as political instruments (Breithaupt 2017; Bloom 2017).

For the environmental context, what is most interesting is whether the effect of perspective-taking depends on who is affected by environmental degradation. For the case of climate change, adverse consequences have to be endured mostly by people who are somehow "distant" from those with the greatest mitigation leverage: while the largest share of greenhouse gas emissions stems from operations in the Global North (Hickel 2020), the most severe consequences of climate change are felt by people living in the Global South (IPCC 2018; Mendelsohn et al. 2006). For instance, although flood risk is also increasing in Germany due to climate change (te Linde et al. 2011), the greatest risk is predicted for South East Asia, India, eastern Africa as well as parts of the Andean region (Hirabayashi et al. 2013). Thus, mitigating climate pressure from people most affected by climate change will require an enormous collective behavioral change from people who are distant to them in terms of residence and cultural background. We have shown elsewhere that distance to those affected by climate change can indeed decrease the willingness to carry out (low-cost) mitigation behaviors – Chapter 5).

In this paper, we examine how distance interacts with perspective-taking. The direction of the interaction is unclear. One the one hand, distance could lower the effect of perspective-taking, because it is limited to close others as claimed by its critics (Breithaupt 2017; Bloom 2017). Perspective-taking with people far from the self requires the activation of higher-order cognitive skills (Hoffman 2000). When the perspective-giver is far, perspective-taking may be more difficult. Based on these considerations, we would expect perspective-taking with people far from the perspective-taker to be *less* effective in promoting mitigation behaviors than when the perspective of close others is taken. Yet, the opposite might also be true. In fact, perspective-taking may help to bridge the gap, i.e. it may reduce distance and its effect on decision-making (cf. Pahl and Bauer 2013; Liberman and Trope 2014). According to Batson (2011), perspective-taking with close, i.e. valued, others happens automatically. This means that intentionally adopting someone's perspective might actually exert a stronger influence when performed with people with whom perspective-taking does not automatically take place – i.e. distant others. Hence, *externally inducing* perspective-taking could also be *more* effective to increase mitigation behaviors when it is directed towards distant others.

In our study, we test whether the effect of perspective-taking on mitigation behaviors depends on distance by offering the perspective of a person affected by climate change induced floods, who

reportedly lives either in Germany (CLOSE) or in India (FAR). Since both theoretical approaches seem plausible, we hypothesize to find an interaction effect, without defining its direction:

Distance between perspective-taker and perspective-giver moderates the effect of perspective-taking on the willingness to engage in a) costly mitigation behaviors and b) the mediation pathways. **(H3a-b)**

3.3 Method

3.3.1 Participants and Design

Overview. We conducted an online experiment with a sample of 557 non-student participants, using a 2x2 full factorial between-subject design (see Table 4). Participants were randomly allocated to one of four treatment conditions: One treatment variation induced either perspective-taking with a person negatively affected by climate change or an objective mindset ($T_{PERSPECTIVE\text{-}TAKING}$ vs. $T_{STAY\ OBJECTIVE}$). The other treatment variation altered who was negatively affected (T_{CLOSE}: a person in Germany vs. T_{FAR}: a person in India). Afterwards, various variables of mitigation behaviors and possible mediators were elicited before participants were asked for sociodemographic characteristics, own flooding experience and migration background as control variables. The study design was ethically approved by the LaER Ethics Committee of University Osnabrück.

Table 4: Overview of our 2x2 experimental design

	STAY OBJECTIVE	**PERSPECTIVE-TAKING**
CLOSE ***(Paul Weber, Germany)***	A (n=136)	B (n=141)
FAR ***(Samudra Sudarshan, India)***	C (n= 132)	D (n=148)

Participants. Participants were recruited from the online platform *clickworker* to take part in an online survey about the "consequences of climate change". They were paid a remuneration of 10€, of which they could donate 0-5€ (one of our dependent variables). Hence, all participants ended up with a payment between 5€ and 10€. Average duration to fill out the survey was approximately 25 minutes. We recruited 150 participants per treatment, so a total of 600. Of these, 43 were removed

because they did not pass our pre-defined data inclusion criteria (see below), so that we ended up with a total sample n = 557.

Data Exclusion. We excluded data from (i) participants with very short total answering time as we can assume that these participants did not take the task seriously. We define very short total answering time as being less than half of the average of total answering time. We further excluded data from (ii) participants who failed both attention checks and from (iii) participants who responded with 'always' or 'sometimes' to an item at the end of the questionnaire asking whether they gave meaningless responses. Finally, we excluded data from (iv) participants who did not finish the study. After data exclusion, we checked whether randomization was still successful in terms of the distribution of the sociodemographic variables (income, education, gender, age) and further control variables relevant for our research question (flooding experience, migration background). Attributes were evenly distributed except gender and flooding experience (see Table A2 in Appendix). To account for potential effects stemming from these characteristics, we controlled for these variables in our regression analysis.

Sample. All participants lived in Germany and spoke German as native language (our filter configurations to keep distance constant). 16% reported to have a migration history in their family, while none of them had parents or grandparents from India in specific. 16.3% indicated that they had experienced flooding themselves. The sample consisted of 239 females, 314 males, two people identifying as diverse and two people without specification. Age ranged from 18 to 74 years, with a mean age of 34.4 years old. Almost half (43.8%) of the study participants had a university degree. In our regression models, we account for this set of sociodemographic variables to probe the robustness of our results.

Time. The experiment took place in April 2020. Thus, it was carried out during the first peak of the Covid-19 pandemic. We discuss later how this might have impacted our results.

3.3.2 Procedure and Treatments

Procedure. At the start, all participants were introduced to the basics of climate change and how it increases the risk and intensity of floods. They were asked two multiple-choice questions after reading the text for an attention check. Then, an example was provided of how people experience

extreme flooding events: Participants read an interview of a person who recounted how their house was flooded. Interview questions were about how the persons experienced the flooding event, how it felt when they came back to the house and how the flooding changed their attitude towards life. The interview was composed of original statements from people who had experienced floods (Interview text and the treatment variations can be accessed in S1 of the Supplementary Online Material – https://osf.io/b54z3/?view_only=0c676aff652442fda7a0be87e3b81104 (blinded for peer-review) and A3 in the Appendix).

Perspective-Taking Treatment. The first treatment alteration consisted of inducing perspective-taking with the person negatively affected by climate change vs. a neutral mindset. Before reading the interview with the affected person, participants were given varying instructions. In $T_{\text{PERSPECTIVE-TAKING}}$, participants were given the instruction to adopt the perspective of the interviewed person and concentrate on their feelings and thoughts. In $T_{\text{STAY OBJECTIVE}}$, participants were asked to stay objective and take a neutral perspective, just concentrating on the described facts. Such variations of instructions have been used successfully in various experiments to increase low-cost PEBs or indicators thereof (Berenguer 2007; Pahl and Bauer 2013; Pfattheicher et al. 2016; Shelton and Rogers 1981). Previous research has also shown that altering instructions has a physiologically measurable effect on empathic emotional arousal (Stotland 1969; Lamm et al. 2007). In order to strengthen our manipulation, we included an interactive task after the interview. In $T_{\text{PERSPECTIVE-TAKING}}$, participants were asked to write a letter to the person as a friend. In $T_{\text{STAY OBJECTIVE}}$, participants were asked to write a neutral report of the event as a journalist. For both tasks, a minimum of 300 characters was required to continue the survey.

Distance Treatment. The second treatment alteration, aimed to test **H3**, manipulated *who* was negatively affected by climate change. In T_{CLOSE}, the person giving the interview was named Paul Weber, living in Rhüden, a small town in central Germany. In T_{FAR}, the person was named Samudra Sudarshan, living in Hatipara, an equally sized town in eastern India. A big map was shown before the interview to visually demark the residence. Additionally, a small map was presented above the interview text to keep residence salient, and questions always referred to Paul Weber or Samudra Sudarshan, respectively.

3.3.3 Manipulation Checks

Manipulation Check – Perspective-Taking Treatment. To check if our perspective-taking treatment was successful in inducing the intended state of mind, we employed two manipulation check items, which have been used in a similar form by Batson in various studies (e.g. Batson et al. 2002). After reading the interview, participants were asked to state to what extent they took the perspective of the other person and to what extent they stayed objective (1=not at all, 7=fully). The second item was reverse coded and the average of both items was taken as an indicator for the level of (self-reported) perspective-taking. Comparing indicator values between $T_{\text{STAY OBJECTIVE}}$ and $T_{\text{PERSPECTIVE-TAKING}}$ with a Mann-Whitney-U-test, we found the difference to be significant with $p < 0.0000$. As expected, the average is higher in $T_{\text{PERSPECTIVE-TAKING}}$ (M=5.07) compared to $T_{\text{STAY OBJECTIVE}}$ (M=4.02).

Manipulation Check – Distance Treatment. To assess the saliency of the second treatment, we asked participants after completing the entire survey about the name and residence of the interviewed person, i.e., Paul Weber in Germany in T_{CLOSE} or Samudra Sudarshan in India in T_{FAR}. Well above 95% of study participants correctly identified name and residency of the interviewed person in the respective treatment group (correct answers for Paul Weber: 99.6%, Germany: 99.3%; Samudra Sudarshan: 98.9%, India: 95.4%). That is, our treatments were successful: it was salient to the study participants who was affected by climate change.

3.3.4 Outcome Measures: Mitigation Behaviors

In our study, we are interested in actual and/or costly mitigation behaviors. All behaviors included are aimed at reducing greenhouse gas emissions and thus have a positive impact on climate protection. With help of three variables, we captured participants' willingness to engage in mitigation behaviors: (1) willingness to donate money to a mitigation NGO, (2) willingness to sign a petition, and (3) willingness to approve mitigation policies (S2 in the online supplementary material/A2 in the Appendix provides the exact description of how these variables were elicited).

Donation. Our first dependent variable is an actual donation made to a climate NGO, with which we captured participants' willingness to give up own financial resources. Specifically, we asked participants at the end of the survey if they wanted to donate 0-5€ (in steps of 0.50€) of their 10€

remuneration to the pro-environmental NGO *atmosfair*, which finances climate protection projects all over the world to compensate CO_2 emissions. Participants were told that *atmosfair* operates with the highest standard for CO_2 emissions reduction projects (CDM Gold Standard) and that a donation of 1€ equals an approximate reduction of 40 kg of CO_2. We chose *atmosfair* because the climate benefits of CO_2 compensation can be felt globally and thus benefit a person in Germany and India to the same extent. The total amount donated by the study participants was transferred to *atmosfair* after the study.

Petition. As our second dependent variable we elicited the willingness to sign a petition in the context of climate change mitigation as a mean to engage in environmental citizenship behavior (cf. Stern 2000; Dobson and Bell 2006). Participants were asked if they wanted to receive a link for signing a petition for more climate protection in Germany and would leave their email address for that purpose (which was stored separately from the rest of the data set to secure anonymity). While not involving pecuniary costs, this variable was observed and costly in the sense that people had to provide personal data and dedicate time. Participants who agreed, received the link after the study; yet we do not know whether they actually signed the petition. We used the willingness to provide the email address (yes/no) as a proxy for the willingness to sign a petition.

Policy Approval. As our third dependent variable, we elicited whether people were willing to approve structural changes in favor of climate protection at their own cost or discomfort. Participants were presented with a battery of 12 political measures which, at the time, were discussed in the political debate to mitigate climate change. These included command and control instruments (e.g. ban of domestic flights), price-based instruments (e.g. introduction of a CO_2 tax) as well as more ambitious political goals (e.g. phasing out from coal power until 2030 instead of 2038). Study participants could answer on a 5-point scale whether they personally fully approved (+2) to fully disapproved (-2) an introduction of the respective measure. The average rate of approval served as the final dependent variable, i.e., the willingness to approve the costly political measures.

3.3.5 Mediation Pathways

Perception of Need/Valuing of the Other. To test Batson's theory that perspective-taking raises empathic concern with others with the two antecedents "valuing of the other" and "perceiving their

need", we used two items similar to those from Batson (2002). One item asked participants to which extent they perceived the situation of Paul Weber/Samudra Sudarshan as an emergency (perception of need). The other item asked how much they cared for Paul Weber's/Samudra Sudarshan's well-being (valuing of the other). Both items could be answered on a 7-point scale (1=not at all, 7=fully).

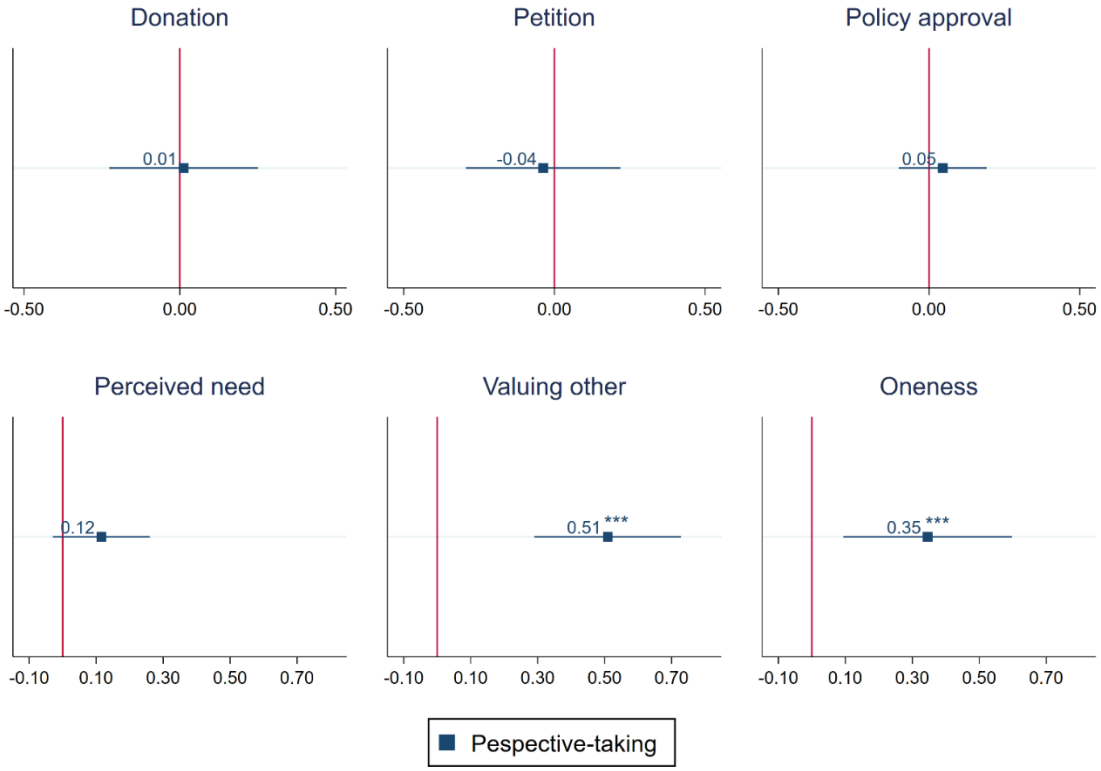
Oneness. To assess the explanatory power of Cialdini's theory that the effect of perspective-taking stems from a merging between the self and the other, we used the Inclusion of Other in Self (IOS) scale developed by Aron et al. (1992) to measure perceived oneness between perspective-taker and perspective-giver. Participants were shown seven pictures of two circles representing themselves and Paul Weber/Samudra Sudarshan with varying distances or degrees of overlap and were asked to select the depiction that described best their perceived closeness to the other person.

3.4 Results

To test whether perspective-taking leads to a higher willingness to engage in mitigation behaviors **(H1)**, we performed Chi square tests for the donation and the petition as well as a Mann-Whitney-U test for policy approval, comparing the respective behaviors in $T_{\text{PERSPECTIVE-TAKING}}$ vs. $T_{\text{STAY OBJECTIVE}}$ (pooling the data for the CLOSE and FAR conditions). For none of the three mitigation behaviors did we find significant differences between the two treatment conditions (donation: $\chi2(1) =0.07$, $p = 0.80$; petition: $\chi2(1)= 0.09$, $p=0.77$; policy approval: $z =-0.91$, $p =0.37$). The same result is obtained when running regression analysis that includes the control variables (socio-demographic characteristics as well as own flood experience and migration background; probit models for the donation and the petition, ordinary least square regression models for policy approval). Results of the regression analysis are depicted graphically in the upper row of Figure 1, which shows, for each dependent variable, the regression coefficients and corresponding confidence intervals for the treatment dummy "PERSPECTIVE-TAKING". The respective regression tables can be found in the Appendix (Table A4). In sum, our perspective-taking intervention did *not* increase participants' willingness to engage in costly mitigation behaviors. Thus, we do not find support for our first hypothesis.

For our second hypothesis **(H2)**, we aimed at testing the mediation channels as proposed by Batson et al. (2011) – a. perception of need and b. valuing of the other – and Cialdini et al. (1997) – c. oneness. Although we did not find effects on the behavioral variables, our treatments could have exerted an effect on these channels without translating into action. Estimating the treatment effects with help of ordinary least square regression models, while accounting for the control variables (see Table A5 in Appendix), we find that perspective-taking did increase the valuing of the other (p=0.000) as well as oneness (p=0.007). For perception of need, the likewise positive effect of perspective-taking failed to be statistically significant (p=0.11). The bottom row of Figure 1 depicts again graphically the coefficients and confidence intervals for the treatment dummy 'PERSPECTIVE-TAKING'. In sum, our findings are supportive of our hypotheses **2b** and **2c**: Individuals induced to take the perspective of people negatively affected by climate change show higher levels of valuing of the other and oneness, compared to individuals who were induced to stay objective. We do not find evidence for hypothesis **2a** as the impact of perspective-taking on perception of need is non-significant.

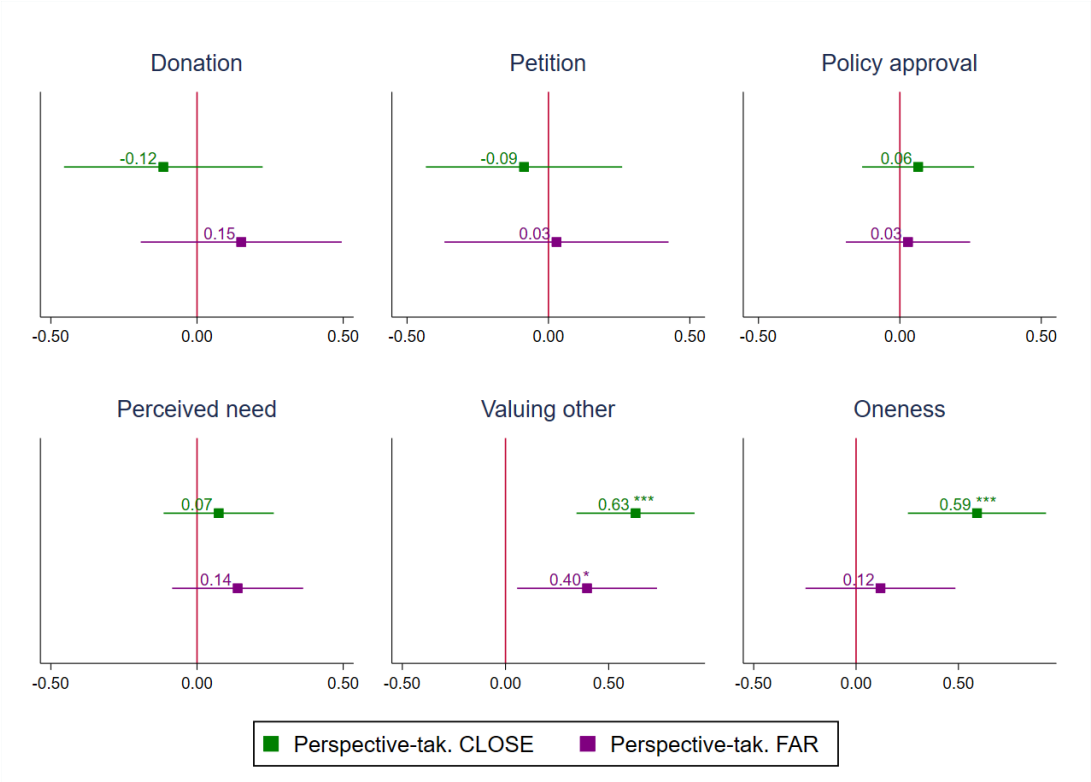
Figure 1: Effect of perspective-taking on mitigation behaviors and mediators



*Note: The figure shows the point estimates (squares) and 95% confidence intervals (blue lines) of the respective regression models for the treatment dummy 'PERSPECTIVE-TAKING'. The symbols *, **, *** indicate significance at p<0.05, p<0.01, and p<0.001, respectively.*

Lastly, we assessed whether the distance between the perspective-taker and the perspective-giver, i.e., the person affected by climate change, moderates the effect of perspective-taking on mitigation behavior **(H3a)** and on the mediation pathways **(H3b)**. For this purpose, we estimated the effect of perspective-taking for T_{CLOSE} and T_{FAR} separately, with the help of regression models. Figure 2 displays the estimated treatment effects for each subgroup. Tables A6 and A7 in the Appendix show the corresponding numerical regression results for mitigation behavior and mediation pathways, respectively. Figure 2 shows that when analyzed separately for T_{CLOSE} and T_{FAR}, perspective-taking has no significant effect on the three mitigation outcome variables. An equality test on the coefficients for 'PERSPECTIVE-TAKING' between subsamples revealed that no structural difference exists in the impact perspective-taking unfolds on the mitigation behaviors in T_{CLOSE} vs. T_{FAR} (p=0.28, p=0.67, and p=0.81). In sum, we reject our hypothesis **H3a**– there was no difference in the effect of perspective-taking on the mitigation behaviors depending on who was affected by the floods (Paul Weber in Germany or Samudra Sudarshan in India).

Figure 2: Effect of perspective-taking on mitigation behaviors and mediators split for the CLOSE and the FAR treatment



*Note: The figure shows the point estimates (squares) and 95% confidence intervals (horizontal lines) of the estimated effects of PERSPECTIVE-TAKING in the two subsamples CLOSE (green) and FAR (purple). The symbols *, **, *** indicate significance at p<0.05, p<0.01, and p<0.001, respectively.*

For the mediators, results are shown in the lower part of Figure 2, based on the regression results in Table A7. We found evidence for a moderation effect of distance for two of the three variables. For the "perception of need", perspective-taking failed to produce a significant effect in both subsamples. The equality test on the two coefficients for 'PERSPECTIVE-TAKING' consequently revealed that no structural difference exists in its effect on perceived need between T_{CLOSE} vs. T_{FAR} (p=0.67). The same applies for valuing the other. While the effect of perspective-taking is statistically significant for both distance conditions, with p=0.02 for T_{FAR} and p=0.000 for T_{CLOSE}, no significant structural difference exists in this effect (p=0.29). On contrast, for the feeling of oneness, perspective-taking only had a significant influence in T_{CLOSE} (p=0.001), but not in T_{FAR} (p=0.52). Thus, for oneness, our third hypothesis **H3b** is supported, i.e., distance moderates the effect of perspective-taking (p=0.06). For the perception of need and valuing of the other, we reject our hypothesis **H3b**: our experiment does not show evidence for a moderation effect.

3.5 Discussion

In our experiment, perspective-taking did not increase the willingness to engage in mitigation behaviors (we reject **H1**). There were no differences in this (lack of) effect depending on who was affected by climate change (we reject **H3a**). How can it be explained that our results differ from previous studies that found positive effects of perspective-taking on the engagement in PEBs (e.g. Berenguer 2007; Pfattheicher et al. 2016)? As we laid out in the beginning, we are looking at actual and/or costly behaviors while the other studies conducted in the context of climate change looked at hypothetical or low-cost behaviors. Hence, it seems plausible that perspective-taking in a complex environmental context promotes pro-environmental cognitions and emotions or low-cost behaviors but is not sufficient to invoke actual and/or costly behavior.

For the case of climate change, not only the causes are more difficult to pinpoint, but also the remedies for the variety of factors and actors that have to come together to mitigate climate change. Hence, self-efficacy is limited and individuals may feel that the impact of pro-environmental actions are negligible (cf. Value-Belief-Norm Theory – Stern et al. 1999). This may explain why perspective-taking was successful to promote costly PEBs for local settings in previous studies (Ortiz-Riomalo et al. 2021; Czap et al. 2015), in contrast to our study. This explanation can be supported by the many studies that report significant positive effects of perspective-taking in the

context of general *prosocial* behavior, as also here the presented cause-effect links are more straight-forward than in our case (Batson 1991; 2011).

Regarding the underlying mechanisms of why and how perspective-taking works, our findings lend some support to both Batson's and Cialdini's explanations also in the environmental context: perspective-taking increased the valuing of the other and perceived oneness (we support **H2b** and **H2c**). Our study results also show that oneness and valuing of the other are highly correlated (Spearman's rho=0.44, p=0.000). Interestingly, there seems to be a difference in how perspective-taking works depending on whose perspective is taken: distance moderated the effect on oneness: perspective-taking only unfolded a statistically significant effect when a person in Germany was affected (we support **H3b** for this measure). That is to say, perspective-taking was able to narrow the divide between the self and the other only for close others. In that respect, the reproach made against empathy-inducing approaches seems justified in the sense that they may discriminate between different groups of people. At the same time, perspective-taking did increase the valuing of the other for both close and far people. But, we also found that this was not enough to endure costs to benefit those others. In line with Batson's theory, actions in our case also seem to stem from both: empathic concern and behavioral costs.

In sum, behavior is always context-specific (e.g. Batson and Moran 1999) and as outlined above, our experiment induced perspective-taking with respect to actual and/or costly behavioral actions and in an environmental context very different to the situations in which previous experiments assessed the effects of perspective-taking. This may explain our null result in comparison to the previously found positive effect. In an additional exploratory analysis, we probed whether empathy and perspective-taking played any role at all in the decision-making of our participants. Instead of the situation-based treatment and respective mediator variables, we examined in a complementary analysis (presented in Table A8 in Appendix) dispositional empathic concern and dispositional perspective-taking – measured by the Interpersonal Reactivity Index (IRI – Davis 1980, subscales following Cliffordson 2001) – as general and more stable personality traits. Using questions such as "When I see someone being taken advantage of, I feel kind of protective towards them" (empathic concern) or "I sometimes try to understand my friends better by imagining how things look from their perspective" (perspective-taking), these subscales elicit a person's inherent likelihood to engage with the emotional and cognitive aspects of empathy. With our data, we show that dispositional empathic concern is indeed predictive for the willingness to engage in mitigation

behaviors (donation p=0.01, petition p=0.001 and policy approval p=0.000). For the cognitive aspect of empathy, i.e., the ability to take another's perspective, we found that it influences the willingness to sign a petition (p=0.045) and to support structural change through policy approval (p=0.000), but is not associated with the donation, i.e. the mitigation behavior involving direct pecuniary costs. Thus, a connection between perspective-taking/empathy and the willingness to undertake mitigation efforts also exists in our experiment, yet the incremental change from perspective-taking appears not to have been strong enough to further alter behavior.

Lastly, it must be mentioned that our study was conducted at the beginning of the Covid-19 pandemic, which may have affected our results. In fact, a pretest that we ran before the main data collection indicated results more consistent with **H1** and **H3**, but the sample was too small to take this as a solid finding. It is possible that people experienced something like a perspective-taking overload because they were confronted with extensive suffering during this time. Also, the crisis may have strengthened the focus on self-protection, thus people might have been less receptive to the perspective-taking intervention. A study by Todd et al. et al. (2015) supports this possible caveat. Their study experimentally varied the level of anxiety in participants and found that more anxious states negatively interfered with the perspective-taking capacities of people (in line with their general finding that anxiety promotes self-centeredness). Thus, the null effect of perspective-taking we found in our experiment may have also been driven by the extraordinary stress induced by a global crisis.

3.6 Conclusion

In this paper, we experimentally tested whether perspective-taking with someone negatively affected by climate change increases the willingness to engage in actual and/or costly mitigation behaviors. Moreover, we asked through which mechanisms such effect may take place and whether the results depend on who is negatively affected. We found that perspective-taking did not increase mitigation behaviors. Results did not differ depending on whether the person affected lived in Germany or India. For the mechanisms, our results show that perspective-taking increased the valuing of the other person and the perception of oneness. These results, contrary to the behavioral measures, varied with who the perspective-giver was: only for the person in Germany with a name

of German origin did the induced perspective-taking narrow the perceived divide between the self and the other for our German sample.

Future research should continue to investigate the effect of perspective-taking on actual and costly pro-environmental and mitigation behaviors, for instance by applying a similar design in a time without an acute crisis or by designing stronger perspective-taking interventions (e.g. multiple interventions or with tasks that require more active perspective-taking). Our study provides a starting point for future research to investigate the different functioning of perspective-taking depending on whose perspective and under which conditions it is taken in the environmental context.

In terms of policy implications, our results give reason to question the use of perspective-taking as a policy approach in a global environmental context for inducing actual and costly behavioral change. Our exploratory analysis implies, however, that dispositional perspective-taking and empathy go in hand with an increased willingness to undertake action and to approve of structural change for climate protection. Thus, more constant cultivation of both could possibly help to lay the ground for a democratically legitimized sustainability transformation. In any case, the different effects of perspective-taking when directed to close versus far others should be considered when discussing it as a possible policy approach.

4. How to encourage business professionals to adopt sustainable practices? Experimental evidence that the 'business case' discourse can backfire

Authors: Julian Rode, Nicolai Heinz, Gert Cornelissen and Marc LeMenestrel

Abstract:

Appeals to companies to adopt more sustainable practices are typically either framed as a request to assume 'responsibility' towards society and the future of the planet, or as a 'business case' for sustainability. The business case discourse emphasizes how sustainable practices can enhance (financial) business performance. We conducted a survey-based online experiment with business professionals to empirically explore the effectiveness of the two discourse types in motivating business actors to adopt more sustainable practices. Our results suggest that professionals believe that the business case discourse is more effective in encouraging businesses to engage with sustainability than the responsibility discourse. However, exposure to the business case discourse in the experiment did not lead these professionals to state a stronger motivation or intention to act in favour of sustainability within their organization. Furthermore, compared to the responsibility discourse, an appeal based on a business case discourse resulted in *less* approval for pro-environmental investments when these could not be justified by reputational benefits. Since effective measures to improve corporate environmental performance do not always involve win-win situations, our results raise concerns about the use of the business case approach to encourage companies to adopt sustainable practices.

Keywords: business, environmental sustainability, persuasive messaging, business case for sustainability, corporate responsibility

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4.1 Introduction

Business activities play a decisive role in the challenge to achieve environmental sustainability. They can contribute to environmental degradation, either directly, as a result of harmful manufacturing processes, or indirectly, because of unsustainable practices in their supply chain, or as a result of marketing, financing, or lobbying activities (Crane 2000; Trucost 2013; Le Menestrel and Rode 2013). Although there are many positive examples of corporate commitments to sustainability (Lozano 2012; Thorlakson et al. 2018; Lambin et al. 2018), international policy commitments (e.g. CBD 2010; UN 2015) and multi-stakeholder initiatives (e.g. New Climate Institute 2016; Steer and Reid 2018) highlight the importance of engaging the business community in efforts to tackle global environmental challenges such as mitigating climate change, halting biodiversity loss and deforestation, and reducing pollution. Environmental NGOs, governments and groups within the corporate sector as well as business consultancies are responding to those calls with campaigns to raise awareness about the environmental impacts of business activities and to advocate sustainable models for doing business. Communicating the need for businesses to become more sustainable also features increasingly in business education from undergraduate to executive level (Figueiró and Raufflet 2015; Roos 2017).

Communication aimed at promoting sustainability to the business sector has traditionally focused on appealing to companies' and managers' responsibility towards stakeholders and society at large. The academic business and management literature refers to concepts such as 'corporate responsibility' (Preston and Post 1975), 'corporate citizenship' (Andriof and Mcintosh 2017), 'business ethics' (Bowen 1953), and the 'license to operate' (Wilburn and Wilburn 2011). In contrast to a responsibility-based discourse, another discourse that is frequently used in current campaign and advocacy efforts highlights a *'business case'* (BC) for sustainability (see e.g. SustainAbility 2002; PwC 2011; McKinsey 2011; IFC 2012; WWF 2016). The emergence of the BC discourse as an alternative to the responsibility discourse has also been described in the academic management literature (Windsor 2006; Lee 2008).[19]

[19] There are also discourses based on other business strategy concepts that encourage businesses to better manage their economic, social and environmental impacts, such as, those based on "Shared Value" (Porter and Kramer 2011; cf. also Galbreath 2009) or the Triple Bottom Line (Elkington 2018). Our study focuses on the BC discourse as it plays an explicit role in many current sustainability campaigns. Its antithesis to a responsibility discourse also makes it well suited for experimental investigation.

The BC discourse portrays the adoption of sustainable practices as a win-win situation, arguing that it improves a company's environmental performance and at the same time is instrumental to its business performance. In other words, adopting sustainable practices benefits the financial bottom line, often indirectly and in the longer term (Salzmann et al. 2005; Siegel 2009; Willard 2012). Pursuing environmental sustainability can benefit financial business performance, for instance, when pro-environmental actions and cleaner production reduce financial costs or risks (e.g. via resource security or greater resource efficiency), improve the companies' public reputation and consumer goodwill, provide a competitive advantage by anticipating environmental regulations, or increase productivity through employee satisfaction (e.g. Carroll and Shabana 2010; Hockerts 2015).

It is unclear, however, which type of discourse actually fares better in encouraging businesses to adopt sustainable practices. Empirical research on public acceptance of pro-environmental policies and on individual PEB have shown that communication based on instrumental reasoning and self-interest can be ineffective or even entail unintended consequences (Bernauer and McGrath 2016; Rode et al. 2017; Evans et al. 2013; Bolderdijk et al. 2013b). So far, there is no direct empirical evidence that compares the effectiveness of the two communication approaches for corporate behavior. The study presented in this chapter seeks to address this research gap. Indeed, our results complement the previous empirical findings and demonstrate that a BC discourse may not be as effective as expected and that it can even backfire. The results contribute to the literature on environmental communication and campaigning by raising concerns about a strong reliance on the BC approach to encourage companies to adopt sustainable practices.

We embedded an experiment in an online survey. Respondents were allocated at random to three different experimental conditions. In two conditions, respondents were presented with messages concerning sustainability, either reflecting the BC discourse or the responsibility discourse. A third (control) group was not presented with any persuasive communication. We first probed business professionals' intuitions regarding the effectiveness of the two discourse types. Then, two sets of proxies for pro-environmental action were used to explore the effectiveness of the two discourse types for encouraging business actors' to improve corporate environmental performance. In the first set, participants stated their personal level of motivation and their intention to act for sustainability in their own organization. The second set of proxies consisted of hypothetical decisions for or against pro-environmental investments involving a fictitious lifestyle company.

We distinguished between investments that qualify as a 'business case' because reputational gains could potentially outweigh financial costs, and investments that do not involve any indirect benefits for the company (i.e. trade-offs). The inclusion of these two types of investment is a crucial element of our study because it allows us to investigate whether the BC discourse has the potential to undermine business people's willingness to make investments in sustainability when these cannot be justified by projected gains for the business. As it stands, many corporate decisions with large-scale impacts on the environment are characterized by trade-offs (Le Menestrel and Bettignies 2002), where for instance the costs of an investment in cleaner production technology cannot be recovered, or where environmentally harmful production systems are more profitable.

In section 4.2, we position the research question within the academic literature on business and behavioral research on sustainability and derive three hypotheses. Section 4.3 presents the study design. The results are reported in section 4.4. Section 4.5 discusses the implications of our results for research and practice.

4.2 Business and behavioral research on the promotion of sustainable practices

4.2.1 From persuasive messaging to corporate decisions

It is well established that the format, content and framing of the messages in persuasive communication can make them more or less successful in affecting the attitudes and behaviors of their audiences (Lakoff 2010), although there still are many unresolved questions, for example regarding how and when framing works (Chong and Druckman 2007). In any case, the path from persuasive communication, such as a campaign or a training course for business professionals, all the way to a change in a company's strategy or decision-making in favor of better environmental performance is long and complex. When persuasive communication changes an individual's attitudes and behavioral intentions, this may well translate into a change of behavior (Fishbein and Ajzen 1975; Ajzen 1991), yet there remain relatively large attitude-behavior or value-action gaps (Kollmuss and Agyeman 2002; Gifford 2011). Additionally, it is still a long way from a change in individual behavior to a change at the level of the organization – and ultimately to better corporate environmental performance: an organization or a company works to achieve multiple goals, it faces external constraints and influences (for instance in the form of regulation, stakeholder expectations

or public image), and the organizational decision-making processes depend on, for example, corporate governance and hierarchies. The values, motivations and actions of individual managers certainly have an influence on organizational strategy and decision-making, especially in smaller companies (Chin et al. 2013; Doh and Quigley 2014; Font et al. 2016), but the uptake of pro-environmental actions also depends on moderating factors such as company size, corporate governance structure, industry sector, or country-specific conditions (Wickert et al. 2016; Halkos and Skouloudis 2016, 2017; Colucci et al. 2020).

4.2.2 Possible effects of the two discourses

The following paragraphs serve to position our research in the business and behavioral science literature. We focus on the (psychological) mechanisms that may condition responses to persuasive messages based on a BC discourse versus a responsibility discourse. In our exploratory study we did not test for any specific theories or mechanisms that may explain the effects of the different discourses. Reviewing these theories and mechanisms, however, allows to refine our research questions and formulate hypotheses.

Business research has shown that managers use a variety of arguments to justify their existing investments in sustainability (Bansal and Roth 2000; Dummett 2006; Brønn and Vidaver-Cohen 2009; Hockerts 2015; Font et al. 2016; Hafenbrädl and Waeger 2017; Schaltegger and Hörisch 2017). According to these studies, many companies are aware that sustainable activities may eventually be instrumental to their performance. However, they also refer in their reporting to non-instrumental reasons, such as their responsibility towards stakeholders and society or a sense of duty to act as stewards of the planet. Many companies even state the non-instrumental reasons as the dominant motives (Hahn and Scheermesser 2006; Graafland and van de Ven 2006). It is possible that the BC approach does not resonate well with business professionals who adhere to personal values based on a sense of responsibility regarding sustainability (Hemingway and Maclagan 2004; Graves and Sarkis 2018).

Nonetheless, a number of arguments can be made for why a BC discourse might be more effective in encouraging businesses to take issues of environmental sustainability on board. First, within an organizational setting based on the mainstream business paradigm of creating shareholder value (Friedman 1970; Eden 1994; Siegel 2009) within a market economic system, BC reasoning can

provide legitimacy for sustainability considerations. Hafenbrädl and Waeger (2017) show that the conviction that there is a business case for corporate social responsibility (CSR) is to a large extent grounded in executives' idealized beliefs regarding the market economy system. From a practical perspective, having business objectives consistent with this paradigm also facilitates operations that rely on the standard business procedures and tools (e.g. financial risk assessment). Second, the BC discourse helps formulate convincing communication based on instrumental reasoning both internally, for example from middle-level to top management, as well as to shareholders. Those communications could state that the company is concerned with sustainability in the interest of maintaining its reputation and keeping regulatory authorities at a distance, without fundamentally questioning the focus on the financial bottom line. Third, the BC approach is non-threatening to the moral self-perception of managers (Monin and Jordan 2009). Since it does not refer to any moral responsibility, it excludes the risk of experiencing moral blame and does not lead to any conflict between personal goals, for example between managers' responsibility to pursue profitability and their environmental values. Based on these considerations, we develop the following hypotheses:

Compared to business professionals who are exposed to the responsibility discourse, those exposed to the BC discourse believe it is easier to involve the business world for sustainability. **(H1)**

Compared to business professionals who are exposed to the responsibility discourse, those exposed to the BC discourse show more commitment to corporate sustainability (in the sense of motivation, intention, or action). **(H2)**

Another strand of literature hints at the potential limitations of the BC discourse for promoting sustainable business actions. Empirical studies have tested the extent to which different communication approaches influence peoples' judgements related to climate change policies (Bain et al. 2016; Bernauer and McGrath 2016), public policy decisions around environmental protection (Rode et al. 2017), and green business practices (Makov and Newman 2016). Others have tested the influence of message framing on individual PEB (Evans et al. 2013; Bolderdijk et al. 2013b; Delmas et al. 2013; Asensio and Delmas 2015). One general conclusion from this research is that appeals to self-interest may not necessarily be the most effective way to enhance sustainability efforts. At least two broad lines of psychological processes can be found in the literature, which inform our third hypothesis (see below). First, people have multiple goal systems that are activated depending on the context (e.g. market participation, social role as a citizen, family context). The

BC discourse may activate self-interested goals and the norm of maximizing (business) self-interest (Miller 1999; Lindenberg and Steg 2013). As a result, the BC discourse could reinforce those goals that are already predominant in a business or market context, implicitly encouraging business actors to limit sustainable efforts to those situations that contribute to the financial bottom line. Second, previous research found that moral principles – that is, one's beliefs of what is the "right thing" to do – provide an "intrinsic motivation" for business decision-makers to engage in pro-environmental action (Lindenberg 2001). By redirecting people's thinking towards instrumental reasoning, the BC discourse may undermine ("crowd out") this type of intrinsic motivation (Frey 1992; Bowles 2008; Rode et al. 2015). This suggests that a BC discourse may be detrimental to business actors' willingness to move beyond strict financial interest when deciding on investments relevant to sustainability. In contrast to this, the discourse based on responsibility encourages recognition of non-instrumental "pure sustainability" goals. In the experiment, we tested how exposure to the two discourses affects people's approval for costly investments in sustainability on behalf of their (fictitious) company. We distinguished between investments that can be justified by BC benefits to the company (in our example: reputational gains) and those that cannot (i.e. clear trade-offs between profit and environmental impact). More specifically, we tested the following hypothesis:

Compared to business professionals who are exposed to the responsibility discourse, those exposed to the BC discourse are less likely to take cost-intensive action in favor of sustainability, when these costs cannot be justified by other benefits to the company. **(H3)**

4.3 Method and materials

4.3.1 Participants

The online survey was programmed in Qualtrics (www.qualtrics.com), and participants were recruited via the Prolific.ac platform (www.prolific.ac – see Palan and Schitter 2018). A screening filter ensured that only those participants were selected who were currently employed full- or part-time, who worked in a company, ran their own business, or were employed by a government organization, and who held a position as manager, trained professional, or as a member of the administrative staff. The filter reduced the eligible subject pool to 4,853 participants (out of

40,449). Although the aim was to have as many business professionals as possible, employees of government organizations were included in order to increase the eligible subject pool.[20]

In line with the procedures of the recruiting platform, participants were told in advance that they would receive a lump sum payment of GBP 6.00 for an average duration of 45 minutes. A total of 229 participants completed the study survey, but the data from 19 of these were excluded from the analysis because they failed an attention test or provided clearly nonsensical answers. The remaining 210 participants were between the age of 19 and 71 years (M = 37.2) with an almost balanced gender distribution (50.5% female). Nineteen different nationalities were represented in our sample, but the majority of participants were from the UK (71%) and the US (9%). 53% were in management positions (10% upper management) and many in positions of authority over staff (55%), budget allocation (52%), or purchasing (56%).

4.3.2 Study procedure

Table 5 summarizes the experimental procedure. In the first phase, all the participants read a short introduction about the context of the study: environmental sustainability and its relation to business. They were also asked a series of questions about personal characteristics that served to reinforce the message that this study was about business and sustainability. We asked them about the business sector they work in, their position in the company and their decision-making authority, their personal prior experience with sustainability, and how they would rate the current level of engagement with sustainability displayed by their company. In the "experimental treatment" phase, participants were allocated at random to one of three treatment groups. After the exclusion of some participants as described above, this left us with 64 participants in the control group (T_0), 71 participants in the BC discourse treatment group (T_{BC}), and 75 participants in the responsibility discourse treatment group (T_{RESP}). The control group did not receive any additional information in this phase. Treatment groups were presented with videos, arguments, examples and an opportunity for self-reflection in line with one of the two communication approaches for business sustainability (see details below). In a third phase, all participants were asked to respond to the questions and tasks that served as our dependent variables. These were intended to measure (1) beliefs regarding

[20] Separate analysis of the results in the two sub-samples (business professionals and employees of government organizations) revealed similar pattern in the treatment effects.

how difficult it is to engage businesses in sustainability efforts, (2) personal motivation and intention to promote sustainability in their professional context, and (3) inclination to approve investments aimed at improving the company's environmental sustainability in a hypothetical case. Finally, all participants completed a questionnaire with a second set of personal data (gender, age, professional background, nationality, political orientation).

Table 5: Overview of the experimental procedure

1 Introduction	Explanation of study context (sustainability and business decisions) Request for personal information regarding: ▪ Business sector, position in company, decision-making authority ▪ Prior experience with sustainability		
	Random assignment of participants to one of the treatment groups		
2 Treatment	**T_{BC} ('business case')** • Video • Text with BC arguments • Attention check • Reflection on business cases for sustainability in own company	**T_{RESP} ('responsibility')** • Video • Text with responsibility arguments • Attention check • Reflection on responsibility for sustainability in own company	**T_0 (control)** none
3 Dependent variables	1. Belief regarding how difficult it is to engage businesses in sustainability efforts 2. Stated personal motivation and intention to act in favor of sustainability in own professional context 3. Recommendations for or against pro-environmental investments		
4 Personal characteristics	Request for personal information (explanatory variables) regarding: Gender, age, nationality, education, environmental world view, political orientation		

4.3.3 Experimental treatments

Participants in the BC discourse treatment and in the responsibility discourse treatment were asked to watch short explanatory videos, to read relevant passages of text, and to relate that content to two concrete examples in their own organization. We selected and combined the materials in such a way that, as a whole, they would be as representative as possible of the two discourse types as these would generally be communicated to business professionals in naturally occurring settings (e.g. campaigns or training situations). The inevitable drawback is that it is not possible to disentangle which of the specific parts of the material generated an effect (see Roe and Just 2009).

In the BC discourse treatment group (T_{BC}), a video made by Sustainability Illustrated (2014)[21], lasting 4:37 minutes, explained the business case for sustainability based on the work of Bob Willard. A text provided further arguments and examples of how sustainability efforts enhance corporate (long-term) performance (for example, via reputation, price premiums, markets, or employee motivation). Participants were then asked to give two concrete examples of "a business case for improving environmental performance" in their own company. In the responsibility discourse treatment group (T_{RESP}), a 2-minute video made by RealEyesVideo (2010)[22] explained the notion of sustainability in relation to four "care principles" and their importance for future generations and the planet. A text provided arguments and examples emphasizing that companies have a responsibility to engage in sustainability efforts, based on a duty toward future generations and on rights, stewardship and environmental liability. Participants were asked to give two concrete examples of "where and why your own company or organization has a responsibility towards its stakeholders, society at large or nature, to improve environmental performance" (see A9 in the Appendix for the full text). For participants in both discourse treatment groups, an attention check was included to ensure that participants had paid attention to the material presented.[23]

[21] URL: https://www.youtube.com/watch?v=KlW8-WW0k3g&feature=youtu.be
[22] URL: https://www.youtube.com/watch?v=B5NiTN0chj0&feature=youtu.be
[23] In the BC treatment condition, participants were asked *"Which of the following 'business cases for sustainability' are mentioned in the text?"* and had to mark the two correct examples presented (an additional one had not been mentioned and had to be left blank in order to pass the test). In a similar manner, participants of the RESP treatment condition were asked *"Which of the following aspects of responsibility of companies are mentioned in the text?"*

4.3.4 Dependent variables

Table 6 presents the complete set of items and scales that were used to test the three hypotheses. To test **H1**, we asked participants to rate the difficulty of encouraging the business world to play a more active role in solving environmental problems on a 7-point Likert scale. To test **H2**, we used Likert scale responses to measure participants' stated motivations and intentions to act in favor of sustainability in their own professional context. To test **H3**, we used a hypothetical task involving investment decisions.

In the hypothetical decision task, we introduced a fictitious lifestyle company (inspired by the 2013 Trucost study on PUMA's environmental footprint). Participants were given information on the financial, reputational and environmental outcomes of seven pro-environmental investments. They were asked to make recommendations for or against the investments, from their imaginary role as a member of an advisory group to the company's board of directors (cf. Rubinstein 2006). The seven pro-environmental investments were presented at the same time, which reduced the salience of any particular investment in order to avoid any potential experimenter demand effects (Tourangeau et al. 2000). The investments included a "triple win" investment (#1) and a "high-cost trade-off" investment (#7). The remaining five investment scenarios (#2 to #6) involved smaller financial costs to the company (0.05, 0.5 or 1m $ annual profit reduction) and different combinations of reputational and environmental benefits. Investments #3, 5, and 6 are labelled "reputation gains" (#6 "weak reputation gains") investments. Although no concrete estimates for the indirect financial benefits from reputation were provided, these investments can be justified on the basis of a business case logic. In contrast, reputation gains are absent in investments #2 and #4. These investments involve a clear trade-off between profit and environmental benefits, and hence no basis for business case reasoning.

Table 6: Items used as dependent variables

Measure	Item (Question/Task)	Scale
Perceived ease to engage business for sustainability (Q1)	Generally, how difficult do you think it is to engage the business world to play a more active role in solving environmental problems (and thereby contribute to sustainable development)?	7-point Likert *(1=very difficult 7= very easy)*
Personal motivation and intention to act (Q2)	How would you rate your personal motivation to include considerations of environmental sustainability in your own professional (or work-related) decisions and actions?	7-point Likert *(1=not motivated at all , 7= very motivated)*

	What would you be willing to do in your company or organization? • Start conversation with colleagues • Raise issue with my boss • Find out what my company does and how it can improve • Push my company or organization to take sustainability into account	5-point Likert for each of the four actions *(0 = definitely not, 4 = definitely yes),* aggregated to a 16-point scale
Approval of costly pro-environmental investments (Q2 & Q3)	Assume you are working for REKA, a lifestyle company that designs and develops footwear and clothing. The company has recently commissioned a study on the global environmental „footprint" of its activities, including the entire supply chain. Environmental impact was measured in terms of 1) water and energy use, 2) greenhouse gas emissions and other air pollution, and 3) land use conversion and biodiversity loss. The study also identified measures to improve environmental performance and made projections on their financial effects in terms of expected changes in annual net profit due to the measure, the reputational effects in terms of public image of the company, and the environmental effects. It turns out that the company would remain profitable even if all measures were implemented (!), but **each measure would have different financial, reputational, and environmental effects**. You will soon be attending a meeting of the board of directors at which the decision will be made as to which measures to implement. As **part of an advisory group in your company you have been asked to make a personal recommendation on each of the measures**.	4-point Likert *(strongly against, rather against, rather in favor, strongly in favor)* * change in profit per year (in m US $) ** 0 (none) + (mild positive) ++ (positive) +++ (strong positive)

Measures to improve environmental performance	**Financial effect ***	**Reputational effect ****	**Environmental effect ****
1. Technical resource efficiency measures to reduce water and energy use	+0.5	+	+
2. Sustainability training for farmers and employees on more efficient use of water, energy and fertilizer	-0.05	0	+
3. Nature conservation actions in collaboration with a conservation NGO	-0.5	+++	+
4. Emission reduction measures via investments in sustainable sourcing and clean technology	-0.5	0	++
5. Sourcing of sustainable cotton based on the production standards of a well-known consumer label	-1	+++	+
6. Sourcing of sustainable rubber based on the production standards of a new consumer label	-1	+	+++
7. Removing the most resource-intensive products from product line	-3.5	0	+++

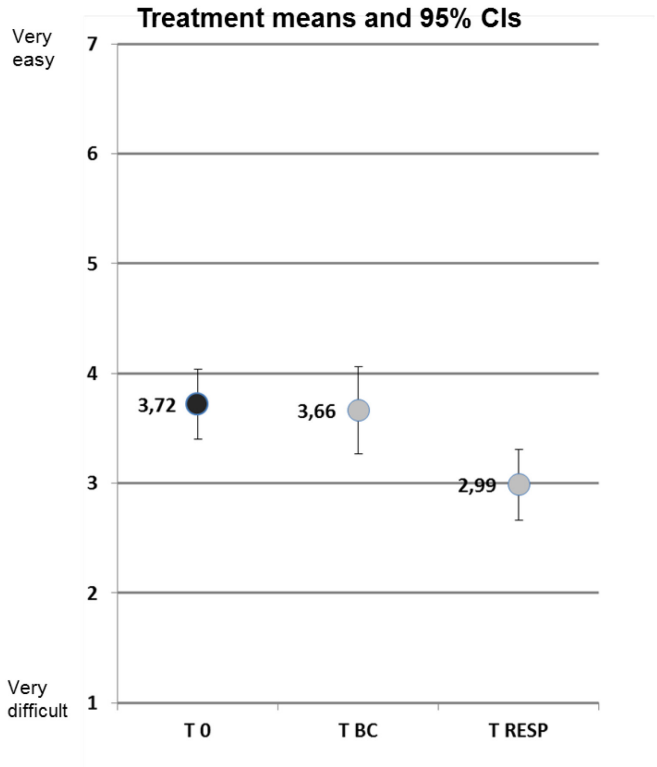
4.3.5 Analysis and statistical methods

The main focus of our analysis was on the comparison across treatments in order to test the hypotheses. This was preferably done using non-parametric tests, as they entail no distributional assumptions and seem appropriate with this sample size. Answers on Likert scales (**H1-H2**) were analyzed using the Kruskal–Wallis-H test for overall differences between the treatment samples and the Mann-Whitney-U test for comparisons between any two specific treatment scenarios. For the investment task (**H3**), the response had a binary format: a participant was either "in favor" or "against" the investment. A Chi square test compared the proportion of participants in each treatment group who approved the investments. Where we found a significant treatment effect, we additionally ran binomial logistic regressions with dummy variables for the two treatments in order to confirm the effect when isolating it from the influence of respondents' personal characteristics: age, gender, political orientation, private sector employment, and previous experience with sustainability. The influence of the personal characteristics were hence rather a supplementary and exploratory aspect, and we otherwise do not give it much attention in the discussion and conclusions.

4.4 Results

In line with hypothesis **H1**, business professionals in the responsibility treatment group (T_{RESP}) rated it as significantly more difficult to engage business for sustainability, compared to those in the business case treatment group (T_{BC}; MWU: $z = -2.40$, $p = 0.02$) and compared to the control group (T_0; MWU: $z = -2.86$, $p < 0.01$) – see Figure 3 for a comparison of treatment means and confidence intervals. There were no significant differences between T_{BC} and T_0. This means that business professionals have the intuition that the responsibility discourse discourages the business world from contributing to the solution of environmental problems. A linear regression analysis with the difficulty ratings as dependent variable (see Table A10 in the Appendix for the full results) confirmed that respondents in the RESP treatment rate it as significantly more difficult to engage business (coeff. -0.71, $p < 0.01$). The only statistically significant personal characteristic was prior experience with sustainability, which leads people to judge it as easier to engage business (coeff. 0.17, $p = 0.03$).

Figure 3: Ratings of how easy it is to promote sustainability to the business world



Note: The figure shows the mean ratings and the 95% confidence intervals for the three treatment conditions.

We found no support for our hypothesis **H2** that business professionals exposed to the BC discourse show more commitment to corporate sustainability (in the sense of motivation, intention, or action). Average personal motivation scores were slightly higher in T_{BC} (M = 4.1) and T_{RESP} (M = 4.3) compared to T_0 (M = 3.9), but none of the differences were statistically significant (MWU for T_{RESP} vs. T_0: z = -1.36, p = 0.18). Results for the stated intention to act in favor of sustainability in the organization point in the same direction, but again none of the differences between the three treatments (mean for $T_{BC,}$ M = 10.4; for $T_{RESP,}$ M = 10.6; for T_0, M = 9.8) were statistically significant (MWU for T_{RESP} vs. T_0: z = -0.90, p = 0.37). The results thus far imply that, even though our participants have the intuition that the BC should do a better job than the responsibility discourse at motivating the business world to implement sustainable practices, we can show no difference between these two discourses in motivating individuals to include sustainability considerations in decisions they take in their professional role.

In the hypothetical investment task, the overall mean of respondents' approval for pro-environmental investments across the seven potential investments was slightly higher in the

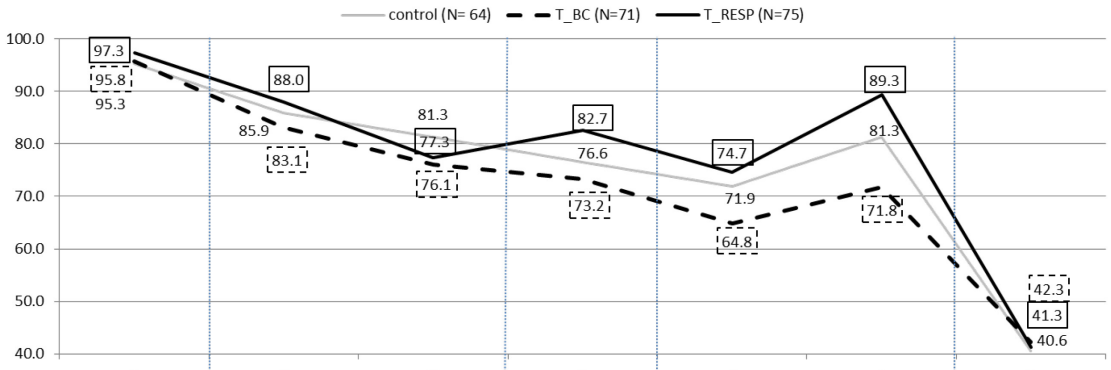
responsibility discourse treatment (mean for $T_{BC,}$ M = 5.07; for $T_{RESP,}$ M = 5.51; for T_0, M = 5.33) compared to the BC discourse treatment, but the difference between T_{RESP} and T_{BC} was not statistically significant (MWU: z = -1.06, p = 0.29). This result confirms that the BC discourse is not superior in motivating individuals to make sustainable business decisions.

In line with hypothesis **H3**, however, we found that business professionals in the BC discourse treatment were less inclined to accept costly investments for sustainable practices when they could not be justified by indirect (here: reputational) benefits to the company, compared to those in the responsibility treatment group. In other words, when investments involve an obvious trade-off between sustainability and profit, the BC discourse for sustainability seems to backfire. Figure 4 illustrates the results of the hypothetical investment decision task across the seven pro-environmental investments. The figure also provides the results of the Chi square tests of the differences between the two discourse treatment conditions. Over 95% of participants across all three treatments approved the "triple-win" investment #1. About 40% across all three treatments approved the high-cost investment #7. These are two "clear cases", on either end of the spectrum, where investing in sustainability is either completely justified (investment #1) or extremely costly (investment #7). As a result, participants, independent of the condition they were in, generally agreed on whether to invest or not, and there were no significant differences between treatments. This broad agreement also provides evidence that participants were processing all information correctly and made sensible decisions. For investments #2 to #6 the approval rates are consistently higher in the responsibility treatment than in the BC treatment. However, the differences between the BC treatment and the responsibility treatment are modest and not significant for investments #3 and #5 (4.9% and 1.2%; i.e. for situations involving strong reputation gains). The difference was larger (9.5%), although still not significant, for investment #6 with weak reputation gains. For investments involving a clear "trade-off" (investments #2 and #4), the difference was larger still (9.9% and 17.5%, respectively). For investment #4 this difference in approval rates between the BC and responsibility treatments was statistically significant (T_{BC} vs. T_{RESP}: Chi-square = 7.21, $p < 0.01$). Approval rates in the control condition typically lay between those in the two discourse treatments. The differences between each of the two discourse treatments and the control treatment were not statistically significant.

These results imply that, when investments in sustainability can be justified with a business case logic that accounts for indirect and long-term effects on profit, the BC and responsibility discourse

fare about equally well. However, in situations with a clear trade-off, where it is not possible to justify an investment from a profit perspective, the BC discourse undermines the willingness to invest in sustainability.

Figure 4: Approval of pro-environmental investments



Investment scenario	1 (triple-win)	3 (reputation gains)	5 (reputation gains)	6 (weak reputation gains)	2 (trade-off)	4 (trade-off)	7 (high-cost trade-off)
Financial effect	+ 0.5	- 0.5	- 1	- 1	- 0.05	- 0.5	- 3.5
Reputation effect	+	+++	+++	+	0	0	0
Environmental effect	+	+	+	+++	+	++	+++
Chi-square (T_{BC} vs. T_{RESP})	X^2 = .27 (p = .60)	X^2 = .71 (p = .40)	X^2 = .03 (p = .85)	X^2 = 1.89 (p = .17)	X^2 = 1.69 (p = .19)	X^2 = 7.21 **(p < .01)**	X^2 = .01 (p = .91)

Note: The figure shows the proportion of participants (in %) who endorse the seven pro-environmental investments in the hypothetical investment decision task, as well as the Chi square tests of the differences between the two discourse treatment conditions (bottom line). It also shows the information participants received regarding the financial, reputational and environmental effects of each of the investments.

Investment #4 provided the clearest case of this effect. The difference in approval rates was statistically significant between T_{BC} and T_{RESP}. In order to better understand the determinants of the decision to invest or not, beyond the discourse that a participant was exposed to, we ran a binomial logistic regression with the decision to investment, or not, as the outcome variable. This allowed us to test for the influence of exposure to the treatment conditions and for the influence of personal characteristics at the same time. The regression results in Table 7 show that having a left-wing political view and having more previous experience with sustainability had a significant positive effect on approving the investment. Age, gender, employment in the private sector (as opposed to government) and the level of decision-making authority in the organization had no significant effect. Analysis of the variance inflation factors (VIF) reveals no multicollinearity between the independent variables (all VIF below 1.35). Regression (2) uses T_{RESP} as reference

category and confirms the significantly negative effect of exposure to the BC discourse on approval for the pro-environmental investments when compared to the responsibility discourse.

Table 7: Results of the binomial logistic regression

	Approval in trade-off investment scenario #4	
	(1)	(2)
T_0 (control)		-0.34
(1 = yes)		(0.53)
		[0.40]
T_{BC}	-0.78	-1.11**
(1 = yes)	(0.47)	(0.49)
	[2.78]	[5.08]
T_{RESP}	0.34	
(1 = yes)	(0.53)	
	[0.40]	
Private sector employment	0.21	0.21
(1 =yes)	(0.45)	(0.45)
	[0.23]	[0.23]
Decision competency	0.02	0.02
(0 = none to 4 = in four	(0.16)	(0.16)
domains)	[0.02]	[0.02]
Experience with sustainability	0.69***	0.69***
(0 = none to 6 = expert)	(0.17)	(0.17)
	[16.85]	[16.85]
Gender	-0.10	-0.10
(1 = male)	(0.42)	(0.42)
	[0.06]	[0.06]
Age	0.01	0.01
(in years)	(0.02)	(0.02)
	[0.01]	[0.01]
Political orientation	-0.48***	-0.48***
(-3 = strongly left-wing to 3 =	(0.17)	(0.17)
strongly right-wing)	[7.98]	[7.98]
Constant	-0.32	0.02
	(0.98)	(1.01)
	[0.11]	[0.01]
Observations	207	207
R-square Cox & Shell	0.16	0.16
(Nagelkerke)	(0.26)	(0.26)

Note: Regression coefficient presented in the first line. Single, double and triple asterisks (, **, and ***) denote $p < 0.10, 0.05$, and 0.01, respectively. Standard errors in parentheses. Wald values in brackets.*
(1) Reference category is the control group (T_0)
(2) Reference category is the responsibility treatment group (T_{RESP})

4.5 Discussion and conclusions

4.5.1 Theoretical and practical implications

Appeals to companies to adopt more sustainable practices either emphasize their 'responsibility' towards society and the future of the planet or the 'business case' for sustainability. The experimental study presented here constitutes an empirical exploration aimed at understanding the effectiveness of both discourses. The prominence of the BC discourse in managerial and academic literature suggests that many people particularly believe in the potential of the BC discourse. The results from our study confirm this belief: participants who were exposed to the BC discourse thought it would be easier to engage business for sustainability compared to participants who were exposed to the responsibility discourse. Interestingly, comparison with the control group reveals that the difference is not so much due to any positive effect of the BC discourse. Rather, the responsibility discourse is perceived to undermine the motivation to make decisions in the service of sustainability in the business world. This finding may explain why the BC discourse has been widely embraced and has gained so much traction.

Our results also suggest, however, that the beliefs about the effectiveness of the BC discourse to enhance corporate engagement with sustainability and to improve corporate environmental performance may not be justified. Participants who were exposed to the BC discourse neither reported a higher personal motivation nor stronger intentions to act for sustainability than those exposed to the responsibility discourse. Moreover, participants exposed to the responsibility discourse showed higher levels of approval for cost-intensive investments in sustainability in situations when these could not be justified by other (here: reputational) benefits to the company. In other words, our data showed that the BC discourse did not help to promote pro-environmental corporate action, and it actually hurt in trade-off situations where sustainable actions were not justified by business case reasoning.

Certainly, highlighting how efforts to protect the environment can also be in the interest of business actors may lead companies to adopt sustainable practices. The win-win potential of sustainable practices has been neglected for too long by both companies and society, and it is interesting for any company – driven by whatever motives – to discover and realize this potential. Motivating business decision-makers to adopt sustainable practices for the sole reason that it is profitable to

do so is, however, a different matter. In order to respond successfully to pressing global environmental challenges such as climate change and biodiversity loss, human societies (especially those already highly industrialized or those actively pursuing industrialization) will need to enact considerable self-restraint when it comes to exploiting natural resources in pristine areas (e.g. oil in oceans, wood and minerals in rainforests – Walker et al. 2009; Dasgupta and Ehrlich 2013). Given the current lack of stringent global environmental regulations, this will most likely require the corporate sector to accept far-reaching voluntary restraint and to forego profits or bear extra costs (Le Menestrel and Rode 2013). If the BC discourse undermines the business sector's willingness to refrain from exploiting profit opportunities, this may ultimately be detrimental to the achievement of global sustainability goals.

Appeals to companies in the form of BC arguments or arguments relating to companies' responsibility can be a part of public communication campaigns or material used for business education (Figueiró and Raufflet 2015). In essence, our study suggests that communication and education efforts that seek to encourage companies to adopt more sustainable practices should be aware that a business case discourse may not be as effective as expected and may even backfire in trade-off situations. The challenge facing advocates of sustainability is to encourage the search for win-win potential but not to let business case thinking become the only driver of sustainable business action. Embedding information about the win-win potential of sustainable action for businesses and society into more integrated communication strategies could be a possible way forward. As requested by Roos' (2017), education and advocacy efforts should encourage companies to strive for a wise balance between business interests and the common good.

In sum, the main conclusions from our study is that we provide an empirical rebuttal of the idea that the business case is the most effective way to motivate business professionals to act for sustainability. The concerns against such a largely held belief is specifically valid for the case of trade-off situations, for which the results show that a BC discourse may even be counter-productive. Practically, our research conclusions entail a message to professionals in sustainability education, communication, or management who aim to encourage pro-environmental corporate practices: Do not rely on a pure business case discourse, but at least balance it by including "responsibility-based" reasoning in your discussions, brochures, and educational material!

4.5.2 Limitations of the study

A number of possible caveats should be considered when interpreting our results. First, the results from a survey-embedded experiment with stated intentions and hypothetical recommendations on a particular case raise obvious questions concerning their validity for real-life corporate decisions (Levitt and List 2007; Falk and Heckman 2009). Our discourse treatments relied on a stylized representation of the two types of sustainability communication, whereas in reality communication often uses mixed messages or goes beyond these two discourses. In addition, the results of this study show short-term effects and cannot represent the functioning of a lengthy communication campaign or gradual changes in internal business discourse or corporate culture. Hence, we can neither ensure the long-term persistence of the observed effects, nor can we rule out the possibility that stronger effects on business professionals' intentions and actions may occur when they are confronted with a certain line of argument or thinking over the longer term. Our study provides first exploratory empirical evidence that the BC discourse could indeed influence business professionals' perceptions and (hypothetical) decisions in a detrimental manner.

Second, our specific participant pool requires caution regarding the generalizability of the results to other subpopulations. Our study did not address country-specific or industry-specific differences in the responses to different discourses that may be due, for example, to national policies or attitudes on sustainability issues. The majority of our participants were from Western industrialized countries, most from the UK (71%) and fewer from the US (9%). One might expect greater responsiveness to the BC discourse by people socialized in market-oriented societies, as is the case for most of our study participants. Moreover, the responsiveness of different industrial sectors to sustainability discourses might correspond to their degree of market vs. state organization or their specific CSR traditions (cf. Engert et al. 2016). Our study merely indicates that the BC discourse can backfire; it provides no insight into potential moderating factors.

Third, the BC discourse may also affect environmental performance in ways that this study has not measured. For instance, the BC discourse might have a positive effect on environmental performance by enhancing efforts to find win-win situations, such as resource-efficient cleaner production technologies, and to collaborate with NGOs and other societal actors. By contrast, studies on individual PEB have reported that appealing to financial motives as opposed to other-regarding benefits is less likely to generate positive spill-over effects from one decision-making domain to other domains (e.g. Evans et al. 2013; Spence et al. 2014). The same might be true for

companies. Relying on the BC discourse in, for instance, a biodiversity related communication campaign could limit corporations' inclination to engage in energy efficiency improvements or climate-friendly practices.

Finally, business decisions are certainly driven to a large extent by other material and systemic constraints that our study does not address.

4.5.3 Future research

The results presented here enhance our understanding of how companies can be encouraged to adopt sustainable business practices such as introducing cleaner production technologies or more sustainable products and services. Such practices can offer business case potentials (e.g. due to higher energy efficiency, resource security, or access to new markets), but they may also involve trade-offs between financial and environmental performance when investment costs cannot be recovered. The academic debate to date has shown that different motivations can underlie corporate sustainability efforts (e.g. Font et al. 2016; Schaltegger and Hörisch 2017) and that many factors influence their uptake and integration into strategic management (Engert et al. 2016), such as company size and industry sector (Colucci et al. 2020), national institutional conditions (Halkos and Skouloudis 2016), managers' personal perceptions, values, and motivations (Graves and Sarkis 2018), and the way in which information on environmental performance is provided within the company (Hummel and Hörisch 2020). Our study complements this work by exploring the influence of different discourses in encouraging companies to become more sustainable.

Our study can only provide one piece of a larger puzzle; further research is necessary to settle the issue. The results suggest that, compared to the responsibility discourse, the BC discourse is considered by business professionals to be more attractive to the business world. Further research could address the reasons for this perception, which may relate to the neat alignment with the mainstream business paradigm of profit maximization, the implicit message that sustainability can be achieved without questioning the financial bottom line, or an emotional reluctance to deal with trade-off situations. Future research could also investigate more thoroughly for which cultural contexts and for which industries the effect holds.

Our findings that the BC discourse may backfire for sustainability commitments in trade-off situations adds to experimental evidence regarding the use of persuasive communication to enhance public acceptance of pro-environmental policies and to motivate individual PEB. Several studies show that communication based on instrumental reasoning and self-interest can be ineffective or even entail unintended consequences (Bernauer and McGrath 2016; Rode et al. 2017; Evans et al. 2013; Bolderdijk et al. 2013b). Although our study was not designed to test for specific psychological processes underlying the effects, section 4.2 pointed to some potential explanations. Future research could test for the causal mechanisms that drive perceptions and decisions. We discussed above a number of theoretical frameworks that might be relevant in this context. For instance, the BC discourse justifies sustainable action as being instrumental to narrowly defined business interests. One could speculate that this reinforces the primacy of profit maximization in the minds of business professionals and reduce their willingness to accept costs if these cannot be transformed into a (monetary) benefit. Finally, empirical studies could evaluate the effectiveness of combining the two discourses to encourage sustainable practices, or of communication based on other concepts.

5. Distance to climate change consequences reduces willingness to engage in low-cost mitigation actions – Results from an experimental online study from Germany

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Abstract:

Adverse consequences of climate change often affect people and places far away from those that have the greatest capacity for mitigation. Several correlational and some experimental studies suggest that the willingness to take mitigation actions may diminish with increasing distance. However, the empirical findings are ambiguous. In order to investigate if and how socio-spatial distance to climate change effects plays a role for the willingness to engage in mitigation actions, we conducted an online experiment with a German population sample (n=383). We find that the willingness to sign a petition for climate protection was significantly reduced when a person in India with a name of Indian origin was affected by flooding as compared to a person in Germany with a name of German origin. Distance did not affect donating money to climate protection or approving of mitigation policies. Our results provide evidence for the existence of a negative effect of distance to climate change consequences on the willingness to engage in low-cost mitigation actions. Investigating explanations for such an effect, we find that it can be attributed to the spatial distance dimension, which reduced participants' perception of being personally affected by climate change. Moreover, we find some cautious evidence that people with strong racist attitudes react differently to the distance manipulations, suggesting a form of environmental racism that could also reduce mitigation action in the case of climate change.

Keywords: psychological distance, climate change, mitigation, experiment, social distance, spatial distance, environmental racism

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5.1 Introduction

5.1.1 Climate change is a global phenomenon, characterized by a mismatch of causes and effects

While most greenhouse gas emissions accumulated in the atmosphere stem from production or consumption activities in the Global North (Hickel 2020), most harm is inflicted on people living in the Global South (Mendelsohn et al. 2006; IPCC 2018). However, distance between causes and effects may diminish the willingness for action. This would pose a particular challenge to address climate change, as those individuals and societies with the highest emissions and thus also the highest leverage to mitigate the causes are often distant in terms of physical space or socio-cultural background to those experiencing the adverse consequences of climate change most severely. From a policy point of view, mitigation action could be promoted more effectively, when taking into account a possible effect of distance.

While correlational studies indeed point to an inverse relationship between distance and concern or willingness to act (Wang et al. 2019; Singh et al. 2017), the experimental evidence is more ambiguous (Maiella et al. 2020). Further research is needed to test a possible impact of distance on the willingness to take (costly) mitigation actions and to investigate the mechanisms through which such an effect may take place. Moreover, past research focusses on stated rather than actual behavioral measures and does not differentiate impacts of distance between different mitigation actions.

With this paper we aim to address these gaps and add to the understanding of the effect of distance on climate change mitigation actions. We ask: Is there an effect of distance to people negatively affected by climate change on the willingness to engage in mitigation actions? Does the result depend on the behavioral measure used? And if there is such an impact of distance, how could this effect be explained? For instance, is it rather due to the social or spatial dimension of distance? Does racism moderate the effect of distance? To answer these questions, we conducted an online experiment with a German non-student sample (n=383), in which we tested for and distinguished between the impact of social and spatial distance on the willingness to engage in different kinds of mitigation actions.

5.1.2 Spatial and social distance and willingness to engage in mitigation actions

Existing studies which examine if and how distance impacts the willingness to engage in mitigation actions are of two types: (i) correlational studies (i.e. surveys that elicit both measures of distance and mitigation actions or related measures and then examine statistical connections), or (ii) experiments (i.e. studies that manipulate distance and examine the effect on the willingness to mitigate). While correlational studies on the relationship between socio-spatial distance to negative climate change impacts and willingness to engage in climate action consistently point to a relationship between the two, the experimental evidence shows greater inconsistency. Varying socio-spatial distance to climate change consequences seems to have mixed effects on the engagement in mitigation behaviors and/or mitigation policy support, sometimes depending on subsample characteristics moderating the effect (Maiella et al. 2020; McDonald et al. 2015). It should be noted that all of these studies have been conducted in North America, Central Europe and Australia/New Zealand. We will recapitulate the findings of the empirical literature so far and point to ambiguities and research gaps that informed our experimental design.

First, let us consider the studies that *do* find a relation between distance to climate change effects and a lower willingness to mitigate. Several correlational studies found an inverse relationship: Greater perceived distance to climate change consequences was linked to less concern (Singh et al. 2017; Gubler et al. 2019; Stanley et al. 2018), lower (stated) behavioral intentions or willingness to act (Wang et al. 2019; Stanley et al. 2018; Volland 2018; Spence et al. 2012) and lower policy support for mitigation (Wang et al. 2019). Usually, participants were asked to indicate their agreement to statements such as "Climate change is mostly affecting areas that are far away" (Spence et al. 2012) or "Climate change will particularly affect me, my family and my friends" (Jones et al. 2017), indicating how proximate or close they perceived these effects to be. However, while the correlational studies do indicate a link, they do not provide any insights on causal pathways. Some of the experimental evidence also supports these findings and suggests that "proximizing" climate change may be a promising strategy to raise awareness and engage people in mitigation behaviors (Jones et al. 2017; Loy and Spence 2020). These studies experimentally altered how close or distant effects of climate change were displayed to the study participants and found that presenting climate change effects as more proximate had a positive effect on concern (Jones et al. 2017) and (stated willingness to engage in) mitigation behaviors (Jones et al. 2017; Loy and Spence 2020; Scannell and Gifford 2013).

However, not all studies found that distance reduces the willingness to engage in climate mitigation. Brügger et al. (2015), for example, detected that distance to perceived climate change consequences might actually be *positively* related to the willingness to mitigate. In their survey study, both distant and close risk perceptions were predictive for mitigation policy support and personal mitigation intentions, yet distant risk perception had more explanatory power than close risk perception. Other experimental studies found no evidence for an effect of distance to adverse climate change consequences on the willingness to engage in mitigation actions or related measures. Displaying climate change effects as more proximate had no effect on attitudes (Spence and Pidgeon 2010), intentions to mitigate (Brügger et al. 2016; Busse and Menzel 2014; Schoenefeld and McCauley 2016), stated willingness to make a donation to address climate change (Manning et al. 2018) or policy support (Brügger et al. 2016; Schoenefeld and McCauley 2016; Rickard et al. 2016; Shwom et al. 2008). In line with these findings, a study by Kyselá et al. (2019) found that agreement to public spending on reducing the risks of climate change did not differ when these risks were said to be reduced nationally as compared to globally. Taken together, there is an empirical case for the claim that distance to climate change effects could impact the willingness to act. Among those studies finding such a link, most studies support the claim that distance *reduces* the willingness to engage in mitigation actions. However, a considerable amount of experimental studies report an absence or the opposite of this effect.

What makes it difficult to compare and interpret the study results is that spatial and social distance may go hand in hand with other factors that may have (counter)effects on climate mitigation, while some studies varied even further variables in their treatments. For instance, in the experiment of Busse and Menzel (2014), two subsamples received different questionnaires about environmental problems, one referring to Germany and one referring to a developing country of the respondents' choice. The authors argue that this would imply a heightened sense of socio-spatial distance. However, the status of a developing country could have effects on its own, as people living in developing countries are perceived as already being in a vulnerable situation, which may induce an other-regarding motivation (Batson 1991). This could counter the effect of distance and hence explain the null results in Busse and Menzel's study. For example, Spence et al. (2012) found that people show greater concern and mitigation behaviors when they perceive climate change to have an adverse impact on developing countries.

Furthermore, it seems that spatial distance influences the perception of severity of climate change effects. Rickard et al. (2016) cite several studies that suggest that greater distance is linked to the perception of lower environmental quality and of greater severity of effects (Zhang et al. [2014] indicate the opposite in their study), while at the same time such information becomes less personally relevant. Schuldt et al. (2018) noticed in this context that some studies did not only vary distance, but also the (severity of) impacts, which makes it unclear what caused the experimental effects (e.g. mountain pine beetle infestations vs. polar ice melting – Scannell and Gifford 2013). In sum, it might be that effects of distance on PEBs are, indeed, depending on the type of environmental problem at stake (Kyselá et al. 2019). Null results may thus be the product of two or more counteracting effects taking place at the same time.

Lastly, in the existing experiments, stated measures like concern, stated willingness to act or policy support were used to capture mitigation actions. A replication of the postulated effect with observed and costly behavioral measures is lacking. Yet, it is well established that there exists a gap between stated and observed behavioral variables (attitude-behavior or value-action gap – Diekmann and Preisendörfer 2003; Maki et al. 2019). In fact, the differences in the measures of mitigation actions between the studies likely explain some of the ambiguity of the results.

5.1.3 How could distance impact the willingness to mitigate?

Concerning the question of *how* distance effects the willingness to take action – for those studies that did find a relation between distance and mitigation actions –, it is unclear whether it is the spatial or social dimension of distance that was responsible for this effect. For instance, while Singh et al. (2017) found in their study that spatial distance was linked to concern, Gubler et al. (2019) could not find evidence of an effect of spatial distance, but of social distance. Stanley et al. (2018), on the other hand, found support for effects of both distance dimensions. In many of the empirical studies, both dimensions are intertwined (e.g. using one treatment that simultaneously changes spatial and social distance) so that it is impossible to identify the effects of each dimension.

Moreover, it remains an open question whether distance or proximity to climate change consequences have, indeed, the same effects. Some studies suggest that it might rather be close proximity that heightens the willingness to act, while greater distance is not relevant for mitigation actions (Spence et al. 2012; Scannell and Gifford 2013). Greater exposure to effects (Reser et al.

2012) or greater attribution of relevance (Loy and Spence 2020) might account for the enhanced concern or willingness to act. However, other studies did not find an enhanced effect on mitigation actions by showing more local/regional climate effects (Schoenefeld and McCauley 2016; Shwom et al. 2008). Hence, it remains unclear which dimensions of distance exert an effect and how this effect takes place.

One way to conceptualize distance, and to which several studies (e.g. Jones et al. 2017; Rickard et al. 2016) refer to as a theoretical framework to explain the effects, is the Construal Level Theory (CLT – Trope and Liberman 2010). According to CLT (2010), distance is linked to the construal level, meaning how abstract or concrete the mental representation of the object is. The construal level in turn guides the different courses of action. Both spatial and social distance are different distance dimensions under the umbrella of psychological distance within CLT. Psychological distance sets an event or person in a proximity relation to the self and thus describes the "subjective experience that something is close or far away from the self, here, and now" (Trope and Liberman 2010, p. 440). Some studies found support that greater psychological distance may have been the channel through which effects took place (Jones et al. 2017; Loy and Spence 2020). It is unclear, however, whether psychological distance as part of CLT is in fact the best explanatory concept (Wang et al. 2014). Brügger et al. (2015) have argued that CLT does not directly predict a negative effect of distance on action. According to the authors, "proximizing" climate change does not directly affect motivation, but rather works through an intermediary channel, changing the perceptions and the selection of information that decisions are based on, making the link to action more complex. Further, Brügger and his colleagues stressed that displaying local effects of climate change may only under certain circumstances lead to more mitigation actions (e.g. when people value the local entities that are at risk and when they judge the actions as being feasible and effective).

In addition to these points, also other social mechanisms can be utilized to explain a negative effect of distance on the willingness to take action. For instance, people living far away may be perceived as belonging to a different social group than oneself (i.e. an *outgroup*) and as a consequence the willingness to share resources with these outgroup members may be lower (Tajfel and Turner 1986). In the context of climate change, one specific form of outgroup derogation is additionally possible and embedded in global power structures: people living in the Global South might be derogated by white decision-makers in the Global North based on race. Such a form of

environmental racism may result in a lower willingness to restrict own behavior by the powerful when, like in the case of climate change, communities of color are most severely affected (Agyeman et al. 2016).

In sum, we still do not have solid knowledge of whether, how and for whom distance to climate change effects diminishes the willingness to take mitigation actions. With our study, we aim to contribute to the understanding of this complex matter.

5.1.4 The present research

To this end, we conducted an online experiment where we varied name and residence of a person adversely affected by climate-change-induced floods. Floods are a good example of unequally distributed effects as they are projected to disproportionately hit South East Asia, India, eastern Africa and the Andean region (Hirabayashi et al. 2013). We used a clean design that held climate change effects constant and used India as an emerging economy as example to reduce possible effects linked to the status of a developing country, such as e.g. Bangladesh. However, people may still associate a different perception of need to a person in Germany versus India, which in turn may influence the mitigation decisions. In the post-experimental questionnaire, we thus elicited expected state aid to probe our results against effects that may come with the perception of need. To capture the effect of distance on the willingness to engage in climate mitigation, we used three different measures of mitigation actions – (1) actually donating money, (2) willingness to sign a petition and (3) approving of mitigation polices – to cover varying degrees of costs (low-cost vs. high-cost behavior) and different ways to measure the variables (observed vs. stated behavior). By operationalizing the willingness to engage in mitigation actions in several ways, we increase the robustness of our results and can examine whether differences exist depending on the specific mitigation actions.

We expect that people living in the Global North will be less willing to engage in costly mitigation actions when people living in the Global South are affected by adverse consequences of climate change as compared to when those affected are living in the Global North.

We tested this claim as our **main hypothesis** (preregistered at AsPredicted #38798).

To deepen our understanding of how distance may affect the willingness to engage in mitigation actions, we implemented a complementary treatment condition that allowed us to differentiate between the effects of the spatial and social dimension of distance. Moreover, we explored with the help of further elicited variables the channels through which effects may have taken place, specifically perceived own affectedness. In addition, we probed for evidence for outgroup derogation and environmental racism.

The remainder of this chapter is structured as follows: Section 5.2 presents the methodological details of our experiment, giving information about our sample, procedure and operationalization of the concepts looked at. Section 5.3 presents the results of our study, including a more in-depth analysis of how effects might unfold. We discuss our findings with respect to the theoretically derived expectations and embed them into the existing literature. Section 5.4 concludes by drawing implications for research and policy.

5.2 Materials and method

Overview. We conducted a survey-embedded online experiment on the Recruitment Platform *Clickworker* with a German participant pool. The study was run in April 2020. The study protocol was approved by the LaER Ethics Committee of Osnabrück University before running the experiment.

Participants. 450 participants in total were recruited, 150 participants for each of the three treatment conditions. Participants needed to be German residents and be fluent in German to be eligible for the participant pool. A lump sum of 5€ was paid for participation. In addition, participants could receive 0 to 5€, depending on a donation decision they took in the experiment. The payment was framed as a remuneration of 10€ for participation, of which a proportion could be donated to a climate mitigation NGO (the donation constituting one of our three measurement variables).

Sample description. The age of participants ranged from 18 to 74, with a mean age at 34.75 years. 47.78% of participants indicated to be female, 51.17% to be male, 0.26% to be diverse. Disposable income ranged from the lowest offered category (250€ or less) to the highest (4000€ or more) with a mean of 1.702€. 18.54% of participants reported having a migration background (none from

India). 18.28% of the respondents declared having experienced flooding themselves in the past. Almost half of the sample, namely 45.43%, stated having a university degree.

Procedure and materials. All participants read short texts providing general information about climate change and its effect to increase the flood intensity as well as the likelihood of heavy flood events. With two attention check items we assessed whether participants carefully read the text. After this, participants were presented with a first-person report about a flooding event. In the form of an interview, the person described the damage caused by the flooding and emotions associated with the experience. The interview was assembled from various real interviews conducted with people affected by floods. The full text is presented in A3 in the Appendix. Afterwards, participants were asked to write a short newspaper article about what happened.

Figure 5: Treatment operationalization

T Close	**T Far Germany**	**T Far Global**
General information about climate change and the increased risk of flooding		
Interview with a person affected by flooding, being		
Paul Weber in Rhüden, Germany	Samudra Sudarshan in Rhüden, Germany	Samudra Sudarshan in Hatipara, India
		
Participants are asked to write a short newspaper article about the event		

Treatment operationalization. We manipulated who was affected by the flooding event by altering the name and location of residence of the interviewed person. As we worked with a German participant pool, we employed one condition T_{Close} where the affected person lived in Germany in a small town called Rhüden and who had a name of German origin ("Paul Weber"). As our counter scenario $T_{Far\ Global}$, we used a condition where the affected person lived in India in a similar-sized town called Hatipara and who had a name of Indian origin ("Samudra Sudarshan"). We chose an

Indian example since India represents a country of the Global South that is indeed particularly affected by climate change induced floods (Hirabayashi et al. 2013). Further, India is an emerging economy so the specific effects induced by the status of a developing country as suggested by some studies (e.g. Spence et al. 2012) were likely kept small. To disentangle the effects of spatial and social distance, we conducted an additional scenario $T_{Far\ Germany}$, where the affected person lived in Germany and had a name of Indian origin ("Samudra Sudarshan"). Figure 5 displays the treatment operationalization. In combination with the changes in names and place of residence the geographic maps were used to strengthen the treatment manipulation.

Manipulation check. To test whether our treatments were salient to the participants, we asked them about the name and residency of the person affected by flooding at the end of the questionnaire via two multiple choice questions. As for the name, almost all participants correctly identified the name (100% in T_{Close}, 99.19% in $T_{Far\ Germany}$ and 100% in $T_{Far\ Global}$). Also for the residence question, correct answers were satisfyingly high (98.51% in T_{Close}, 98.37% in $T_{Far\ Germany}$ and 96.03% in $T_{Far\ Global}$). In $T_{Far\ Global}$, 3.17% answered Iran instead of India, so the effect of distance should still be similar. We can conclude that our treatment manipulations were salient to the participants.

Operationalization of mitigation actions. Our dependent variable (DV) is willingness to engage in mitigation actions. We operationalized this willingness in several ways to increase the robustness of our results and to examine whether differences exist depending on the type of mitigation measure.

First, we examined whether the distance treatment affected the *willingness to give up own scarce resources* to have a measure of costly and observable behavior. Participants were asked if they wanted to donate parts of their participation remuneration to the NGO *atmosfair*, which finances CO_2 offsetting projects (DV1: donation). Participants could donate 0 to 5€ (in steps of 0.50€).

Second, to include an observable but less costly behavior, we assessed whether participants were willing to leave their email address to receive a link to a *petition aimed at climate protection* (DV2: petition). Due to privacy constraints, we could not assess whether they actually signed the petition, but assume that leaving us with their private data and being willing to engage with the topic after the study can be understood as being willing to allocate time and attention for safeguarding the climate.

Third, we measured approval of concrete structural change, by asking participants to indicate their degree of (dis)approval for the introduction of each of a total of 12 *costly political measures* in Germany that are discussed in the context of climate mitigation (DV3: policy approval). The measures included, for instance, higher CO_2 taxes, a ban of domestic flights or speed limitations on the highway. All measures were briefly explained. On a 5-point scale, participants could indicate whether they *completely disapprove* (-2) to *completely approve* (+2) the introduction. From all items, an average was built to show overall (dis)approval. More details on the dependent variables are provided in A3 in the Appendix.

Further elicited data. Besides the demographic characteristics of participants (age, income, sex, migration background, education) and previous flooding experience, we elicited additional data for more in depth analysis of possible treatment effects.

Social group belonging: We asked participants directly after the treatment to state their agreement on a seven-point Likert Scale (1= *completely disagree*, 7 = *completely agree*) to the statement "Paul Weber/Samudra Sudarshan and I belong to the same social group" (name according to the treatment participants were allocated to). We use this measure as a proxy for displaying social distance or closeness, respectively.

Racism: We elicited racist attitudes building an average of three items taken from GESIS (2013). Participants were asked to rate their agreement to three statements on a 7-point scale (1 = *not at all*, 7 = *fully*). The statements read "I appreciate the diversity of lifestyles, cultures and religions in Germany", "The foreigners living here threaten our security" and "Whites are rightly leaders in the world" (reverse coding). The three items were part of a battery of other political statements so participants could not easily detect that racism was our main interest.

Perception of own affectedness: After the treatments, survey participants were asked to indicate on a seven-point scale to what extent they felt affected by climate change themselves (1 = *not at all*, 7 = *fully*).

State aid: Right after being informed about the name and residence of the person being affected by flooding, but before reading the interview, participants were asked to indicate their agreement to the statement "I assume that those affected in Rhüden/Hatipara will receive state aid." on a 7-point scale (1 = *not at all*, 7 = *fully*). We take this as a proxy variable to capture perceived need, which we could control for in our analysis.

Data exclusion. Online experiments need rigorous data quality control as the attention of participants cannot be controlled for by the experimenter (Abbey and Meloy 2017). To ensure high data quality, we decided ex ante (see preregistration protocol) to exclude the data of participants who

- (i) had very short answering times (less than half of the average answering times),
- (ii) indicated they gave "meaningless responses" frequently or sometimes, or
- (iii) failed both attention checks we asked after the information texts.

Following these criteria, our final data set consisted of 383 observations – 134 in T_{Close}, 123 in $T_{Far\ Germany}$ and 126 in $T_{Far\ Global}$. To control for a potential bias in drop out, we estimated the dropout rates on basis of the treatment groups. No significant differences could be detected. We further conducted balancing tests among the treatment groups for age, income, sex, racism, migration background and own flooding experience, which confirmed that the randomization resulted in a balanced sample (see Table A11 in the Appendix for details).

Analysis. We used non-parametric tests (Chi square and Mann-Whitney-U tests) to assess if treatments had an effect on the willingness to engage in mitigation actions. To test for robustness, mediation channels and moderation effects, we used regression analysis including various control variables. Depending on the type of the dependent variable – numeric or binary, we either used linear regression (policy approval) or a probit regression model (petition, donation), respectively. We report results as significant when $\alpha \leq 5\%$.

5.3 Results and discussion

5.3.1 Is there an effect of distance on the willingness to engage in mitigation actions?

Our first research question asked *whether* distance to those adversely affected by climate change would influence the willingness to engage in mitigation actions. We hypothesized that people living in the Global North would be less willing to engage in mitigation actions when it was a person living in the Global South who was affected by the adverse consequences of climate change as compared to a person living in the Global North. To test this hypothesis, we compared the treatments T_{Close} and $T_{Far\ Global}$ with regards to the participants' mitigation decisions. In this

subsection, we discuss results with respect to the three different mitigation measures we applied in our study as dependent variables.

Figure 6: Mitigation actions, comparing treatments Close and Far Global

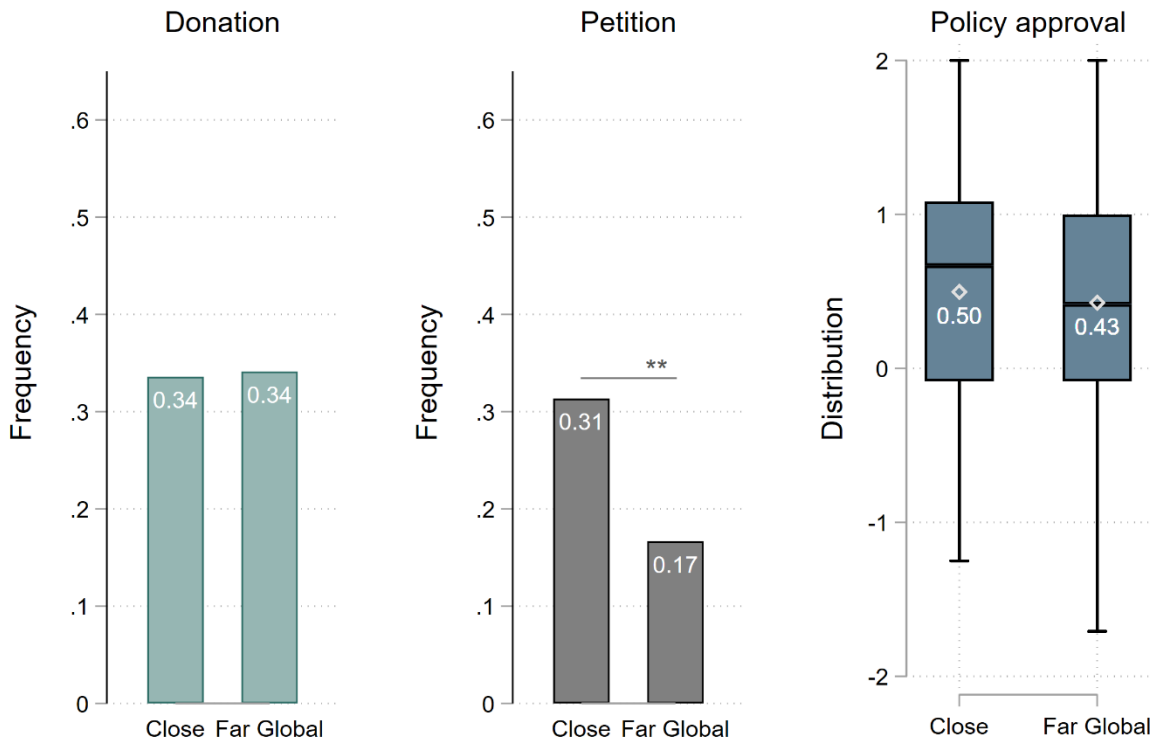

Figure 6 shows the bar graphs for all three dependent variables, comparing T_{Close} and $T_{Far\ Global}$. For the statistical analysis we employed Chi square and Mann-Whitney-U tests. We found support for our hypothesis in one of the three mitigation measures, namely for the willingness to sign a petition for climate protection ($T_{Far\ Global}$ vs. T_{Close}: $\chi^2(1) = 7.62$, $p = 0.006$). For the mitigation measures donation and policy approval, our hypothesis could not be sustained ($\chi^2(1) = 0.009$, $p = 0.93$ and $Z = 0.83$, $p = 0.41$, respectively). For the petition, when a person in Germany with a name of German origin reported being affected by climate change induced floods, 31% of survey respondents in Germany were willing to give their email address to sign a petition for more climate protection. When instead a person in India with a name of Indian origin told the exact same story, this share was almost cut in half to 17% of the German respondents. Thus, for the petition, we

found empirical support for the claim that distance negatively affects the willingness to engage in climate protection.

Table 8: Regression results for treatment effects

	(1) Donation	(2) Petition	(3) Policy approval	(4) Donation	(5) Petition	(6) Policy approval
Far Global	-0.0835	-0.503*	-0.0740	-0.0929	-0.493*	-0.0683
	(-0.46)	(-2.52)	(-0.68)	(-0.51)	(-2.51)	(-0.65)
Far Germany				0.245	-0.0149	0.129
				(1.38)	(-.08)	(1.23)
Constant	-0.368	-1.182**	0.328	-0.469	-1.125***	0.326*
	(-1.07)	(-3.16)	(1.60)	(-1.66)	(-3.77)	(1.98)
N	215	215	215	315	315	315
Controls included	yes	yes	yes	yes	yes	yes
p: Far Global=Far Germany				0.069	0.018	0.070

*Note: This table shows the estimation results from regressing the impact of the treatment conditions Far Global and Far Germany on the willingness to participate in mitigation actions, measured by three mitigation variables: Donation, Petition, and Policy approval. Model (1)–(2) and (4)–(5) show the coefficients for probit regressions on the likelihood of making a donation or signing the petition. Models (3) and (6) are based on an ordinary least squares regression model that estimates the effect of the treatment conditions on the average approval of 12 realistic policy measures for climate protection in Germany. Controls included are sociodemographic characteristics such as age, gender, disposable income, migration background as well as own flood experience. Standard errors are indicated in parentheses. The symbols *, **, *** indicates p<0.05, p<0.01, and p<0.001, respectively. Full sample size n=383.*

We probed the robustness of this result applying multivariate regression analysis and controlling for sociodemographic characteristics as well as own flooding experience by the participants. Including the controls reduced the number of observations due to missing responses for these variables (here: n=215). Table 8 shows the corresponding estimation results. Models 1 and 2 present the results of probit regressions estimating the likelihood of making a donation (Model 1) and of signing a petition (Model 2), while Model 3 shows linear regression (OLS) results for the policy approval measure. In the supplementary information (Table A12 in the Appendix), we provide the detailed regression table with all control variables listed separately. Models 4-6 include,

in addition, the data from and treatment dummy variable for $T_{Far\ Germany}$. The regression analysis confirms the results obtained by the non-parametric tests: the negative effect with regards to the petition of $T_{Far\ Global}$ as compared to T_{Close} is statistically significant and robust ($p=0.012$ in Model (2) and (5)). Results for the donation and policy approval remain non-significant. As a further robustness check, we added expected state aid as a control variable for all three dependent measures and found that it did not impact our findings (Table A12 in the Appendix). State aid itself was not a significant predictor. So, it seems like the experimental choice of India did not invoke particular effects associated with the status of a developing country. In sum, our findings that $T_{Far\ Global}$ reduced the willingness to sign a petition while there was no effect on the willingness to make a donation or approve of mitigation policies can be regarded as robust.

Taken together, our results provide some evidence for the existence of a negative effect of distance to adverse climate change effects on the willingness to engage in mitigation actions. Our empirical findings also show that this effect is not uniform across our different outcome variables capturing mitigation actions: While for the petition, we found an effect of varying the distance to the person adversely affected by climate change, we did not find any effects for donating money or policy support. This difference in results, depending on the different mitigation actions, may explain the mixed evidence found in previous experimental studies. But what are the reasons for these different findings?

We employed as outcome variables mitigation measures that could be distinguished in terms of the personal costs or constraints involved (costly vs. low-cost) and with regards to how the measure was elicited (stated vs. observed). Not surprisingly, the costs of the decision matter for the course of action, as we can see when comparing our two observed variables, donation and petition. Although signing a petition implies spending time and attention to an issue, it is a relatively easy behavior, which does not involve any pecuniary costs or personal disadvantages. This is particularly so, since in our study we did not measure actual signing of the partition, but just providing an email address for being sent more information on the petition. In comparison, donating part of one's remuneration involves an immediate monetary cost. Thus, it is intuitive that our treatment had an effect on the low-cost behavior (signing the petition) while there was no impact on the costly behavior (donating money).

However, if immediate costs were the only decisive factor, one may have expected that for our policy support measure, we would observe the strongest treatment effect. Answering the policy support questions neither implied immediate costs nor had real-life consequences for the participants. Still, our treatment did not impact policy support. Possibly, this can be explained by the nature and concreteness of the suggested policy measures. We only chose costly or restrictive political measures, such as higher taxes or a mandatory Veggy day. All measures were policy options discussed in the actual public debate on how to achieve climate mitigation. As such, they likely succeeded to trigger realistic consideration by the study participants, implying high costs if the measures were actually implemented. Moreover, approval or disapproval of the policy measures could be linked to more encompassing political or partisan identities and values, which are constant at least in the short-term (Drews and van den Bergh 2016; Harring et al. 2017). This finding is supported by other experimental studies also using policy approval as a measure of mitigation action, which mostly found no effect of experimentally varying distance (Brügger et al. 2016; Schoenefeld and McCauley 2016; Rickard et al. 2016; Schuldt et al. 2018).

In sum, we found that increasing the distance to the person adversely affected by climate change reduced our observed but low-cost mitigation action, while it had no effect on the observed costlier action or stated support for costly policy measures for mitigation.

5.3.2 Is it the spatial or social dimension of distance that exerts an effect?

We found robust evidence that people in Germany are less willing to sign a petition for more climate protection, when a person in India with a name of Indian origin is affected as compared to a person in Germany with a name of German origin. Based on this finding, we were interested in finding an explanation for the effect. Thus, we assessed whether the geographical distance or the social distance to people with a different socio-cultural background is responsible for the effect on our dependent variable likelihood to sign a petition. For this purpose, we used our third treatment condition $T_{\text{Far Germany}}$ – in which a person living in Germany with a name of Indian origin was the person interviewed about a previously experienced flood event.

In order to identify the impact of *spatial distance*, we included observations of this additional treatment group in the regression estimations of Table 8 (Models (4)-(6)). The resulting sample size for these regressions including controls was 315. We compared $T_{\text{Far Germany}}$ and $T_{\text{Far Global}}$, as

between these conditions only the residency changed while the name was held constant. We found that changing the country, where the climate change induced floods occurred, from Germany to India significantly reduced the willingness to sign the petition ($\chi^2(1)= 5.59$, $p=0.018$). Hence, our study provides empirical support that spatial distance significantly contributes to a lower willingness to engage in mitigation actions.

While we varied spatial distance on an objective level by exchanging Germany and India as places of residence, *social distance* corresponds to a more subjective perception. To assess whether our treatment conditions induced changes in the perceived social distance through the altered name and possibly also the place of residence of the interviewed person, we examined participants' answers on an item about perceived social group belonging. After reading the interview, participants were asked to what extent they thought that Paul Weber/Samudra Sudarshan belonged to the same social group as themselves. We found that varying the name and the place of residence of the interviewed person indeed changed the perception of group belonging. As expected, in T_{Close} social group belonging was highest ($M=3.16$, $SD=1.44$), lowest in $T_{Far\ Gobal}$ ($M=1.96$, $SD=1.28$) and somewhere in-between in $T_{Far\ Germany}$ ($M=2.77$, $SD=1.44$). Table 9 presents the results of multivariate regression analyses probing whether the treatments altered the perceived social distance (Model (1)) and whether this mediated the treatment effect (Model (2)). For better comparison, Model (3) takes into account both social distance and the exogenously induced change in spatial distance through the treatment condition $T_{Far\ Global}$.

As can be seen in Table 9, Model (1), both $T_{Far\ Germany}$ ($p= 0.016$) and $T_{Far\ Global}$ ($p<0.001$) significantly lowered the score of social group belonging, i.e. the two distance treatments increased perceived social distance. Conducting an F-test probing the equality, we see that there also exists a significant difference between $T_{Far\ Germany}$ and $T_{Far\ Global}$ ($F(1,306) = 17.09$, $p<0.001$), with $T_{Far\ Global}$ having the stronger effect. Thus, our treatments induced different perceptions of social distance and it may be that the behavioral difference between $T_{Far\ Germany}$ and $T_{Far\ Global}$ we reported on above and assumed to be stemming from the difference in spatial distance may also partly be due to the heightened perception of social distance that came with the altered residency.

To investigate whether social distance explains our previous results, we evaluated in Model (2) and (3) its predictive power for signing the petition. We found that social distance is not a significant predictor of participants' willingness to sign the petition ($p=0.21$ in Model (2) and $p=0.68$ in Model

(3)). When including both, the proxy for social distance (the social group score) and the one for spatial distance (the treatment dummy for $T_{Far\ Global}$) as predictors in Model (3), the influence of spatial distance continues to be significant (p=0.013). Thus, while our treatment conditions seem to have affected participants' perception about the social distance, we can conclude that it was indeed the spatial dimension of distance that lowered participants' willingness to engage in climate mitigation.

Table 9: Regression results for possible mediation pathways

	Perceived social group belonging			**Perceived personal affectedness**	
	(1)	**(2)**	**(3)**	**(4)**	**(5)**
	Social group	**Petition**	**Petition**	**Affectedness**	**Petition**
Far Global	-1.300***		-0.463*	-0.530**	
	(-6.71)		(-2.49)	(-2.71)	
Far Germany	-0.469*			0.374	
	(-2.42)			(1.91)	
Social group belonging		0.0651	0.0226		
		(1.25)	(0.41)		
Affectedness					0.114*
					(2.09)
Constant	3.323***	-1.451***	-1.201***	3.614***	-1.685***
	(10.91)	(-4.56)	(-3.59)	(11.76)	(-4.84)
N	315	315	315	315	315
Controls included	yes	yes	yes	yes	yes
p: Far Glob=Far Germ	<0.001			<0.001	

*Note: Regression models presented in this table examine whether an altered feeling of social distance (Model (1)-(3)) or personal affectedness (Model (4)-(5)) mediated the treatment effect on the willingness to sign the petition. Model (1) and (4) are based on ordinary least square regression models, examining whether the social group perception (Model (1)) and perceived personal affectedness (Model (4)) were influenced by the treatments. Model (2)+(3) and (5) estimate the likelihood of signing the petition, employing a probit model and controlling for these potentially altered perceptions. Model (3) includes both social distance and the exogenously induced change in spatial distance through the treatment condition Far Global. Controls included sociodemographic characteristics such as age, gender, disposable income, migration background, as well as own flood experience. Standard errors are indicated in parentheses. The symbols *, **, *** indicate significance for p<0.05, p<0.01, and p<0.001, respectively. Full sample size n=383.*

5.3.3 How could the effect of (spatial) distance be explained?

Examining this finding in more depth, we may ask what it is about the spatial distance to climate change effects that reduces people's willingness to act. According to CLT, it would be the level of mental construal that is altered by the spatial distance dimension. Adverse effects become more abstract and thus do not align with concrete actions like signing a petition. This mismatch of construal level could explain the lowered engagement. However, as Brügger et al. (2016) argued, CLT is not directly predictive of lowered mitigation efforts. Hence, we looked for an alternative explanation of how spatial distance may have lowered the willingness to engage in mitigation actions.

Specifically, spatial distance may influence the *perception of personal affectedness*, which could affect the willingness to act (cf. Reser et al. 2012). In our study, we asked participants, after they read the treatment text, whether they felt personally affected by climate change. Following the same procedure to find a possible mediation pathway as above, we found that $T_{Far\ Global}$ significantly reduced the extent to which people felt personally affected by climate change (Model (4)) compared to T_{Close} ($p=0.007$) and $T_{Far\ Germany}$ ($F(1, 306) = 19.89$, $p<0.001$). In other words, if people in Germany were confronted with climate change induced floods in Germany as compared to floods in India, regardless of the specific individual affected, they felt more affected themselves. This result makes sense as climate change induced floods do not distinguish between social groups when they occur in a certain area. As a next step, we tested if the perception of being affected oneself is a significant predictor for the mitigation actions. Indeed, perceived personal affectedness predicted our outcome variable petition ($p=0.04$, Model (5)). Hence, the extent to which people felt affected themselves by climate change was linked to their willingness to sign a petition for climate mitigation. This result supports the idea that the negative effect of spatial distance on signing the petition could be explained, at least partly, by changing the perception of being at risk oneself.

5.3.4 Does racism moderate the effect of distance?

Lastly, we explored whether environmental racism moderates the treatment effects. As this may hold also for those outcome variables, for which we did not find an effect at the aggregate level, we looked at all three mitigation variables again.

For the combined racism item (see section 5.2), the average score on the 7-point-scale was relatively low (M= 2.22, SD= 1.15). Additionally, it was an item that a considerable amount of people (18 participants) did not answer at all. Both observations can be taken as a hint for social desirability playing a role in the answers on these items. To counter this social desirability effect, we looked at the extremes. Specifically, we constructed a dummy variable for high racism, indicating whether an individual score was above the 90th percentile (46 participants fell in this category).

We checked if the treatments interact with high racism by including an interaction term of high racism and the treatment variables in the regression models including the sociodemographic controls (see Table A13 in the Appendix). The interaction terms were not significant for donating money (High Racism*$T_{Far\ Germany}$: b=-0.83, p=0.27; High Racism*$T_{Far\ Global}$: b=-0.58, p=0.41) nor for signing the petition (High Racism*$T_{Far\ Germany}$: b=0.12, p=0.86; High Racism*$T_{Far\ Global}$: b=-0.36, p=0.61). For policy approval, we found a significant interaction with the $T_{Far\ Germany}$ treatment (b= -0.78, p=0.03), yet none for $T_{Far\ Global}$ (b=-0.34, p=0.31).

Figure 7: Different reaction patterns (policy approval) to the treatments depending on racist attitudes

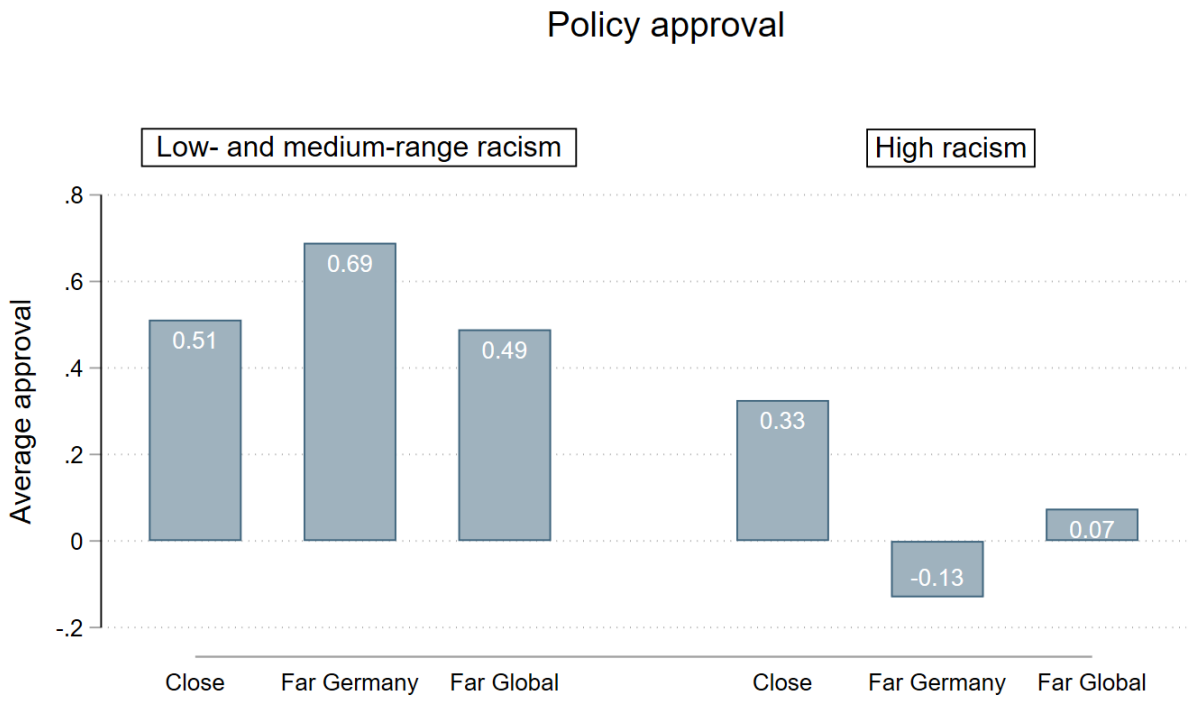

Figure 7 shows the interaction effect for policy approval graphically. We see that the reaction patterns for people scoring high on racism are different to those scoring low on racism. While people with low racist attitudes do not seem to be particularly responsive when the country changed from Germany to India, we observe a drop in policy support for those with high racist attitudes. Moreover, in the $T_{Far\ Germany}$ condition, there seems to be even a reverse effect: Participants with strong racist attitudes rejected mitigation policies when the name changed from Paul Weber to Samudra Sudarshan while the location of the flooding remained to be Germany.

The graph also reveals that people scoring high on racism in general show less support for mitigation policies. Indeed, racism itself is a strong and significant negative predictor for all three mitigation variables (donation: b=-0.24, p=0.001; petition: b=-0.18, p=0.021; policy support: b=-0.21, p<0.000, controls included – Table A14 in the Appendix). As for a possible moderating role of racism for the effect of distance on the willingness to engage in mitigation actions, overall our results provide only weak evidence. We detected this effect only for policy approval and when the person affected was located in the same country as the respondent. While the latter finding might seem counterintuitive at first sight, it is not surprising that racist attitudes come out particularly strongly when those derogated by racism are close to them. As for only finding a significant moderation effect for policy approval and not for the donation and petition, it is not clear why this is the case. Following our argumentation from above, we would have expected to see main or moderation effects for the same variable that was most responsive to our treatments, namely the petition as a low-cost action. It could be, however, that our study lacks explanatory power for this variable due to social desirability bias in the responses on racism, leading to small numbers of observations with high racism. Further research is needed to follow up on these tentative results.

5.4 Conclusions

We asked if the distance to people negatively affected by climate change plays a role for the willingness to engage in mitigation actions. We found that the willingness to sign a petition for more climate protection was significantly reduced when a person in India with a name of Indian origin was affected by flooding as compared to a person in Germany with a name of German origin. For donating money to CO_2 offsetting as well as for support of mitigation policies, there was no

such effect. We argue that this is because these two behaviors involve higher (potential) costs for the respondents. The cost aspect seemed to matter more than if the behavior was observed or stated. The experimental results tell us that there is indeed a negative effect of distance, at least for low-cost measures of mitigation actions.

Moreover, we asked how such an effect may take place. We did not find evidence that social distance drove the effect. Rather, the effect can be attributed to the spatial distance to the adverse climate change effects. We found that greater spatial distance reduces the perception of being affected by climate change oneself, which in turn lowers the willingness to engage in climate mitigation. This provides an alternative explanation for a negative effect of distance on mitigation actions, which can complement the explanation offered by CLT. Moreover, we found weak evidence that racism might moderate the effects of social distance, even leading to a situation that seems irrational: People with strong racist attitudes dropped their support for mitigation policies when a person with a name of Indian origin was affected by floods as compared to a person with a name of German origin, both having a residence in Germany.

Our study was a short-term intervention that only changed a few words to vary proximity and distance, supported by a map to display the location. This was sufficient to alter low-cost mitigation actions. Further research could evaluate if stronger interventions, e.g. more long-term interventions or interventions using pictures or videos of people, would induce an effect also for more costly mitigation actions. In addition, an interesting avenue for future research is to examine whether our findings can be replicated with samples of different countries in the Global North or Global South. For instance, a future study could apply a slightly adjusted study design to an Indian sample with India as the Close condition and investigate if effects are the same. Moreover, more rigorous studies are needed to test for the effect of racism.

In the context of climate change, societies must deal with the remaining challenge how to collectively engage its citizens in mitigation efforts that are both costly and to the benefit of people at a distance. Concerning conclusions for policy, we are hesitant to recommend displaying climate change effects more locally as the consequent political strategy, as some other studies suggest (Spence et al. 2012; Jones et al. 2017). Such a communication approach may heighten the perception of being affected oneself, which in turn may increase the willingness to act. But, first, our experiment has shown that the effect likely only holds for low-cost behaviors. Second, changing communication approaches to feed self-serving decision-making comes at its own

problems, e.g. it may manifest a self-serving way of thinking and, as a consequence, might even backfire (Rode et al. 2021 – Chapter 4). While it can still be a political strategy to communicate local effects of climate change to trigger low-cost mitigation actions, for costly behaviors other approaches are needed. Strengthening and activating other-regarding preferences could be one promising pathway for people to accept own costs to the benefit of others (Heinz and Koessler 2021 – Chapter 2). While the role of racism for the effect of distance needs further investigation, racism itself is undoubtedly and strongly linked to a low engagement in mitigation actions in our study. So apart from promoting social justice, cultivating an anti-racist society may possibly also ease the achievement of climate justice.

6. Synthesis, discussion and conclusions

6.1 Synthesis of results

This thesis aimed at investigating if PEB can be promoted by activating or strengthening other-regarding preferences (**RQ1**), how – via which mechanisms and mediators – such an effect may occur (**RQ2**), how interventions addressing other-regarding preferences compare to interventions addressing self-regarding preferences (**RQ3**) and if it matters who is affected by environmental degradation for the willingness to engage in PEB (**RQ4**). In the following subsections, answers to these main research questions and the related questions formulated in section 1.3 are provided in form of a synthesis of all four research papers conducted as part of this thesis.

6.1.1 Research question 1: Does addressing other-regarding preferences promote PEB?

RQ1.1: Which insights does the existing literature provide with regard to the question if PEB can be promoted by activating or strengthening other-regarding preferences?

In the literature review presented in Chapter 2 (Heinz and Koessler 2021), the majority of assessed studies did find a positive effect on PEB of addressing other-regarding preferences. Of the 26 experimental studies using an other-regarding intervention and a neutral control condition, 18 reported that these interventions were effective in enhancing PEB. Four studies found mixed effects for different subgroups and four studies could not find any effects. Although null results are difficult to publish and hence can be assumed to be underreported (Franco et al. 2014), we can clearly derive from these results that addressing other-regarding preferences has the potential to promote PEB. Effective interventions spanned from information provision to subtle changes in the framing of a situation to more active forms of engaging the study participants. The variety of settings, samples and types of PEB used in the studies makes this a robust finding. Taken together, the review of experimental studies confirms the causal link that many correlational studies claim but cannot prove.

Positive impacts of addressing other-regarding interventions were found for different types of Stern's (2000) classification of PEB. However, based on the specific operationalization of dependent variables, only for two types of PEB it can be said with reasonable confidence that they can be promoted by addressing other-regarding preferences, namely consumption behavior and non-activist public sphere behavior. Most studies used consumption behavior as dependent variables. Other-regarding interventions were able to increase both stated and observed consumption behaviors for different domains like, for instance, water use, recycling or eco-driving (e.g. Ferraro and Price 2013; Evans et al. 2013; Dogan et al. 2014). Especially the effects found on the observed behaviors show that there is robust empirical evidence that other-regarding interventions can promote pro-environmental consumption behavior. Regarding the non-activist public sphere behavior, various studies found that the other-regarding intervention increased (stated) pro-environmental policy support (e.g. Bratanova et al. 2012; Severson and Coleman 2015) or resources dedicated for political environmental purposes, measured both as stated and observed variables (e.g. Pahl and Bauer 2013; Bratanova et al. 2012). Thus, the review also showed robust evidence that other-regarding interventions were able to raise approval or support of structural changes, in contrast to just promoting individual behavioral change. There were not enough studies in the review sample covering organizational behavior and activism to derive robust conclusions on these two PEB types. The lack of these behaviors to be represented in our sample might have been the result of the specific search terms we used.

RQ1.2: Can perspective-taking with people negatively affected by climate change promote actual and/or costly PEB?

While the experimental literature so far provides evidence that perspective-taking with other humans (e.g. Pahl and Bauer 2013), animals (e.g. Shelton and Rogers 1981) and plants (e.g. Berenguer 2007) can enhance PEB, most of these studies used state or low-cost behavioral measures or they referenced local environmental problems like water use (e.g. Ortiz-Riomalo et al. 2021). Pahl and Bauer (2013) is the only study for a global challenge like climate change that used actual and behavioral measures entailing at least some costs in terms of time and attention spent (number of brochures collected and time spent looking at information material).

In EXP 1A as presented in Chapter 3, a perspective-taking intervention was used and its effect on three actual/and or costly PEB variables was measured. Participants read the report of a person who experienced climate change induced floods. In the perspective-taking condition, they were instructed to take the perspective of that person, while in the stay objective condition, they were instructed to stay neutral. The treatments were strengthened through a task asking the participants to write a short text, either a letter to the person comforting them as a friend in the perspective-taking condition or in form of a neutral newspaper article. The willingness to engage in mitigation behaviors was measured as actual willingness to make a donation, to sign a petition, and to approve of costly policies, each aimed at more climate protection in Germany. In line with the literature above, the tested hypothesis was that the perspective-taking intervention would increase PEB.

We found that none of the PEB variables were increased by the perspective-taking treatment. A Chi square test was used for the two binary variables *donation* and *petition* and a Mann-Whitney-U test for policy approval, which was averaged over the approval rates of the 12 measures. No significant differences between the two treatments could be detected. The results were confirmed by running regression models that included the control variables. Thus, our hypothesis was not supported: In our experiment, actual and/or costly PEB was not promoted by a perspective-taking intervention in the context of climate change.

In a more exploratory analysis, it was further tested whether dispositional empathic concern and dispositional perspective-taking, measured as two subscales of the Interpersonal Reactivity Index (IRI – Davis 1980; subscales following Cliffordson 2001), were linked to PEB. We found that these subscales were highly predictive of (most of) the PEB outcome variables. Dispositional empathic concern showed to be a significant predictor for all three behavioral variables. Dispositional perspective-taking was predictive for the willingness to sign a petition and to support structural change through policy approval, while it did not predict participants' donation choices. This is to say, there seems to be a strong relationship between perspective-taking and empathic concern as more stable traits on the one hand and PEB on the other hand, but that our perspective-taking intervention was not strong enough to become behaviorally relevant.

RQ1.3: Can a discourse based on corporate responsibility promote PEB in a business context?

In the other experiment EXP 2 as presented in Chapter 4 (Rode et al. 2021)**,** business professionals were confronted with a sustainability discourse based on corporate responsibility towards society and the environment. Participants in the responsibility treatment group (n=75) watched a video explaining sustainability in relation to four care principles and read a text with arguments making the case for corporate responsibility based on the duty towards future generations, stewardship, rights and environmental liability. We measured their willingness to engage in corporate sustainability efforts as personal motivation and intentions to promote sustainability in their professional role and their willingness to (hypothetically) approve costly sustainability measures. These measures were compared to the outcome of a neutral control group (n=64), which did not receive any treatment.

Reported motivation to act was slightly higher in the responsibility treatment as compared to the control, but it was not statistically significant. Results for intentions to act showed a similar pattern: The mean was higher in the responsibility treatment as compared to the neutral control, yet the effect did not reach statistical significance. As for the hypothetical decision to approve sustainability investments, approval rates tended to be slightly higher in the responsibility treatment as compared to the control, yet again none of these differences were statistically significant. It may be that a bigger sample would have made some of these patterns, especially for the reported motivation, statistically significant. Moreover, the treatment was short-term and hence surely had not the same impact as a discourse encountered in real life. In our study, however, the responsibility discourse treatment did not enhance PEB of business professionals.

Overarching discussion on RQ1:

A solid base of studies using social science experiments has shown that addressing other-regarding preferences *can* be effective in promoting PEB. As carved out in section 1.4, experiments are a scientific method that can show causal effects, which correlational studies can assume based on theory, yet are unable to provide evidence for. This is to say, the experimental studies reviewed show us that there is, indeed, a causal link between other-regarding preferences and PEB: The two are linked, and an activation or strengthening of other-regarding preferences or a greater regard for others in general *can* lead to more PEB.

At the same time, we can conclude that it is possible to intentionally address other-regarding preferences to promote PEB. This supports a dynamic notion of preferences in line with theories that approach them as context- or role- specific (e.g. Lindenberg and Steg 2007; Sagoff 1988). However, whether and how intentionally addressing other-regarding preferences to promote PEB *should* be done is a different – a political – question that will be addressed in section 6.4 below.

Yet, for the question *if* addressing other-regarding preferences promotes PEB, both the null results found in the literature and the results of our own experiments clearly point to the fact that this is not always the case. Our own experiments did not find the other-regarding interventions to be effective: Neither was perspective-taking able to raise costly and/or actual PEBs in the context of climate change nor was the exposition to a responsibility discourse for corporate sustainability successful in raising PEB in a business context.

It may be that our experimental interventions were too subtle or short-term to invoke these effects on PEB – they did influence other variables as will be discussed in the next subsections. Another possible factor playing into the results was the Covid-19 crisis, which was at a first peak when EXP 1 was conducted. As of now, we do not know how such an unprecedented crisis may interact with people's ability and willingness to consider others' well-being as well as their PEB-related choices in particular. Some studies suggest that extensive mental load and anxiety – states certainly enhanced by this global crisis – may pose excessive demands on people and lower the capacity to take the perspective of others (e.g. Todd et al. 2015). Indeed, a pretest with a low sample size we ran before the Covid-19 pandemic seemed to show results in line with our hypothesis, when effects were scaled up for a greater sample. As such, it is still possible that even though we did not find significant effects of the other-regarding interventions, interventions of greater strength/length or at a different time would have shown to be effective. Further research could apply bigger interventions and test for their effects in calmer times.

The effectiveness of other-regarding interventions may also be specific to certain kinds of PEB. For instance, behavior in organizations could differ from other behaviors since decisions in a business world may entail different pressures or decision logics. For instance, companies are driven out of the market when they do not hit certain financial benchmarks. Moreover, various empirical studies suggest that also behavioral norms in competitive or market environments or linked to money as a core concept within the economic sphere trigger self-regarding decision-making (e.g. Liberman et al. 2004; Shahrier et al. 2016; Vohs 2015). As such, promoting PEB in the business

world is likely to work differently and encounter more systematic obstacles as compared to doing so in the private sphere of individuals. This could have played into the null effects of the responsibility discourse in our experiment. Also in our literature review, we were not able to derive sound conclusions for organizational behavior as the reviewed studies did not represent this particular behavioral sphere. Future research could use more specific search terms related to particular work sectors to synthesize experimental results in the context of organizational PEB and corporate sustainability decisions more systematically.

Altogether, other-regarding interventions can work under certain circumstances to promote PEB, yet there are some serious limitations to them that deserve cautious consideration. These will be discussed in the next sections.

6.1.2 Research question 2: How does addressing other-regarding preferences promote PEB?

RQ2.1: Which findings does the literature so far provide with regard to which interventions are effective, through which channels they exert an effect and which factors explain when and for whom they are effective in promoting PEB?

The reviewed studies in Chapter 2 suggest and sometimes even tested for the underlying mechanisms through which the effects on PEB were exerted. In general, these mechanisms can include activating existing other-regarding preferences, or more specifically raising awareness on the detrimental consequences for others, increasing empathic concern, and expanding the moral circle. It is likely that some interventions triggered several of these channels at the same time.

First, the review showed that activating other-regarding preferences was successful in enhancing PEB. Both direct appeals as well as more unconscious cues provided by framing or priming within the experiments were able to activate an other-regarding mindset. This finding goes hand in hand with various theories stating that either more self- or more other-regarding preferences held by individuals can be activated through the behavioral context (Schwartz 1977; Lindenberg and Steg 2007; Sagoff 1988).

Second, raising awareness about detrimental consequences of certain collective or individual behaviors on others, sometimes as direct behavioral feedback, was effective in promoting PEB. Several studies also showed that learning about detrimental consequences on others or the environment was only effective in promoting PEB when these others or nature as such were valued by the study participants. This is in line with theories of other-regarding behavior that stress the importance of being aware of adverse effects on others (Stern et al. 1999) or the perception of their need (Batson 2011) for people to act on their other-regarding preferences.

Third, the review showed that perspective-taking, induced via written instructions or role reversals, was able to enhance PEB. This is also in line with Batson's (1991) theory of other-regarding behavior, which posits that empathic concern leads to an other-regarding motivation to act (empathy-altruism hypothesis). Perspective-taking is often discussed to increase empathic concern. Some of the studies also showed that perspective-taking was able to raise empathic concern of the participants.

Fourth, expanding the moral circle, i.e. the group of entities considered as morally worthy, is a mechanism through which the other-regarding interventions were able to raise PEB. The greater this circle, the greater is also the willingness to protect the entities within, even when this entails personal costs (Singer 1981; Crimston et al. 2016). A way to include non-human species in this circle is to deconstruct existing moral boundaries and recategorize them into the moral domain. One reviewed study showed in a series of experiments that subtle experimental manipulations were able to widen participants' moral circle and thereby enhance various types of PEB.

The functioning of the other-regarding interventions is also linked to several moderating factors that were analyzed in the review paper in Chapter 2. In order to activate other-regarding preferences, these have to exist in the first place and, indeed, various studies show that the effect of the other-regarding intervention was moderated by preexisting preferences of the participants. Most of these study results are in line with the idea of preference or value congruence, meaning that only those individuals with strong other-regarding preferences or for whom these preferences are central for their self-concept will positively respond to the other-regarding intervention.

Another relevant factor cited by various studies are the costs associated with PEB. For instance, the experiment by Ovchinnikova et al. (2009) showed that when opportunity costs for the behavior were raised, the positive effect of the other-regarding intervention was diminished. Likewise, the

effect of the other-regarding intervention could also be increased when behavioral costs were reduced (Czap et al. 2015).

Moreover, the perception of others' cooperation seems to be a further important factor explaining when these other-regarding interventions successfully promote PEB. In line with the literature on social norms and PEB (Farrow et al. 2017), several of the reviewed experiments found that the other-regarding intervention only worked in conjunction with a descriptive social norm intervention. This is to say, it was effective when people were informed that others of an associated group were also performing the PEB in question (cf. Cialdini et al. 1990). The use of descriptive social norms in these experiments, besides signaling what ought to be done in a certain situation, likely triggered conditional cooperation, i.e. cooperation dependent on the cooperation of others (Fischbacher et al. 2001), by reducing uncertainty about others' behavior – in that sense they changed beliefs rather than preferences, and thereby triggered PEB.

RQ2.2: Does perspective-taking increase the perception of need, valuing of the other and feelings of oneness, as suggested by Batson and Cialdini?

In the literature, both Batson and Cialdini have provided theoretical accounts on how perspective-taking leads to other-regarding behavior. According to Batson (1991; 2011), empathic concern is raised, which raises the other-regarding motivation to act. The two antecedents of empathic concern are valuing of the other and the perception of their need. Cialdini et al (1997), by contrast, argue perspective-taking increase oneness, i.e. the merging of self with the other person.

In our perspective-taking experiment (EXP 1A, presented in Chapter 3), we induced participants to take the perspective-taking of a person negatively affected by climate change induced flooding. After the intervention, we took measures of both theories. We measured the perception of need as well as the valuation of the other person with two items similar to the ones used by Batson et al. (2002) to test Batson's theory. In addition, we measured oneness with the Inclusion of Other in Self scale developed by Aron et al. (1992) to test Cialdini's theory: Participants saw pictures of circles with different degrees of overlap, representing themselves and the other person, and could select the one that they perceived as describing their relationship best.

Using OLS regression including various control variables, we found that perspective-taking increased valuing of the other and oneness. For perception of need, the positive effect of perspective-taking was not statistically significant. There was also a high correlation between the two measures. Moreover, interesting subgroup effects occurred depending on who the other person was, which will be covered in subsection 6.1.4.

However, as summarized above, there was no treatment effect on the PEB variables. Hence, although perspective-taking did have an effect on people's perception of others harmed by environmental degradation and their relation to them, these changes did not translate into behavioral changes. In line with theories (e.g. Batson's theory), motivation and behavioral costs together determine the choices of individuals.

RQ2.3: Is the perceived ease to engage the business world in sustainability efforts influenced by the different discourses on corporate sustainability?

It is argued by proponents of the business case discourse that such a discourse makes sustainability more appealing for a business context. The mainstream business paradigm is one of maximizing shareholder value within a market economy (e.g. Friedman 1970). Business case reasoning fits into this paradigm and could thus provide legitimacy for corporate sustainability. Thereby, it could serve as an entry point to the business sector. Hence, in EXP 2 as presented in Chapter 4, we hypothesized that participants in the business case treatment group would perceive it as easier to promote sustainability, as compared to participants in the responsibility treatment.

In line with this hypothesis, we found that participants exposed to the business case discourse rated it as significantly easier to engage the business world in sustainability efforts, when compared to the responsibility treatment. Taking a closer look revealed that this difference was not attributable to the business case treatment, which had very similar ratings to the control conditions, but rather the result of a negative impact of the responsibility treatment, showing a significant difference compared to the control. An OLS regression confirmed this result including various control variables.

However, this changed perception of ease was not reflected in the PEB measures we used. In fact, if at all, the opposite was true. That is to say, even though people exposed to the business case

discourse judged it as easier to engage the business world, this apparently did not make them commit more strongly to corporate sustainability efforts themselves. Hence, it seems like perceived ease to engage the business world, although affected by the business case discourse, is not a mediator for corporate sustainability efforts.

Overarching discussion on RQ2:

It can be summarized that different mechanisms exist under the umbrella of addressing other-regarding preferences. Psychologically speaking, these mechanisms can work via cognitive or affective channels. Oftentimes, they may also invoke both a cognitive and an emotional response. The experimental findings assessed by the literature review as well as from the perspective-taking experiment confirm what is postulated by various theories, namely that preferences are not fixed and determinant of behavior irrespective of their context (e.g. Tversky and Simonson 1993; Lindenberg and Steg 2007). The empirical evidence supports the idea that the specific interplay of other- and self-regarding preferences can be influenced by the character of the situation and the identities this situation brings up: The same people can take more self- or more other-regarding decisions, depending on what their decision environment tells them about which preferences are more appropriate. Hence, regard for others is not a stable trait that people with more other-regarding personalities exhibit.

For instance, the valuation of the well-being of another person adversely affected by climate change was raised in our experiment when people took the perspective of that person. Only when others and nature are valued can we assume that people approve their protection or put effort in protecting them through own action. Also the perception of oneness was raised through perspective-taking, i.e. the line between the other and the self was blurred: People become more interrelated with others. When even small and short-term interventions can produce these changes, it is conceivable that if perspective-taking with others were a routine, it would result in even bigger effects and potentially establish a generally higher regard for others. The data also showed that perspective-taking and empathic concern with others in general was linked to a greater willingness to engage in PEB. While we also clearly saw that a greater valuation of others or connectedness with them can occur without translating into action, these perceptions are likely necessary, but not sufficient prerequisites for behavior in line with regard for others.

When it comes to actual and costly behavior, the cognitive and/or emotional response induced by the other-regarding interventions may, however, not suffice to induce a behavioral footprint. There is a gap between the mechanisms triggered and actual behavior that needs to be considered. Such a gap is well-documented in the literature: Values, attitudes, intentions etc. do not automatically translate into behavior. In line with many theories, e.g. Batson's theory of other-regarding behavior, as well as the results of the literature review, costs and efforts factor in and can impede behavior that is aligned with one's preferences or plans. Moreover, the behavioral sciences have pointed to many other factors that determine human decision-making (e.g. habits – Michalek et al. 2019).

That not all perceptions are in line with behavior could also be shown for the business context. In our experiment, we saw that the perceived difficulty to engage the business world in sustainability efforts was raised by the responsibility discourse, while it remained unaffected by the business case. This stresses that regard for others is not the norm in the business world where the profit maximizing principle is largely accepted. However, the perceived higher difficulty to engage companies in sustainability efforts induced by the responsibility discourse was not linked to the study participants' own motivations and intentions nor to their investment decisions. It may hence also be a (partial) misconception that the business world operates only according to these principles. Indeed, the management literature has shown that many business professionals hold values in accordance with regard for others or the environment (Hemingway and Maclagan 2004). Possibly, people do not expect others to have the same other-regarding preferences as themselves. This may work as an impediment for other-regarding decision-making in the business world, considering conditional cooperation and the effects of social norms that were discussed in the literature review.

A last, but important note should be taken on the distributional effects of other-regarding interventions. Various studies have shown that more other-regarding people respond more strongly to the other-regarding interventions than do more self-regarding people. Sometimes, the former are even the only ones reacting to them, while others might in some instances even respond with rejection. Hence, if PEB is promoted by addressing other-regarding preferences, it will be those with the strongest other-regarding preferences carrying the highest cost burden of PEB. For the long run, it might be different, as continuously fostering regard for others could lead to more gradual but long-term changes of preferences to be more other-regarding. However, stating that other-regarding preferences are not fixed traits does not mean that preferences easily change.

Rather, they seem to be contingent and receptive to social institutions and undergo only slow changes (cf. Bowles 1998). Thus, there may be an area of tension between both the short- and long-term distributional effects and the longer-term cultivation of regard for others.

6.1.3 Research question 3: How do interventions addressing other-regarding preferences compare to interventions addressing self-regarding preferences?

RQ3.1: Which insights can we draw from the existing literature on which intervention type is more effective in comparison and which further more indirect effects attached to each intervention type need to be considered for their evaluation?

In the literature review presented in Chapter 2, we also compared the effects of those experimental studies that both employed an other-regarding as well as a self-regarding intervention. Out of the 20 reviewed studies where PEB came also with benefits for the participants, seven reported greater effects for the other-regarding intervention, while three showed a larger effect of the self-regarding intervention. Four of the reviewed studies found equal effects (including equally missing effects) for both types of interventions. Six studies showed different effects for different subgroups. That is to say, although there is a tendency that the other-regarding interventions fare better in enhancing PEB than self-regarding interventions, the empirical data base in inconclusive.

These mixed results could be explained by the very different nature and strengths of interventions used. For instance, some of the financial savings proposed by the self-regarding interventions were quite small as compared to more substantial savings proposed by others. It is also likely that individuals will respond differently to these kinds of incentives depending on their budget or other characteristics. The other-regarding interventions as well varied substantially, for instance with respect to the behavioral consequences displayed by the interventions: Some gave participants feedback on their CO_2 emissions, which might be difficult to interpret for many consumers, while others provided more specific feedback of environmental effects linked to the behavioral choices. Hence, making general statements of which intervention type is more effective per se is difficult when interventions differ that strongly.

To judge these interventions, also indirect effects like spillover and crowding-out effects have to be considered. When people are motivated to perform a specific PEB based on other-regarding

reasons, this can lead to more PEB in other domains (spillover effect – Thøgersen and Crompton 2009; Truelove et al. 2014). Such a positive spillover effect was reported in the reviewed sample from car-sharing to recycling behavior when other-regarding reasons were given to the participants, but not when self-regarding reasons were given. If self-regarding preferences are the driving force for a certain behavior, it is likely that other PEBs will only be performed if they are beneficial to the self as well. By contrast, introducing self-regarding reasons or instruments to perform other-regarding behavior may even crowd-out the other-regarding motivation (Frey and Stutzer 2006; Rode et al. 2015). This could explain the result found by Bolderdijk et al. (2013b), namely that introducing financial appeals for a PEB reduced the willingness to engage in such behavior. The reviewed studies showed that especially in situations where PEB comes at own costs, i.e. in trade-off situations, activating a self-regarding mindset could have detrimental effects.[24]

The review showed that combining both types of interventions could be beneficial in these cases, as it may eliminate the trade-off situation, e.g. by making PEB less costly. By contrast, introducing both self- and other-regarding reasons for PEB may eliminate the positive spillover effects that occur when only other-regrading reasons are given, possibly by activating two conflicting mindsets.

RQ3.2: Is a responsibility discourse or a business case discourse aimed at enhancing corporate sustainability more effective in increasing business professionals' motivations, intentions and actions favoring their company's sustainability efforts?

Our experimental design of EXP 2 presented in Chapter 4 allowed for the comparison of the effects of exposure to a business case discourse versus a responsibility discourse on business professionals' pro-environmental motivations, intentions and a hypothetical decisions.

We did not observe a statistically significant difference between the two treatments for the three dependent variables: The means of the responsibility treatments were higher than the means of the business case treatment for motivation and intentions, but none of these differences were statistically significant. For the overall approval of the pro-environmental investment decisions,

[24] While within our review sample of studies, there was only empirical support for detrimental effects on other-regarding motivations ("crowding-out"), the literature on motivation crowding (e.g. Bowles and Polanía-Reyes 2012; Rode et al. 2015) suggests that self-regarding institutions can also reinforce the other-regarding motivations ("crowding-in").

means in the responsibility treatment were likewise higher, but also failed to be statistically significant. Comparing the scores of the three outcome variables with the neutral control, it can be observed that neither the responsibility treatment nor the business case treatment led to a significant increase in participants' willingness to commit to corporate sustainability in terms of motivation, intentions or action.

Although the perceived ease to engage the business world into sustainability actions was partially affected by the discourses, more precisely it was lowered by the responsibility discourse, this perception was not reflected in the behavioral variables.

RQ 3.3: Do the two discourse types affect cost-intensive actions in favor of sustainability, when these costs cannot be justified by other benefits to the company?

For evaluating the two discourse's effectiveness and potential side effects, in EXP 2 (Chapter 4) we also looked at trade-off scenarios in particular, that is to say situations where costly pro-environmental investments of the company could not be justified by any benefits that could be turned into profit in the long-run. We constructed different scenarios, where the pro-environmental measure entailed different costs, environmental benefits, as well as reputational benefits to the company. Some of the measures were beneficial in all three areas (triple win), some measures came at costs and brought environmental as well as reputational gains (business case) and some measures represented clear trade-off situations with financial costs and environmental benefits, yet no positive reputational effects for the company.

We found that business professionals in the business case treatment as compared to the responsibility treatment were significantly less inclined to accept costly investments for sustainability when these could not be justified by indirect benefits to the company, compared to those in the responsibility treatment. These findings were robust also in a regression analysis including various control variables. Hence, in our study we found empirical support for the claim that activating a self-regarding mindset in favor of other-regarding actions can have unintended detrimental effects: Business case thinking can backfire in the sense that it lowers the willingness to accept costs for the sake of others without any financial benefits.

For the other trade-off scenarios as well as a middle scenario that entailed large environmental gains and only weak reputational gains at high costs, we could witness a spread of investment approval rates between the participants of the responsibility treatment and the business case treatment, while scores were very similar for the scenarios representing a business case. This is to say, it was not random error linked to other characteristics of the participants that could have allocated business professionals with a generally greater inclination for pro-environmental action into the responsibility treatment group. The differences were not statistically significant, but the pattern is remarkable. If our sample had been bigger, statistical significance might have resulted also for these scenarios.

For a last scenario that came at very high costs, large environmental gains and no reputational effects, approval scores for participants' of all three experimental conditions showed a comparatively similar drop to around 40%. For this measure, it seems like a large amount of participants in either condition perceived the costs as prohibitively high.

Overarching discussion on RQ3:

As pointed out above, it is not possible to provide a uniform answer to the question if it is more effective to address other-regarding or self-regarding preferences in order to enhance PEB. Both intervention types can promote PEB, yet they do not do so in all instances. For example, our own experiment with business professionals showed that both a discourse based on other-regard and a discourse based on self-regard can be equally ineffective in raising sustainability efforts. While it can be particularly difficult to promote sustainability actions in the business world as was discussed in the previous sections, some studies measuring individual behavior report the same finding. A limitation of both ideational approaches is certainly that they do not alter the material decision environment. Aligning both material and ideational conditions so that they favor regard for others and individuals need not to act against their own interest is an important prerequisite for sustainable behavioral change.

However, aligning self-benefit and regard for others will not always be an easy or even practicable task. As benefits and costs of environmental degradation are very unequally distributed, it will above all require substantial changes of consumption and production patterns in the Global North. This is to say, win-win situations cannot always be created. There will be trade-off situations, where

the environmentally and collectively beneficial option stands in conflict with own interest. Our experiment with business professionals provides evidence that a discourse that frames sustainability as a win-win situation, justifying pro-environmental actions based on their profitability, can backfire. While it may help to put sustainability on the agenda of the business world, it could in the long-run even work against its intended goal, namely diminish the willingness to bear costs for the sake of others.

This finding complements the findings on motivation crowding (e.g. Frey and Jegen 2001; Rode et al. 2015; Bowles and Polanía-Reyes 2012). Motivation crowding in general focuses on the change in intrinsic motivation when extrinsic motivation is introduced. The effect can be positive (crowding-in) or negative (crowding-out). The phenomenon of crowding-out implies that even though material incentives may make behavior more appealing to the individual, the effects on the way of thinking of this individual may even cause the opposite. Here as well it is argued that the instrument may frame the situation in a more self-regarding way, which triggers self-regarding decision-making. At the same time, the motivation crowding literature also tells us that it is well possible to synergistically align material incentives and other-regarding preferences when the instruments are designed, framed and introduced in a sound way (e.g. Lliso et al. 2022; Bernal-Escobar et al. 2021). Without altering the material decision environment to make pro-environmental choices materially more attractive, fostering a mindset that justifies action solely based on self-interest – whether this notion is narrow or enlarged – may inscribe a norm of self-interest (cf. Miller 1999; Ratner and Miller 2001).

This kind of criticism has also been applied in the context of providing instrumental arguments for the protection of nature at the societal level, e.g. by conceptualizing nature's benefits to humans as ecosystem services that can be attributed a monetary value (e.g. Fatheuer 2014). It is well possible that a backfire effect as found in our experiment could potentially also occur as a result of a discourse that puts too much emphasis on the instrumental motivation to preserve nature. For instance, a society might come to the conclusion to only preserve those natural entities that somehow pay-off. However, the arguments brought forward have always been carefully framed as complements to intrinsic values of nature (e.g. Naturkapital Deutschland – TEEB DE) and the limitations that come with the various valuation methodologies are at least in the scientific community widely known and discussed (cf. Schröter et al. 2014). In addition, they can contribute to the discussion of distributional effects of environmental degradation (TEEB 2012). There are

not many studies that have probed the effects of such discourses empirically and the picture so far is inconclusive. The study by Rode et al. (2017) found that instrumental reasons for nature protection could promote the choice of pro-environmental courses of action. At the same time, it also showed that the effect depended on the quantified value attached to the pro-environmental option, which is in line with the idea that if benefit maximization is the dominant decision logic, people are less inclined to accept decisions that do not serve this purpose. The study by Rode et al. (2017) as well as another study by Andrews et al. (2013) also provide evidence that the effects of the different discourses are subgroup-specific, depending on prior beliefs and values.

That nature has a value to society and the economy, that some PEBs entail financial or health benefits and that some sustainability measures in the corporate world are also beneficial for business are just pieces of information representing facts. Thus, an area of tension exists, raising the question of how this information can be brought forward without crowding out the other-regarding motivations.

6.1.4 Research question 4: Does it matter for PEB who is affected by environmental degradation?

RQ4.1: Does the distance to the affected parties influence the willingness to engage in PEB?

Distance to the parties that are affected by environmental degradation may influence the willingness to engage in PEB, especially costly PEB. For climate change, this is particularly important as causes and effects are detached regarding several distance dimensions, e.g. spatial distance and distance in terms of socio-cultural background (Spence et al. 2012). In EXP 1B (Chapter 5), we altered the social and spatial distance to the affected party, here a person being interviewed about a previously experienced climate change induced flood. While the story was exactly the same, name and residence of the person was changed to depict different degrees of distance to the German study participants. In the Close condition, we used a name of German origin (Paul Weber) and described the person as living in the small town of Rhüden in Germany. In the Far Global condition, we used a name of Indian origin (Samudra Sudarshan) and described the person as living in an equally sized town called Hatipara in India. India as an emerging economy was used as an example to reduce effects linked to the status of a developing country, which is

suggested by some of the previous studies (Spence et al. 2012). To make the residence more salient, we marked it on a map, which was shown to the participants. Attention checks confirmed that both distance dimensions were salient to the participants when making their choices regarding the PEB variables.

The main hypothesis was that participants in the Far Global treatment would engage in less PEB than participants in the Close treatment. We employed Chi square and Mann-Whitney-U tests to test this hypothesis and found empirical support for one of the PEB variables, namely willingness to sign a petition. For donation and policy approval, we could not detect any significant differences between the two treatment conditions. This is to say, when a person in India with a name of Indian origin was adversely affected by climate change, people in Germany were less willing to sign a petition for more climate protection, as compared to when a person in Germany with a name of German origin was affected. The share of people actually providing their email address to receive the petition was cut in half – from 31% in the Close condition to 17% in the Far Global condition. Using regression analysis to control for sociodemographic characteristics and own flooding experience, we could confirm the robustness of these results. In a further analysis, we added expected state aid as a control variable to control for possible effects linked to the status of a developing country and found that state aid was not a significant predictor for neither of the outcome variables. The treatment effect we found for the petition can thus be regarded as robust.

In our interpretation, the difference in effects regarding the different PEB variables could be explained by the relative costs involved in each behavior. Signing the petition, or more precisely providing their email address to sign a petition (we could not measure actual signing due to data protection reasons) is a relatively low-cost behavior while donating money involves immediate pecuniary costs. All policy measures presented were policies that were discussed in the current debate and were entailing high costs or noticeable changes if introduced, e.g. a higher CO_2 tax or a speed limit on the autobahn. Thus, even though this measure was only stated, the anticipation of real costs is likely to have led to realistic considerations of these measures as costly by the study participants.

In order to find out whether it was the spatial or the social dimension of distance that drove the detected effect, we used a third condition, Far Germany, in which we combined the name of Indian origin with the German residence. To assess the impact of the spatial dimension, we compared the

willingness to sign the petition between the Far Germany and Far Global treatment. When the country was changed from Germany to India, while everything else was held constant, the willingness to sign the petition was significantly reduced.

To assess the effects associated with social distance, a more subjective dimension than spatial distance, we used an item measuring perceived belonging to the same social group. Both non-parametric tests and regression analysis showed that our treatments affected the perception of social group belonging, with the highest score in the Close treatment, the lowest in the Far Global treatment and a score in between in the Far Germany treatment. When using social group score as an independent variable in the regression analysis, we found that it did not predict the willingness to sign the petition. We ran an additional analysis that included both the social group score as well as a dummy variable for spatial distance and showed that spatial distance remained a significant predictor for the outcome variable. Hence, our study showed empirical support for a negative effect of spatial distance on mitigation actions, but not of social distance.

RQ4.2: Does the distance to affected people moderate the effects of perspective-taking on PEB and the mediation mechanisms?

Moreover, we were interested in how distance to those adversely affected by environmental degradation would moderate the effect of an other-regarding intervention (EXP1A in Chapter 3). More precisely, we looked at how distance would moderate the effect of perspective-taking, both in terms of enhancing PEB as well as regarding the mechanisms that perspective-taking may trigger. For this purpose, we looked at the effects of the perspective-taking treatment in the Close and Far Global treatment separately and estimated the effects with regression models. We used equality tests to investigate if the effects differed in a significant way.

For the three PEB variables, there was no significant difference between the effects. Thus, distance to the affected person – whether it was Paul Weber in Germany or Samudra Sudarshan in India – did not moderate the effect of perspective-taking on the mitigation behaviors.

For the mediation mechanisms – perception of need, valuation of the other and oneness –, we found evidence for a moderation effect of distance for one of the three variables: oneness. Perspective-taking only showed to have a significant effect on oneness in the Close treatment, yet no such effect

was found in the Far Global treatment. Hence, distance moderated the effect of perspective-taking. This is to say, the perspective-taking intervention led people to feel more connected with the affected person only when this person was close to them, but not when the person was distant to them. For perception of need, the (null) effect of perspective-taking was the same in both treatments. For valuation of the other, the effect was significant in both treatments and no structural difference between the effects existed.

RQ4.3: Does racism moderate the effect of distance on the willingness to engage in PEB?

While environmental racism is well documented when it comes to a higher exposure to environmental pollution of communities of color (e.g. Agyeman et al. 2016), we were interested in examining whether environmental racism might also exist when it comes to the willingness to engage in PEB. In EXP 1B (Chapter 5), we thus investigated whether our data suggested the existence of environmental racism in that sense, more precisely if racist attitudes of the participants moderated the effect of distance on the willingness to engage in PEB.

We used and averaged items from GESIS (2013) to measure racist attitudes. They were surrounded by other items asking about political attitudes to make them less salient and hence reduce social desirability bias in the answers. Still, the average score was very low and a high share of people did not answer these items, indicating that responses were likely driven by social desirability. Hence, we used the extremes to counter the social desirability effects in the measurements. We constructed a dummy variable for high racism, using scores above or within the 90^{th} percentile.

To check for a possible moderating role of racist attitudes, we included an interaction term of the high racism dummy and the distance treatment variables in our regression analysis. For policy approval, we found a significant interaction with the $T_{\text{Far Germany}}$ treatment, but none with the $T_{\text{Far Global}}$ treatment. The interaction terms were not significant for the donation nor for signing the petition. Graphically depicting our results revealed that people with low or medium scores in racism did not react much to the different treatments, while people holding strong racist attitudes responded to the treatments. When the name of the person affected by the floods was changed from Paul Weber to Samudra Sudarshan even though both were living in Germany, people in the high racism group even started to reject the mitigation policies.

Overarching discussion on RQ4:

Taken together, these results indicate that it matters, at least for some aspects of PEB, who is affected by environmental degradation. In our experiment, (spatial) distance to adverse effects of climate change lowered the willingness to sign a petition for more climate protection, altering the perception of being personally affected by climate change. From our study results, it seems like the perception of being affected, i.e. regard for the self, could account for the willingness to engage in PEB. Again, we see that people hold both self- and other-regarding preferences and PEB can be motivated by both. Thinking that oneself could be affected, e.g. that climate change could destroy one's own home, is certainly powerful in motivating mitigation action. Recent extreme events in the Global North show that this is, indeed, the case. When people hence consider climate change as a personal threat, this might give them the necessary motivation to act. However, the most severe consequences of climate change will be felt by people spatially distant to the inhabitants of the Global North. Moreover, effects will be time delayed, so that many of the consequences will hit people temporarily distant and not affect those living today. If people need to feel affected themselves in order to become active on behalf of climate protection, this might still pose a serious challenge to finding the remedies of appropriate scale in the here and now.

Yet increased distance in our experiment did not affect policy approval in general or costly behavior. It may be that signing the petition as the most low-cost behavior of our measured PEB variables was most responsive to the change in distance in our experiment, while more costly PEBs including the approval of mitigation policies is mostly affected by the daily discourse about climate change. It could also be the case that even if negative climate change effects are noticeable in Germany, they could still be regarded as too distant to one's own reality to justify direct costs. It is very likely that people living in or close to the Ahrtal, an area that recently experienced severe floods, have now a different attitude towards climate protection and would be more willing to accept immediate costs or disadvantages in the context of mitigation to reduce the likelihood of such events to happen in the future. Indeed, a recent still unpublished study (Hilbig and Riaz 2022) found that green party support was modestly increased in the heavily affected areas (but not on the county level).

We did not find evidence for a more indirect effect of distance on PEB as a moderator of the perspective-taking intervention. However, distance moderated the effects the perspective-taking

treatment had on the perception of oneness: While perspective-taking did increase oneness when the person affected by climate change was in Germany with a name of German origin, there was no effect for a person in India with a name of Indian origin. Even though this was not reflected in the behavioral variables, it is noteworthy and worrisome that perspective-taking did only increase the perceived connection with close others, but not with far others. This seems to support the claim by the critics of empathy-based approaches, namely that their impact is restricted to close others (e.g. Bloom 2017). By contrast, perspective-taking increased valuation for both close and far others (although statistical significance was higher for close others). Hence, the criticism is not completely correct as perspective-taking has some positive effects irrespective of distance. In total, results regarding the interaction of perspective-taking and distance are ambiguous.

The hints that we found for a form of environmental racism is a somehow curious finding. While the finding on the effect of spatial distance could be explained by the consideration of own interest, thus being self-serving but also logically consistent, it is difficult to understand why some people would start to even reject mitigation policies, when a person they perceive as belonging to another social group but who lives in the same country is affected by climate change. Even if they were just concerned with themselves, this seems like an irrational response, detrimental to their own well-being: For instance, if climate change induced floods hit Germany, these will not make a difference between homes and people that have a different migration history in their family.[25] It thus seems that ideational drivers can even be stronger than material considerations. It appears that racist derogation of people resulted in obviously irrational decision-making for some. However, the results are very tentative and more research in this area is needed to confirm the existence of such a form of environmental racism. What can be said with certainty from EXP 1B (Chapter 5) is that racist attitudes in general are linked to a lower willingness to engage in PEB. Hence, addressing both environmental and social aspects at the same time could have mutually reinforcing effects.

Thus, the ways in which the distance to those affected by climate change – both spatially and socially – affects PEB is complex: Neither is it uniform for all types of PEB we measured nor homogenous across all individuals. Our study results also tell us that who is affected by climate change can matter for PEB, but it likely has an impact that is not straight-forward. Moreover, it

[25] However, it may be that migrant homes are located more frequently in flood-prone areas or there may be differences in adaptation capacities linked to a lower income for people with migration histories (Büchel and Frick 2004; Osberghaus and Abeling 2022). The former would be an argument in line with the conventional notion of environmental racism.

seems appropriate to not completely disregard possible indirect effects of distance. Even though we did not find distance to be a moderator of our other-regarding intervention on the PEB variables, distance seems to affect the extent to which such interventions are able to bridge the gap between the self and others.

6.2 Limitations and transferability of the results

Some of the more specific limitations of the experimental studies conducted as part of this thesis were already discussed in section 6.1 or the respective main chapters. For instance, it may have been that the Covid-19 crisis deterred the effects of the perspective-taking intervention. Possibly, at a different moment, the perspective-taking intervention would have enhanced PEB in accordance to what we found in the pretest. Moreover, the interventions used in the experiments were all short-term and rather subtle – small exercises or exposition to arguments – so that, both in the perspective-taking as well as the corporate sustainability experiment, stronger interventions may have had effects on the PEB variables (as found in the study by Ortiz-Riomalo et al. 2021 that used a physically simulated perspective-taking intervention in a field setting, yet in the context of a local environmental problem). These limitations point to a possible failure of our own empirical research design to detect effects that actually exist.

At the same time, there are limitations attached to the effects we did find. As with any other scientific method, there are limits to the experimental methodology when it comes to generating generalizable and robust knowledge. For instance, the representativeness of both the participants for the population under study and the simulated situation for real-life conditions largely determines how transferable findings from experimental studies are to empirical realities (Henrich et al. 2010; Hogarth 2005).

In all studies, we used convenience online samples, that is to say people self-selected into our studies. For EXP 1A and EXP 1B, the sample was recruited from the German online platform *clickworker*. Although it was not representative of the German population, the sample displayed a wide variety of socioeconomic characteristics. Hence, results seem more transferable than many results obtained in lab situations with students (cf. Cappelen et al. 2015). However, it is still a specific subpopulation that is registered at *clickworker* (cf. Stritch et al. 2017) and that choses to participate in a survey on "the consequences of climate change", as we called our survey-embedded

experiment. However, from the socioeconomic variables we measured, exploratory analyses in EXP 1A, for instance, showed that only age showed a significant interaction effect with perspective-taking: While for younger people, the perspective-taking intervention had a positive effect on policy support, for older people it even exerted a negative effect. Average age in the study was 34.4, ranging from 18 to 74, in comparison to the general population that has an average age of 44.5 (Statista 2021). This suggests that were the sample more representative of the German population, it would have been even more unlikely to find an effect of perspective-taking according to our data. So overall it seems like the (null) results can be transferred to the general German population. This is in line with Mullinix et al. (2015) who compared online convenience samples to representative population samples and found that most convenience samples in their study yielded similar results to the representative samples. It is questionable, however, if the findings of our study would also be transferable to other countries with other cultural norms and collective attitudes towards climate mitigation, e.g. the US (cf. Swim and Becker 2012).

For EXP 2, we used the platform *Prolific Academic* to recruit only English speaking business professionals. While we would assume that taking part in these online surveys for a remuneration of GBP 6.00 (in our case for an average duration of 45 min) would only attract business professionals of low hierarchy levels, it was surprising that 53% had power over budget or people, i.e. they held management positions. In that sense, the sample proves to be very useful in modelling answers of real-world business professionals with decision power. The people taking part in the study had various national backgrounds, most of them in Western industrialized countries. Our experiment did not capture country- or industry-specific differences in response to different discourses, which could be due to national policies or attitudes on sustainability issues or sector-specific CSR traditions (cf. Engert et al. 2016). Thus, whether the results generally hold for business professionals of different countries and in different sectors, we cannot tell. Further research with different samples would be needed to examine if results are transferable. It should further be noted that the sample in this study was relatively small (64 to 71 participants for each treatment), thus coming with low statistical power.

Online experiments in specific are sometimes questioned in terms of the data quality they provide. Despite the issues of sample self-selection, participants may just click through the surveys to quickly gain their remuneration without paying attention to the items and thus results could be misleading. In general, however, it seems like the data obtained from online surveys yields good

results when quality-ensuring mechanisms are applied (Stritch et al. 2017). Some are already inherent in the online platforms that will only allow participants with high response quality to continuously use the platforms. Others can be set by the researchers, as we did with our exclusion criteria to ensure high data quality (e.g. eliminate data from people with less than half of the average response time or from people not able to correctly answer the attention check items). Hence, the experimental data we obtained from the online platforms can be regarded as meeting high quality criteria, while keeping the mentioned limitations in mind when interpreting the data.

Further, there could be limitations to the internal validity and reliability of our data. Did we measure what we intended to and did we do so correctly? For instance, it could be argued that the petition variable for which we found an effect by altering the distance to people affected by climate change in EXP 1A is not actually capturing people's willingness to sign the petition. As mentioned above, due to data protection reasons, we used the proxy of people providing their email address to be sent the link for the petition. We used this variable, as it was observable and still somehow costly in the sense that people left their personal data. However, it is not clear if this proxy is representative of how many people actually signed the petition. Since we focused on comparative effects as opposed to absolute results, the choice of variable still seems justified. Another critical variable we used was the high racism item in EXP 1B. There was a relatively high share of people not answering the racism items and of those who did, the average outcome was very low. Both of these findings led us to the conclusion that social desirability of the answers drove the results and hence we looked at the extremes, constructing a dummy variable to find out if (high) racism moderated the effect of distance. While this procedure is plausible, it is still based on assumptions that we cannot test. Above all, since the effect we found was weak and only for the one of the PEB variables (policy support), results should be interpreted with caution.

Moreover, there may be limitations to the robustness of results. We controlled for several potentially influencing variables in the regression analysis for both EXP 1 and EXP 2 and found that the results we obtained from using non-parametric tests were solid. Yet, replicating the same results with new studies would be necessary to show that the findings are robust. The issue of replicability, or rather the lack of replicability of some experimental studies, has been a large discussion in the scientific community (Camerer et al. 2016; 2018). In the two big series of replication studies by Camerer and colleagues, only about 60% of the initially found effects could be replicated. As of now, it is unclear if the results we found can be replicated. However, we do

provide the full details concerning operationalization of treatments and measured variables as well as the exact study and analysis protocols so that other scientists are free to undertake replication studies and can also statistically reproduce the results we obtained. Further research using variants of the study designs or different samples is explicitly encouraged.

The limitations of each study assessed in the literature review (Chapter 2) cannot be provided here in detail. However, the same criteria as laid out above for the thesis' experiments apply for their evaluation. The studies reviewed in the course of this thesis were very different in terms of the experimental specifications employed. While, for instance, the samples used by Ferraro et al. (2011; 2013) or Gosnell (2018) were constituted of thousands of real-world water or electricity consumers, thus being representative for these groups, other experiments were based on small student samples in the lab (e.g. Berenguer 2007) and thus come with the known limitations to generalize results (cf. Henrich et al. 2010). In terms of the selection of studies assessed in our literature review to answer our research questions, the search terms we used are a further limiting factor. As pointed out above, not using specific terms related to the respective sectors for behavior in organizations likely led to a lack of representation of this behavioral type in our review. Hence, we could not derive conclusions for behavior in organizations. Neither were we able to do so for activism.

Furthermore, it should be considered that the research approach used in this thesis was quantitative in nature and hence comes with certain limitations. Quantitative research is able to show regularities and tendencies for groups, which is why it was a suitable approach to our research questions (Stockemer 2019). Yet it does not provide us with individual reasons and motivations or an evolution thereof as part of the internal processes of actors (Zawawi 2007). Indeed, human decision-making is complex and far from an easy and mechanistic stimulus-response impact chain. The quantitative and experimental approach, which delivers information much according to such a simplistic thought concept, is not able to fully grasp these mechanisms. While it remains an important source of knowledge to show and explain certain effects, it should be considered as one part of the puzzle: the knowledge produced by it in general and by our empirical research in specific is best accompanied by research that employs qualitative methods that is able to produce more faceted knowledge about the *why* and *how*, and as such to provide an understanding of human decision-making from a different perspective (Zawawi 2007).

Last, it should be noted that social science experiments are not purely observational analyses, but the experiment itself (co-)conditions the actions of the subjects (Muniesa and Callon 2007). With a reflective view of these limitations and challenges, we can use the insights derived from the experiments conducted by us or by others to advance the knowledge on the research subject.

6.3 Implications for future research and academic reflections

On the one hand, the research presented in this thesis points to various future avenues for research to address open questions. On the other hand, it invites more general academic reflections related to the specific research subject.

For the question whether other-regarding interventions are effective (RQ1), the review of existing studies was able to systematize the knowledge and identify factors that influence the effectiveness of addressing other-regarding preferences to promote PEB. However, we still do not fully understand when and for whom these interventions show effects, which would be needed to explain why some of the interventions show positive effects while others do not. Future experiments could also test and compare different other-regarding interventions – e.g. more cognitive or more emotional approaches – to assess their relative effectiveness. For perspective-taking in particular, our experiment has cast doubt on its potential to trigger costly PEBs for global environmental problems like climate change. An interesting research endeavor would be a more systematic investigation of perspective-taking for local versus global environmental problems. Moreover, employing stronger perspective-taking interventions (e.g. more long-term treatments) or testing the effects of perspective-taking in a time without an acute crisis would be helpful to examine more thoroughly the potential of perspective-taking in an environmental context. Moreover, a very important and still understudied matter are the distributional effects of addressing other-regarding preferences to promote PEB. Experimental studies are a particularly suitable method for this type of research. Last, future research could differentiate between interventions addressing other-regarding preferences directed towards humans (pro-social preferences), as opposed to other-regarding preferences directed towards non-human species or the environment in general (pro-environmental preferences), to find out if interventions are equally effective in inducing PEB.

Regarding the question how other-regarding interventions promote PEB (RQ2), we identified potential channels through which the other-regarding interventions (potentially) work and tested

for possible mediation mechanism in the context of perspective-taking ourselves. Further studies could examine in more detail at what point the effects disappear or if a certain level of valuation or connectedness works like a threshold that triggers behavioral change. Follow-up experiments could use both intentions and actual behaviors as outcome variables to see if the interpretation we provided, namely that it is the behavioral costs that counter the effectiveness of perspective-taking, is correct. While quantitative, especially experimental studies could test for the suggested channels we identified in the literature review, this research area in particular lends itself to a more qualitative approach. Qualitative methods could help to understand how people make their PEB decision amidst conflicting preference systems, which factors are influential for the decisions and for whom.

Concerning the comparison between approaches addressing self- versus other-regarding preferences (RQ3), more systematic research is needed to understand when and for whom the different approaches show effects. Further research could also investigate in more depth how self- and other-regarding arguments can be fruitfully combined and when their potentially conflicting effects cancel each other out or even have detrimental effects (building on the works of Rode et al. 2017; Evans et al. 2013; Andrews et al. 2013). Experimental studies are particularly apt for this research interest. The spillover and backfire effects found by some studies, including our own experiment, also deserve close attention. Future studies should try to replicate these results with different samples and in different contexts to probe for their robustness. This would also help to gain knowledge on a potential moderating role of cultural contexts or different industries.

In terms of the question if it matters who is affected by environmental degradation (RQ4), future studies could employ stronger interventions, e.g. with pictures or videos to more closely depict media coverage (like Ortiz-Riomalo et al. 2021) also for global environmental problems, and test if effects of distance can also be found on costlier behaviors. Further studies could try to replicate our findings with different samples from different countries both in the Global North and Global South. For instance, it would be interesting to see if a reversed set-up of distance, an Indian sample with India as the Close and Germany as the Far condition, would produce the same results. Moreover, further research could examine the effects of proximity to climate change consequences more closely. As we found that potentially being affected oneself was probably a driver of the effect of distance, it may well be possible that proximity on a local or regional level to climate change impacts would matter for the willingness to engage in PEB more than national proximity.

Last, as pointed out above, the findings suggesting a form of environmental racism should be probed for in future research to see if results are indeed robust.

Besides these specific paths that future studies related to the research subject could start to explore, the interdisciplinary approach of this PhD project has shown to be a fruitful endeavor, which future research could build upon. While the interdisciplinary approach is not new and has a long-standing tradition, especially in the behavioral sciences (Truc 2021) or related to sustainability research (Turvey 2015), it gives rise to reflect on the strengths and blind spots of the different scientific disciplines. Although there exists great heterogeneity in each discipline, they do come with certain foci, research traditions and paradigms. Knowing and comparing them allows to intentionally fill these gaps and bring insights together to get a fuller understanding of the subject. For instance, while psychologists have a greater interest and much better equipped methodological repertoire to investigate mediation channels and subtle inner-human processes, experimental economists can provide us with (quantifiable) knowledge about material and distributional effects. Both of these disciplines are predominantly quantitative and individual-based. It would also be interesting to combine them with qualitative approaches and/or approaches that put more emphasis on collective decision-making, both stemming from within economics and psychology or from other disciplines such as political sciences or sociology. Future research could investigate with experimental methodology how concepts like care or solidarity could be made practical for the environmental context. Or, as already mentioned above, it would be interesting to complement our research with research using qualitative methods. For instance, people could be asked after a perspective-taking exercise with others negatively affected by environmental degradation if and how this affected their care for the other person, the feeling of connectedness or their willingness to engage in costly PEBs. The limits that come either with the qualitative or the quantitative approach need not to worry the researcher as we dispose of a large variety of scientific methods for different purposes, which will hopefully be brought together in an enriching and appreciative manner in future research collaborations.

Last, the research undertaken in this PhD project has shown that different patterns of thinking and feeling exist and that these influence the decisions that actors take. For instance, the literature review revealed that many empirical studies exist that show that either regard for the self or regard for others can be activated or strengthened and that these ideational inner-human orientations affect also material decisions. Future research could link the literature strands of motivation crowding

based on incentives/institutions and the impact of different decision logics more systematically. Future experimental studies could also provide valuable insights also on the material effects on the different social discourses on nature.

While the results we obtained still need further validation and clarification, they give some reason for concern. If scientists operate with certain ideas about human decision-making, this might in the end also affect decision-making itself (Schattschneider 2013; Callon 2007). In many scientific disciplines, especially but not exclusively in economics, *homo oeconomicus* is still the dominant model of human decision-making (cf. Kirchgässner 1991). Often, the understanding is more advanced than the mere consideration of immediate and pecuniary payoffs – the categories of costs and benefits are usually enlarged to include more long-term or non-pecuniary aspects (e.g. Andreoni 1990; Fehr and Schmidt 2006). However, the logic itself is often untouched: Actors will do what maximizes their utility and everything else – from other humans or species to the environment – is instrumental to this. While there can be reasons that call for such an abstract and single-unit conceptualization – e.g. the ability to mathematically model decisions – we should be aware that continuously referring to humans as *homines oeconomici* might become a self-fulfilling prophecy: By conveying a social norm to people and at the same time an idea of others' behavior, this paradigmatic model could ultimately undermine (conditional) cooperation.

6.4 Policy-related reflections and policy implications

The study of behavior by experimental methods has also increasingly raised the interest of policy-makers. This is reflected in a number of publications highlighting the contribution of behavioral sciences to the design of (environmental) policy instruments (OECD 2017a, 2017b; World Bank 2014). Similarly, the importance of experimental methods for generating transformational knowledge is highlighted: Bierwirth et al. (2017) even call for an 'experimental turn' in transformation research. Before going into deriving concrete policy implications, it is worth reflecting on the different purposes of experiments and the role of science for policy-making in particular. [26]

[26] For this reason, the different order of the terms reflections and implications between the previous subsection and this subsection is on purpose.

Experiments can have different rationales and objectives: Most of the research referenced in this PhD thesis showed that specific non-material interventions did (or did not) have some effects on PEB or PEB-related variables. In that sense, these experiments helped us to gain knowledge about causal relations and effect mechanisms. They showed, for instance, that – on average and under certain conditions – people take different PEB decisions, when they take on either a more self- or a more other-regarding mindset. Moreover, the experiments show that regard for the self and for others is not fixed, but can be activated or strengthened. Even more so, they provide insights about how different preferences could be addressed and what happens when they are. However, it is a different purpose of experiments to test or evaluate specific interventions for or after their real-world application. In that case, a politically set goal guides what is experimentally investigated. Critics rightfully point to a blurring between these two purposes and as such also the lines between academia and policy-making (Lepenies and Malecka 2019).

When research shows that addressing other-regarding preferences can promote PEB, does that mean that it should be made a policy approach? In fact, a different form of legitimization is needed in a society to make this choice. In a democracy, it is the representation of the citizens, e.g. the elected parliament that debates and ultimately decides on the specific policies. Research can help to inform these debates by pointing to advantages and disadvantages of certain approaches and help to prioritize policies and resources according to the expected impacts. Hence, finding that other-regarding interventions can enhance PEB does not automatically translate into a policy recommendation. Moreover, scientific rigor demands that the results of single studies should not be treated as universal knowledge, but need further validation to inform policy-making. However, both the reviewed research as well as our own empirical studies have pointed to several important aspects that policy-makers should consider when designing pro-environmental policies.

The findings from the literature review suggest that there are various possibilities to purposefully activate or strengthen other-regarding preferences. While there is much evidence that addressing other-regarding preferences fuels pro-social behavior, the findings in this PhD project indicate that they can also be effectively addressed to promote PEB in various instances. Hence, policy-makers could intentionally target other-regarding preferences also to foster collective behavioral change in line with the planetary boundaries. Instruments that activate other-regarding preferences, educate about adverse consequences on others, raise emphatic concern or expand the moral circle have the potential to have this impact. However, as our own experiment (EXP 1A) and various other studies

have shown, they will not always be effective. Hence, they could be used as one piece of the puzzle, as a complement to other existing pro-environmental policy instruments. A problem coming with such an approach is that it might entail undesirable distributional consequences, meaning a shift of the cost burden to individuals with strong other-regarding preferences. Such distributional effects should be cautiously considered by the policy-maker when addressing other-regarding preferences to promote PEB.

The research conducted further implies that it matters who is affected by environmental degradation for various factors relevant for PEB. In our study, people in Germany were less willing to consider a petition for more climate protection in Germany, when an affected person was located in India instead of Germany (EXP 1B). This indicates that it could be an effective policy-related strategy to emphasize the local over the global climate change effects to engage people in PEB. The same conclusion has also been drawn by Spence et al. (2012) and Jones et al. (2017) from their study findings. This would be a relatively easy-to-apply and likely effective policy approach – in essence a communication-based approach – with little costs involved. However, there may be detrimental effects in the long run, if this diminishes the willingness to incur costs when others are affected (which will be discussed below), so that such a communication approach might come with a serious drawback.

Moreover, we found that perspective-taking only increased the feeling of connectedness with a close person (EXP 1B), supporting some of the criticism directed towards the restricted nature of empathy. At the same time, it did increase valuation of the other person for both close and far others. In that sense, perspective-taking still seems to have a potential to lay the ground for a socio-ecological transformation. Even though we did not find an effect on the behavioral dimensions, valuation of others is likely a prerequisite of considering their well-being in individual and collective decision-making. This is indicated by various theories that put the value of others at the core of other-regarding behavioral outcomes (e.g. Stern et al. 1999; Batson 2011). In accordance, our research also showed that perspective-taking and empathic concern as more stable characteristics of people is highly predictive of engagement in PEB, stressing its potential role in a socio-ecological transformation process. Further, this research cautiously suggests that a type of environmental racism might exist that could hinder structural change in favor of sustainability. As noted above, there needs to be additional validation of this first tentative finding. If it proves true, it certainly calls for the attention of policy-makers, especially considering that many years of

research show that people of color are disproportionately often hit by environmental degradation (e.g. Agyeman et al. 2016; Bullard et al. 2007). At the same time, we found robust evidence that racism is connected to low PEB engagement (EXP 1B). This suggests that policy efforts for social and ecological justice best go hand in hand.

This research project has shown again that costs matter for pro-environmental decision-making. Although this is not a new insight, it should be mentioned in the context of discussing policy approaches that target preferences. Evidence for the importance of behavioral costs was found in some of the reviewed studies, for instance showing that higher opportunity costs diminish the willingness to decide for the pro-environmental option (Ovchinnikova et al. 2009). Also in the empirical studies we conducted, costs seemed to matter. We interpreted not finding an effect of perspective-taking for PEB in a global context as linked to the higher costs of our measured PEB variables (EXP 1A). Similarly, it seems like we could only find an effect of distance on low-cost behaviors (EXP 1B). Many theories also point to the importance of costs for other-regarding behavior (e.g. Batson 1991). This is to say and not surprising, the material conditions, in which actors are embedded, are highly relevant for making decisions. Many people want to act on behalf of others or the environment. Policy-makers should hence make these choices easy and cheap while environmentally harmful behaviors should be the more difficult and costly options. They have different instruments at hand that alter the cost structures of behaviors, e.g. subsidies for pro-environmental choices or environmental taxation to make environmentally harmful behaviors more costly. It should be mentioned that cost alterations should always entail a glance on potential effects on access to low-income people that might call for redistributive measures in the social sphere. In total, a combined toolbox of carefully designed economic incentive approaches with and institutional environment that promotes regard for others is likely to fare best as an overall policy approach.

While aligning costs to other-regarding preferences is certainly an effective way to promote PEB, bringing about a socio-ecological transformation sufficient to make climate change and other pressing problems a manageable task will require tremendous efforts from all, but mostly those with the largest footprints: There will need to be restrictions compared to the status quo for people in the Global North and there will be trade-off situations that cannot be transformed into appealing win-win situations.

The results of one of our studies (EXP 2), together with various accounts in the literature (e.g. Bolderdijk et al. 2013b; Ovchinnikova et al. 2009; Czap et al. 2012; cf. also Frey and Jegen 2001), give reason to think that making self-benefit the main motivation for PEB may in the end be detrimental to actors' willingness to bear costs for the sake of others – may these others exist in the future, in different parts of the world or as non-human living beings. However, it certainly makes sense to highlight the benefits of PEBs or an intact environment – whether this is to a company, an individual or a society. Quite obviously, these benefits are matters of facts (e.g. Iacurci 2021; WWF 2016; Millennium Ecosystem Assessment 2005). The same applies for the aforementioned communication approaches to "proximize" climate change in order to make adverse effects tangible for the self and thereby help to promote mitigation actions. However, if it becomes established that environmental protection should only be undertaken to further self-benefit, i.e. if intrinsic motivations are crowded out, it could likely backfire and lower the willingness to incur costs where no benefits for the self are involved. When the biggest impacts of climate change will be felt elsewhere – as it is the case –, a policy-makers somehow have to convince people to agree to local climate protection appropriate in dimension to halt climate change at the global scale.

There is already a large body of literature that examines how self-regarding instruments for environmental protection can best be introduced without crowding out intrinsic motivation (Rode et al. 2015; Bowles and Polanía-Reyes 2012; Akers and Yasué 2019). From that literature, for instance, we know that framing them as a reward (Bernal-Escobar et al. 2021) or according to local conceptions of human-nature relationship (Lliso et al. 2022) or introducing them in a way that simultaneously establishes legitimization and security (DeCaro et al. 2015; Abatayo and Lynham 2016) can help to counter the unintended side effects. This literature shows that self- and other-regarding approaches can be applied in a way that mutually reinforce each other if done properly. The research also indicates that crowding effects can be specific to subpopulations (Lliso et al. 2022), suggesting that effective political communication approaches may need to be tailored to the worldviews of different communities.

Designing political communication based on subgroup specifics is also discussed in the context of making climate protection an issue congruent with the core and sometimes self-regarding preferences of individuals (e.g. stressing the economics benefits of climate protection to conservatives – cf. Bain et al. 2012). However, while this may trigger agreement to specific pro-environmental policies in the short run, it bears the risk of making the divide between the

proponents and skeptics of climate protection even bigger in the long run. If one part of society is only concerned with self- or ingroup well-being, potentially becoming less and less willing to share resources or restrict themselves without a payback, this might even aggravate the unequal distribution of costs. Sharing resources or restricting own choices for a collective good is, however, key in solving any public good or CPR-like situation.

As we also know from the literature, solving these social dilemmas requires more than individual preferences in line with the collective good: it requires institutions that allow for, facilitate and stabilize cooperation (Ostrom 1990; Hardin 1994). One could argue, however, that collectively held preferences are institutions in themselves, i.e. they display regularities of an acting collective that references the same socio-cultural context. Thus, they are not completely individual, but embedded in social structures and shaped by collective interactions (cf. Kirchgässner 1991; Schattschneider 2013). A society may achieve to collectively cultivate preferences that include care towards others to the same extent as care towards the self, turning these preferences into a social norm (cf. Nyborg 2018). Moreover, if people expect others to be other-regarding, this fosters cooperation by conditional cooperators. At the same time, institutions that restrict behavioral options or alter cost structures of behavior within a society need to be in place. These institutions likewise signal the appropriateness of certain choices. This is important also because individuals would be overwhelmed when expected to fix social problems purely through a manifold of complicated individual consumer decisions that acquire also resources like attention and time. While time is obviously a scarce resource, the capacity to process information is likewise limited as the concept of bounded rationality implies (Simon 1972). Here, institutions also help to lift the burden of the individual. In fact, approaches based on addressing individual preferences could carry the risk of individualizing collective problems that can and should best be solved on the collective level (cf. Straßheim and Beck 2019).

Although they are and should be regarded as distinct, economic and social institutions and individual preferences are deeply intertwined. As the Old Institutionalism puts it, institutions have the power to alter actors' preferences (Hodgson 2000; Bowles 1998; Dequech 2002). At the same time, agreeing to these institutional changes, entailing some immediate or long-term cost or restriction to the self, will require some other-regard of the actors – at least in a democratically organized society. The literature review conducted showed that agreement to such changes of the institutional environment is also not stable, but can be activated or strengthened. Against this

backdrop, it seems like a worthwhile political endeavor to provide individuals with the chance to develop empathic concern with others, learn about adverse effects on them or categorize them as moral beings – in an institutionalized manner. The education system is likely key to cultivate such skills and desires. Also, places where people can learn how to collectively organize commons, where they can engage in practices of "commoning" (Bollier and Helfrich 2015), could be promising starting points. Policy-makers have the power to support here both by providing resources and by reducing bureaucratic barriers.

6.5 Concluding remarks

This PhD thesis was dedicated to investigate the causal relation between other-regarding preferences and PEB. More so, it looked at the potential to activate and strengthen these preferences in the light of global environmental problems. A further spotlight was put on the comparison between approaches addressing other- versus approaches addressing self-regarding preferences to promote PEB and the (dis)advantages of each. Last, it was examined whether it matters who is affected by environmental degradation for the willingness to engage in PEB, particularly whether the distance to affected parties plays a role.

As laid out in the introduction, today's environmental problems are pressing – and they are accelerating in magnitude and pace. A fundamental transformation of the socio-economic system of our society is needed to manage these problems. Whether this happens by disaster or by design is a choice we have. And if such change is inevitable – why not asking ourselves proactively how a better future could look like in terms of organizing our society so that everyone's basic needs are met? While the approach of this PhD thesis was quantitative, this change is likely to be necessary on a more qualitative level. If concepts like care or solidarity were core values of today's societies, these societies were likely also much better equipped to find cooperative solutions to overcome large-scale environmental problems. What seems a utopia today could become reality tomorrow (or a bit later). History provides us with ample examples of fundamental changes that were unimaginable at a certain time. And there is reason for hope as so many motivated and skillful actors are already working on creating a better future for all – from the local to the global level, as institutionalized actors or self-organized groups, with different national and socio-economic backgrounds.

A socio-ecological transformation is not a project that can be carried out by individuals, but that can only be realized by changing structural conditions in which individual behavior is embedded. Neither can it be an undertaking of single actors – it requires a joint effort of individuals, companies, activists, policy-makers and scientists. Moreover, not a single scientific discipline will be able to provide answers to the many urgent questions that need to be addressed. As many interdisciplinary efforts – including this PhD thesis – have shown, bringing together different perspectives, methods and expertise proves tremendously fruitful. In order for such transdisciplinary cooperation to take place, it is key to value each other's contribution. Cultivating emphatic concern could help in this regard, by fostering mutual understanding and learning and helping to endure diversity and ambiguity.

While the policy implications of this research certainly remain contested – and they should be in a democracy –, the author of this thesis hopes to have contributed to a better understanding of the research subject that excites lively discussions in both the academic and the political sphere.

7. References

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Appendix

A1: Overview of studies in our sample (Chapter 2)

Study	Specifications	Intervention *(other-regarding intervention in italics)*	PEB	Significant effect of other-regarding intervention
Asensio and Delmas 2015	Field-experiment with 118 residences in the U.S.	Feedback on energy consumption in kwh linked to (i) *reduction in air pollution and health risks* vs. (ii) monetary savings vs. (iii) control	Energy consumption over 8 months, measured at appliance level	Yes*
Bain et al. 2012 (study 2)	Online experiment with 347 climate change deniers in the U.S.	Different frames to reduce carbon emissions: (i) *reduce risks on nature, animals and humans ('real frame' – they use as control);* (ii) good society ('warmth frame'); (iii) economic benefits and prosperous society ('development frame')	Environmental citizenship intentions (e.g. intentions to vote for-environmental candidates, sign petitions supporting environmental protection)	Mixed*
Bastian et al. 2019	Lab experiments with 149 student participants	*Additional information that crickets die if resource is depleted* vs. control	Points taken from resource dilemma game	Yes
Berenguer 2007	Lab experiment with 60 students in Spain	Instructions (*perspective-taking* vs. stay neutral) X Object (bird vs. tree)	Attitudes; Fund allocation recommendation to student council	Yes
Bernauer and McGrath 2016	Online experiments with 1675 participants in U.S.	Study 1: like Bain et al. 2012; study 2: alteration with health benefits	DV1: Policy attitudes regarding climate change mitigation; DV2: Behavioural change intentions; DV3: Environmental citizenship intentions	No*
Bolderdijk et al. 2013a (study 3)	Field study at a petrol station in the U.S. with an estimated number of 75.8 customers	Four different signs at petrol station to get free tire check (e.g. *"Care about the environment?"* vs. "Care about your finances?")	Number of coupons taken during period of 22 days	No
Bolderdijk et al. 2013b	Online experiment with 192 participants in the Netherlands	Move about the negative impact of bottled water vs. unrelated movie	DV1: Acceptance of policies; DV2: Beliefs and intentions regarding use of bottled water	Mixed (only for people high on biospherism)
Bratanova et al. 2012	Lab experiments with 189 students in Belgium	Manipulation of moral circle size	Study 1: Moral concern Study 2: Money allocated for carbon offsetting Donated money Study 3: Support for policies aimed at reducing environmental pollution Study 4: Intentions to engage in PEB	Yes
Czap et al. 2012	Framed lab experiment with 216 students in the U.S.	Different framings of Upstream Farmer/Downstream Water User Game: *Empathy* vs. Self-interest vs. control	Amount of acres put under conservation tillage by Upstream Farmers	Yes

Czap et al. 2015	Lab experiment with 400 participants in the U.S.	Upstream Farmer/Downstream Water User Game with *empathy messages* vs. financial subsidy	Amount of acres put under conservation tillage by Upstream Farmers	Yes
De Dominicis et al. 2017 (studies 2 and 3)	Lab experiments with 425 students in the U.S.	Environmental concern manipulation (other-regarding vs. self-regarding) X value frame (*other-regarding* vs. self-regarding frames for PEB)	Study 1 and study 2: Intentions to engage in PEB (conserve energy, use public transport); study 3: sign up for a beach clean-up event	Mixed (only for those high in environmental concern treatment, no for those low in environmental concern treatment)
Dogan et al. 2014	Online experiment with representative sample of 350 participants in the Netherlands	Different feedback frames for eco-driving: (i) *environmental*, (ii) financial, (iii) control	DV1: worthiness of eco-driving behaviours; DV2: intentions for eco-driving	DV1: No, DV2: Yes
Evans et al. 2013	Lab experiments with 130 participants from University participant pool in the U.K.	Information about car-sharing: *environmental benefits* vs. financial benefits vs. control (first experiment involved some filler tasks on personality)	DV1: Use of recycling bin; DV2: use of scrap paper; in study 1 also DV3: choice of energy savings mode on computer	DV1: Yes, DV2: No; DV3: No
Ferraro and Price 2013	Field experiment with >100.000 water customers in the U.S.	Letters with (i) technical advice (TA) to save water, (ii) TA+ *appeal to other-regard including information about adverse consequences* (OR), (iii) TA+OR+ descriptive norm of others behaviour , (iv) control	Reduction in water use in 2007	Yes
Ferraro et al. 2011	Experiment from Ferraro and Price 2013	See above.	Reduction in water use in 2007-2009	No
Gosnell 2018	Field experiment with 36,810 customers of a renewable energy supplier in the U.K.	Letters with information about online billing: (i) *environmental benefits*; (ii) *appeal to environmental identity;* (iii) own advantages	Take up rate for online billing	No for i. and mixed for ii. (only for those not holding a doctorate degree)
Hafner et al. 2017	Online study with 493 participants in the U.K.	Feedback frame for different energy technologies (*environmental* vs. financial) X different messengers; control	DV1: Likelihood of selecting the 'green' (and more expensive) technology, DV2: real-life adoption intentions	No*
Hafner et al. 2019	Online study with 599 participants in the U.K.	Feedback frame for different energy technologies (*environmental* vs. financial) X different descriptive norms; control	DV1: Likelihood of selecting the 'green' (and more expensive) technology, DV2: real-life adoption intentions	DV1: Yes only in conjunction with descriptive norms; DV2: No
Loureiro and Lima 2018	Lab experiment with 118 students in Portugal	Conceptual priming with (i) altruism, (ii) environmentalism, control	DV1: observed PEB (e.g. turn out light when leaving); DV2: intentions on energy savings	Mixed (only for those low on altruistic values)

Ovchinnikova et al. 2009	Lab experiments with 138 students in the U.S.	Other-regarding vs. self-regarding priming vs. control (different price increases in two studies)	Proportion of offsets sold to conservation agency instead of stock market, with price differential increasing in each round	Study 1: Yes; study 2: No
Pahl and Bauer 2013	Lab experiment with 83 students in Germany	*Perspective-taking instructions* vs. stay neutral instructions linked to narrative of a future person negatively affected by environmental degradation vs. control: no narrative	DV1: PEB intentions; DV2: observed time spent looking at PE information material; Dv3: observed number of PE brochures picked up	Yes
Pfattheicher, Sassnenrath, Schindler 2016 (study 2)	Lab experiment with 94 students in Germany	*Perspective-taking instructions* vs. stay neutral instructions	PEB intentions	Yes
Severson and Coleman 2015	Online experiment with 360 participants in the U.S.	6 different framings of climate change: deontological moral (i: *secular*; ii: *religious*); empirical-scientific; economic (iii: *economic equity*); control	Policy support for 10 regulatory policies to address climate change	Yes for i. and iii.; No for .ii.
Shelton and Rogers 1981	Lab experiment with 118 students in the U.S.	Watching documentary with instructions (*i: perspective-taking* vs. stay neutral) X level of noxiousness (*ii. high* vs. low) X efficacy of coping response (high vs. low)	DV1: PE intentions; DV2: allocation of volunteering time; merged to one index	Yes for i. and ii.
Singh and Swanson 2017	Online experiment with 1053 participants in the U.S.	Framing climate change as *human rights issue* vs. national security issue vs. scientific consensus on climate change; control	Absolute and relative importance of climate change policy	No
Verplanken and Holland 2002 (study 1)	Lab experiment with 40 students in the Netherlands	Priming: *environmental values* vs. no	Choice of TV sets with better environmental attributes in consumer choice task	Yes

*Note: Significant effect of other-regarding intervention (column 5) compared to control, * if compared to the self-regarding intervention when the study had no neutral control condition.*

A2: Balancing Table (Chapter 3)

	(1) Stay objective/CLOSE		(2) Stay objective/FAR		(3) Pespective-tak./CLOSE		(4) Pespective-tak./FAR		t-test Differences					
Variable	**N**	**Mean/SE**	**N**	**Mean/SE**	**N**	**Mean/SE**	**N**	**Mean/SE**	**(1)-(2)**	**(1)-(3)**	**(1)-(4)**	**(2)-(3)**	**(2)-(4)**	**(3)-(4)**
Disposable income (in EUR)	119	1740.546	109	1755.734	126	1625.992	134	1826.493	-15.188	114.554	-85.946	129.742	-70.759	-200.500
		[98.990]		[102.728]		[96.953]		[98.381]						
University degree	136	0.463	132	0.462	140	0.364	147	0.469	0.001	0.099	-0.006	0.098	-0.007	-0.105
		[0.043]		[0.044]		[0.041]		[0.041]						
Gender (non-male)	136	0.449	132	0.523	141	0.411	148	0.372	-0.074	0.037	0.077	0.111	0.151*	0.040
		[0.043]		[0.044]		[0.042]		[0.040]						
Age	132	36.121	129	33.775	138	33.558	143	34.350	2.346	2.563	1.772	0.217	-0.574	-0.792
		[1.135]		[0.999]		[0.968]		[0.985]						
Migration background	134	0.149	127	0.173	139	0.137	146	0.192	-0.024	0.013	-0.043	0.037	-0.019	-0.055
		[0.031]		[0.034]		[0.029]		[0.033]						
Flooding experience	136	0.154	131	0.221	141	0.113	147	0.156	-0.067	0.041	-0.002	0.108*	0.065	-0.043
		[0.031]		[0.036]		[0.027]		[0.030]						
F-test of joint significance (F-stat)									0.590	1.179	0.526	1.858*	0.969	1.208
F-test, number of observations									222	236	242	226	232	246

*Note: The value displayed for t-tests are the differences in the means across the groups. The values displayed for F-tests are the F-statistics. ***, **, and * indicate significance at p<0.05, p<0.01, and p<0.001.*

A3: Treatment and dependent variables (Chapter 3 and Chapter 5)

The German original text can be provided by the authors upon request.

Information on climate change induced floods for all participants

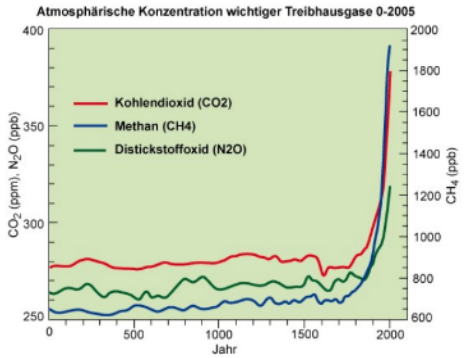
Climate change

Climate change means a warming of the average global temperature in the atmosphere and oceans. The Intergovernmental Panel on Climate Change (IPCC) assumes a temperature increase of about 1°C since the beginning of industrialization.

Although this increase is supposedly small, its consequences are enormous. Climate change is leading to altered seasons and precipitation, rising sea levels, melting of permanent ice (e.g., glaciers or permafrost), and loss of fertile soils and habitats.

Humans are also increasingly affected by the consequences of global warming. The drying up of arable soils, for example, threatens the income or livelihood of many people living in rural areas. Rising sea levels threaten low-lying housing developments or entire states. Extreme weather events destroy homes and crops and regularly cause fatalities.

Climate change is caused by rising concentrations of greenhouse gases such as CO_2 or methane in the earth's atmosphere (see figure). These act like a shell that stores heat - similar to a greenhouse. It is considered a scientific consensus that climate change, as we experience it today, is human-made. Since industrialization, human-made emissions of greenhouse gases have increased enormously. Above all the combustion of fossil fuels such as coal or petroleum, deforestation, and intensive agriculture (especially animal husbandry) are the main contributors to greenhouse gas emissions.



(Quelle: http://wiki.bildungsserver.de/klimawandel/index.php/Datei:Treibhausgase2005.jpg)

In the Paris Climate Agreement, the countries of the world agreed on the goal of limiting the global temperature increase to 1.5°C if possible. An important lever is corresponding reductions in greenhouse gas emissions, to which the countries themselves commit. This is intended to prevent even more serious impacts from climate change.

Heavy rain and floods

One of the predicted and observable consequences of climate change, as already mentioned, is the greater frequency of heavier precipitation and an associated increased risk of flooding.

The higher temperature of the earth's atmosphere leads to an increase in the water vapor absorption capacity of the atmosphere. Moreover, precipitation evaporates more quickly. This results not only in soil dryness

and droughts, but also in a shift of water vapor into the air. In addition, the warming of the oceans and the air leads to a change in the global hydrological cycle and also to a higher release of water vapor into the air.

Overall, the concentration of water vapor in the atmosphere thus increases. The stored water vapor comes back to Earth elsewhere as heavy rainfall (see figure). The absorption capacities of soils, as well as the water removal in rivers or the sewer system, are limited. The drier the soils are – as already mentioned also a consequence of climate change –, the lower is their water absorption capacity. If the capacity cannot keep pace with the amount of precipitation, river levels rise and canal systems overflow. The result is flooding.

(Quelle: Wikicommons)

Globally, an increasing trend in heavy rainfall and flood events can be observed in recent decades. An increasing frequency of floods can be noticed. Even more pronounced is the trend in the intensity of floods. Both the duration of the worst flood events and the number of these particularly long-lasting floods increased in the past.

The latest model calculations predict an increase in precipitation intensity for almost all regions of the world, along with a higher risk of flooding occurring.

Between 1976 and 2005, more than 50 million people per year were affected by floods. With higher temperatures and corresponding precipitation, the number of people affected is also very likely to rise sharply in the future.

Treatment overview for Chapter 3

	STAY OBJECTIVE	**PERSPECTIVE-TAKING**
CLOSE ***(Paul Weber, Germany)***	A (n=136)	B (n=141)
FAR (Global) ***(Samudra Sudarshan, India)***	C (n= 132)	D (n=148)

Treatment overview for Chapter 5

Treatment	Name	Residency
Close	Paul Weber	Rhüden, Germany
Far Germany	Samudra Sudarshan	Rhüden, Germany
Far Global	Samudra Sudarshan	Hatipara, India

Treatment text

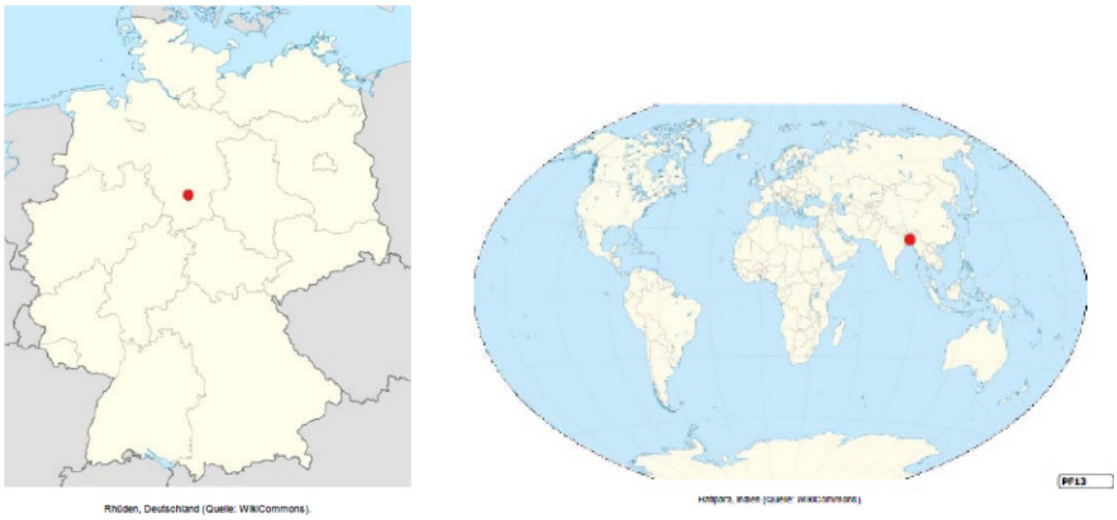
Being affected by floods - An example

Treatment CLOSE: Paul Weber, Rhüden, District Goslar, Germany

Treatment FAR (Germany): Samudra Sudarshan, Rhüden, District Goslar, Germany

Treatment FAR (Global): Samudra Sudarshan, Hatipara, District Assam, India

Paul Weber/Samudra Sudarshan lives in Rhüden, District Goslar, Germany/Hatipara, District Assam, India (see red dot on the picture). He experienced one of the largest floods in the region in 2017.



Rhüden, Deutschland (Quelle: WikiCommons).

(Big picture was shown to the participants)

[next page]

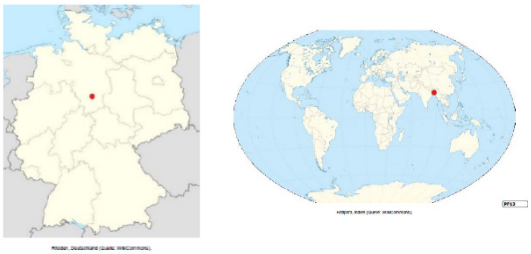
Below, Paul Weber/Samudra Sudarshan describes in an interview how he witnessed the flooding.

Treatment STAY OBJECTIVE (this was the default for Chapter 5):

Try to analyze the situation as **objectively** as possible. Please adopt a **neutral perspective** and concentrate only on the facts described.

Treatment PERSPECTIVE-TAKING:

Try to put yourself in his shoes as much as possible. Please take **his perspective** and focus on his feelings and thoughts in the situation.



(Small picture was shown above interview text)

Interview with Paul Weber/Samudra Sudarshan, Rhüden/Hatipara 2017:

1. You have experienced a flood yourself. Would you tell us your perspective on the events?

"I remember the terrible flood very well. We were woken up by a strong roar at two in the night. The door was crushed and the flood wave came into the house. The water was already about one meter high. That was a shock for us. We were all surprised. I couldn't believe it at first - it was like a dream.

We brought our furniture and valuables upstairs. But the higher we stored them, the higher the water level rose. The water rose so fast that we didn't even know what to do. I was pretty scared."

2. What did it look like outside?

"The wind and rain were strong. The houses and streets were deep under water. I remember two vehicles that had been turned over by the wind and blocked the road. And there were also dead bodies of dogs and cats floating in the water."

3. What was it like when you got back to where you lived?

"When we came back, everything was still under water. All the furniture was wet, totally broken, still standing in the water. We were cleaning all evening. Everything stank of heating oil because a heating oil tank burst nearby. One cannot even imagine how it was."

4. How did the flooding change your attitude toward life?

"There was never any of that before and now it happens all of a sudden! And it's getting worse and worse. Year after year, more and more. You have to think of it like this: What do we do when the water comes again next year? Then we will have invested and run up debts. Then we start all over again. At some point, you ask yourself whether it makes sense. You stand there and don't know what to do next. My daughter tells me to move out, move somewhere else. But when you grow up there, you have a relationship. You're attached to it. It's bad."

Treatment STAY OBJECTIVE (this was the default for Chapter 5):

As a journalist, you write a factual report about the events.

Please use the text field below (at least 300 characters, equivalent to about five sentences).

Treatment PERSPECTIVE-TAKING:

As a good friend of Paul Weber/Samudra Sudarshan, you decide to write a letter to comfort him.

Please use the text field below (at least 300 characters, equivalent to about five sentences).

Dependent variables (DV) measuring mitigation behaviors

DV 1: Donation	Actual donation of part (0-5€) of the 10€ remuneration to the NGO atmosfair (=1 if donation is provided, = 0 otherwise)
DV2: Petition	Indication of email address for signing a petition for more climate protection (Petition) (=1 if email address is provided, = 0 otherwise)
DV3: Policy approval	Willingness to approve of 12 mitigation policies to be introduced in Germany (-2 fully against; +2 fully in favor), DV3 is average of approval for all policies

DV1: Donation

We would like to thank you for your participation up to this point!

As compensation, you will be credited with 10€ via the Clickworker platform.
You can decide to donate parts of this compensation (maximum 5€) to the climate protection organization atmosfair.

atmosfair finances climate protection projects in the field of renewable energies as well as environmental education at schools. The projects atmosfair supports are certified according to the highest standard for CO2 reduction projects (CDM Gold Standard). 1€ is roughly equivalent to offsetting 40 kg of CO2.

Would you like to donate to atmosfair?

- Yes
- No

[If yes] How much do you want to donate?
I donate [selection of 0-5€, in steps of 0.50€]

DV2: Petition

Do you want to participate?

If you would like to receive the link to sign a current petition to strengthen climate protection policy, please leave your email address here.

Your email address will be stored separately from the rest of the data in this questionnaire so that your anonymity is preserved.

- Yes, please send me the link by email.
- No, thank you

DV3: Policy approval

We are now interested in your attitude to various political measures and projects that are being discussed in the context of climate change.

Please state how you *personally* feel about the implementation of these measures.

	Fully against -2	Rather against -1	Indifferent 0	Rather in favour +1	Fully in favour +2
Binding establishment of the 1.5°C target for Germany: In a climate protection law, Germany's compliance with the 1.5°C target of the Paris Climate Agreement is stipulated and backed up by concrete monitoring and sanction mechanisms.					
Increasing the EU-wide greenhouse gas reduction target: The EU gradually tightens its greenhouse gas reduction target from 40% to 55% and eventually to 65% by 2030.					
Phasing out coal power by 2030 instead of 2038: Germany is already phasing out coal energy in 2030 - eight years ahead of the planned phase-out in 2038, which was negotiated by the so-called Coal Commission.					
Reduce fossil fuel subsidies: Subsidies of fossil energy sources (volume in 2017: 46 billion euros) are being phased out with a binding timetable. This is expected to make some products more expensive initially.					
Ban on domestic flights: Flights within Germany will be banned by law.					
Introduction of a speed limit on the autobahn: A speed limit of 120 km/h will be introduced for traffic on highways in order to reduce CO2 and pollutant emissions from individual traffic.					
Increase taxes and levies on air travel: Higher taxes and levies on air travel (kerosene tax, air traffic tax) increase the price of air travel.					
Phasing out the internal combustion engine: Legislation will stipulate that from 2025 onwards, no new passenger cars with internal combustion engines will be permitted.					
VeggyDay in public institutions: In public institutions, one day a week exclusively vegetarian food is served in order to reduce the climate-damaging effects of meat consumption.					
Increase of the new CO2 tax: The newly introduced CO2 tax will be introduced at 50€ per ton of CO2 (currently planned 25€) and will be increased to 180€ by 2025 (currently planned 55€), making CO2-intensive products (even) more expensive in comparison.					
Redistribution of wealth: Wealth is redistributed in Germany so that all people can afford a climate-friendly lifestyle.					
Comprehensive economic and social system change: Comprehensive economic and social system change is being pursued in Germany in order to achieve a climate-friendly way of life.					

A4: Estimations of the Effect of Perspective-Taking on the Three Behavioral Measures (Chapter 3)

	(1) Donation	(2) Donation	(3) Petition	(4) Petition	(5) Policy approval	(6) Policy approval
Perspective-taking	-0.0285	0.012	-0.0341	-0.0373	0.0306	0.0457
	[-0.245,0.188]	[-0.226,0.250]	[-0.264,0.196]	[-0.294,0.219]	[-0.102,0.163]	[-0.100,0.192]
Disposable income (in EUR)		-0.00000806		-0.000215**		-0.000120***
		[-0.000,0.000]		[-0.000,-0.000]		[-0.000,-0.000]
University degree		0.255*		-0.0204		0.00512
		[0.011,0.500]		[-0.284,0.243]		[-0.145,0.155]
Gender (not male)		0.255*		-0.0204		0.00512
		[0.011,0.500]		[-0.284,0.243]		[-0.145,0.155]
Age		-0.0037		0.0116*		0.00159
		[-0.014,0.007]		[0.001,0.022]		[-0.005,0.008]
Flood experience		-0.155		-0.0495		-0.0753
		[-0.482,0.172]		[-0.398,0.299]		[-0.272,0.121]
Migration background		0.00242		0.0144		-0.0266
		[-0.323,0.328]		[-0.334,0.363]		[-0.226,0.173]
Constant	-0.434***	-0.386	-0.710***	-0.809**	0.456***	0.511***
	[-0.589,-0.279]	[-0.844,0.073]	[-0.875,-0.546]	[-1.291,-0.326]	[0.360,0.551]	[0.233,0.789]
N	557	468	557	468	557	468

*Note: This table shows the estimation results from regressing the impact of the treatment PERSPECTIVE-TAKING on participants' willingness to give up own resources (Donation), give their email address to sign a petition (Petition) and to support structural change (Policy approval). Models (1)–(4) show the coefficients of probit regressions on the likelihood of making a donation or giving their email address to sign a petition. Models (5)–(6) are based on an ordinary least squares regression model that estimates the effect of PERSPECTIVE-TAKING on the average approval of 12 realistic policy measures for climate protection in Germany. 95% confidence intervals are shown in brackets. The symbols *, **, *** indicate significance at p<0.05, p<0.01, and p<0.001, respectively. The coefficient plots at the top of Figure 1 are based on model (2), (4) and (6).*

A5: Estimations on the Effect of Perspective-Taking on the Mediator Variables (Chapter 3)

	(7) Perceived need	(8) Perceived need	(9) Valuing other	(10) Valuing other	(11) Oneness	(12) Oneness
Perspective-taking	0.121	0.116	0.323**	0.509***	0.238*	0.346**
	[-0.016,0.258]	[-0.029,0.260]	[0.116,0.530]	[0.290,0.728]	[0.010,0.466]	[0.094,0.598]
Disposable income (in EUR)		-0.00000152		0.0000554		0.0000861
		[-0.000,0.000]		[-0.000,0.000]		[-0.000,0.000]
University degree		-0.0244		-0.269*		-0.219
		[-0.173,0.125]		[-0.495,-0.043]		[-0.478,0.041]
Gender (not male)		0.159*		0.426***		0.159
		[0.011,0.308]		[0.201,0.651]		[-0.099,0.418]
Age		0.00630*		0.00629		0.00971
		[0.000,0.013]		[-0.003,0.016]		[-0.001,0.021]
Flood experience		0.0258		0.0442		-0.0424
		[-0.169,0.221]		[-0.251,0.340]		[-0.382,0.297]
Migration background		-0.0416		0.139		-0.0826
		[-0.240,0.157]		[-0.161,0.439]		[-0.428,0.263]
Constant	6.425***	6.189***	5.366***	4.843***	2.776***	2.279***
	[6.327,6.524]	[5.913,6.464]	[5.216,5.515]	[4.426,5.261]	[2.612,2.940]	[1.799,2.759]
N	557	468	557	468	557	468

*Note: This table shows the estimation results of an OLS regression estimating the impact of the treatment PERSPECTIVE-TAKING on participants' perception of the flood victim's situation as an emergency (Perceived need), their appreciation of the person's well-being (Valuing other) and their perceived oneness with the flood victim, measured with the IOS scale (Aaron et al. 1992). 95% confidence intervals are shown in brackets. The symbols *, **, *** indicate significance at p<0.05, p<0.01, and p<0.001, respectively. The coefficient plots at the bottom of Figure 1 are based on model (8), (10) and (12).*

A6: Distance Specific Effects of Perspective-Taking on the Behavioral Measures (Chapter 3)

	(1) **Donation** CLOSE	(2) **Donation** FAR	(3) **Petition** CLOSE	(4) **Petition** FAR	(5) **Policy approval** CLOSE	(6) **Policy approval** FAR
Perspective-taking	-0.115	0.151	-0.0863	0.0285	0.0646	0.0288
	[-0.455,0.225]	[-0.193,0.495]	[-0.433,0.261]	[-0.368,0.425]	[-0.134,0.263]	[-0.191,0.248]
Disposable income (in EUR)	-0.0000524	0.0000176	-0.000214*	-0.000206*	-0.000123*	-0.000115*
	[-0.000,0.000]	[-0.000,0.000]	[-0.000,-0.000]	[-0.000,-0.000]	[-0.000,-0.000]	[-0.000,-0.000]
University degree	0.362*	0.165	-0.114	0.122	0.058	-0.0495
	[0.009,0.715]	[-0.184,0.514]	[-0.474,0.246]	[-0.284,0.528]	[-0.148,0.264]	[-0.273,0.174]
Sex (not male)	-0.175	0.149	0.23	0.18	0.297**	0.232*
	[-0.532,0.182]	[-0.200,0.497]	[-0.125,0.585]	[-0.220,0.580]	[0.091,0.503]	[0.008,0.456]
Age	-0.00603	-0.00212	0.00935	0.0142	0.000261	0.00303
	[-0.020,0.008]	[-0.018,0.013]	[-0.005,0.023]	[-0.003,0.031]	[-0.008,0.008]	[-0.007,0.013]
Flood experience	0.139	-0.475*	-0.01	-0.0445	0.0284	-0.149
	[-0.338,0.616]	[-0.943,-0.007]	[-0.507,0.487]	[-0.554,0.465]	[-0.256,0.313]	[-0.429,0.132]
Migration background	-0.136	0.134	-0.205	0.284	-0.111	0.075
	[-0.631,0.359]	[-0.314,0.582]	[-0.699,0.289]	[-0.217,0.785]	[-0.395,0.173]	[-0.214,0.364]
Constant	-0.171	-0.566	-0.467	-1.306***	0.564**	0.443*
	[-0.831,0.488]	[-1.215,0.082]	[-1.123,0.190]	[-2.059,-0.554]	[0.182,0.945]	[0.030,0.855]
N	236	232	236	232	236	232
Equality test for 'Perspective-taking' between CLOSE and FAR	$\chi2(1) = 1.17$, $p = 0.279$		$\chi2(1) = 0.18$, $p = 0.670$		$\chi2(1) = 0.06$, $p = 0.810$	

*Note: This table shows the estimation results from regressing the impact of the treatment PERSPECTIVE-TAKING on the willingness to give up own resource (Donation), give their email address to sign a petition (Petition) and to support structural change (Policy approval). Models (1)–(4) show the coefficients of probit regressions on the likelihood of making a donation or giving their email address to sign a petition. Models (5)-(6) are based on an ordinary least squares regression model that estimates the effect of PERSPECTIVE-TAKING on the average approval of 12 realistic policy measures for climate protection in Germany. 95% confidence intervals are shown in brackets. The symbols *, **, *** indicate significance at p<0.05, p<0.01, and p<0.001, respectively. The coefficient plots at the top of Figure 2 are based on the above models.*

A7: Distance-Specific Effect of Perspective-Taking on the Mediator Variables (Chapter 3)

	(7) Perceived need CLOSE	(8) Perceived need FAR	(9) Valuing other CLOSE	(10) Valuing other FAR	(11) Oneness CLOSE	(12) Oneness FAR
Perspective-taking	0.074	0.139	0.630***	0.395*	0.591***	0.119
	[-0.115,0.263]	[-0.085,0.363]	[0.344,0.916]	[0.056,0.734]	[0.253,0.928]	[-0.247,0.485]
Disposable income (in EUR)	0.0000127	-0.0000296	0.0000538	0.0000528	0.0000955	0.0000883
	[-0.000,0.000]	[-0.000,0.000]	[-0.000,0.000]	[-0.000,0.000]	[-0.000,0.000]	[-0.000,0.000]
University degree	0.0281	-0.0928	-0.105	-0.411*	-0.0887	-0.304
	[-0.168,0.225]	[-0.321,0.135]	[-0.404,0.193]	[-0.756,-0.066]	[-0.440,0.263]	[-0.677,0.068]
Gender (not male)	0.163	0.147	0.349*	0.478**	0.0956	0.226
	[-0.033,0.359]	[-0.082,0.375]	[0.052,0.646]	[0.132,0.823]	[-0.255,0.446]	[-0.148,0.599]
Age	0.00192	0.0118*	0.00241	0.0113	0.00225	0.0185*
	[-0.006,0.010]	[0.002,0.022]	[-0.009,0.014]	[-0.004,0.026]	[-0.012,0.016]	[0.002,0.035]
Flood experience	0.0348	-0.00301	0.136	-0.0334	0.242	-0.237
	[-0.236,0.305]	[-0.289,0.283]	[-0.274,0.546]	[-0.466,0.399]	[-0.241,0.726]	[-0.704,0.231]
Migration background	-0.233	0.139	0.00169	0.323	-0.415	0.341
	[-0.503,0.038]	[-0.156,0.434]	[-0.408,0.412]	[-0.123,0.769]	[-0.899,0.068]	[-0.141,0.823]
Constant	6.323***	6.069***	4.952***	4.702***	2.622***	1.822***
	[5.960,6.686]	[5.648,6.490]	[4.401,5.503]	[4.066,5.339]	[1.973,3.272]	[1.134,2.510]
N	236	232	236	232	236	232
Equality test for 'Perspective-taking' between CLOSE and FAR	$\chi2(1) = 0.19$, $p = 0.666$		$\chi2(1) = 1.13$, $p = 0.288$		$\chi2(1) = 3.69$, $p = 0.058$	

*Note: This table shows the estimation results of an OLS regression estimating the impact of the treatment PERSPECTIVE-TAKING on participants' perception of the flood victim's situation as an emergency (Perceived need - Model (7)-(8)), their appreciation of the person's well-being (Valuing other - Model (9)-(10)) and their perceived oneness with the flood victim (Oneness - Model (11)-(12)), measured with the IOS scale (Aaron et al. 1992). 95% confidence intervals are shown in brackets. The symbols *, **, *** indicate significance at p<0.05, p<0.01, and p<0.001, respectively. The coefficient plots at the bottom of Figure 2 are based on these models.*

A8: Estimations of the Effect of IRI Subscales Empathic Concern and Perspective-Taking on the Three Behavioral Measures
(Chapter 3)

	(1) Donation	(2) Petition	(3) Policy approval	(4) Donation	(5) Petition	(6) Policy approval
IRI subscale Empathic concern	0.0661*	0.0922**	0.0685***			
	[0.016,0.117]	[0.037,0.148]	[0.039,0.098]			
IRI subscale Perspective-tak.				0.0382	0.0541*	0.0651***
				[-0.010,0.086]	[0.001,0.107]	[0.037,0.094]
Disposable income (in EUR)	-0.00000921	-0.000224***	-0.000124***	-0.0000135	-0.000224***	-0.000129***
	[-0.000,0.000]	[-0.000,-0.000]	[-0.000,-0.000]	[-0.000,0.000]	[-0.000,-0.000]	[-0.000,-0.000]
University degree	0.269*	0.00123	0.0157	0.256*	-0.0166	0.00288
	[0.023,0.516]	[-0.265,0.267]	[-0.131,0.163]	[0.011,0.501]	[-0.281,0.247]	[-0.144,0.150]
Gender (not male)	-0.111	0.0664	0.166*	-0.0334	0.176	0.244**
	[-0.366,0.143]	[-0.204,0.337]	[0.014,0.317]	[-0.278,0.212]	[-0.084,0.435]	[0.098,0.390]
Age	-0.00421	0.0117*	0.00109	-0.00385	0.0118*	0.00126
	[-0.015,0.006]	[0.001,0.022]	[-0.005,0.007]	[-0.014,0.007]	[0.001,0.022]	[-0.005,0.007]
Flood experience	-0.146	-0.0352	-0.0669	-0.148	-0.0502	-0.0695
	[-0.474,0.181]	[-0.388,0.317]	[-0.259,0.125]	[-0.474,0.178]	[-0.401,0.301]	[-0.262,0.123]
Migration background	-0.0673	-0.0748	-0.0967	-0.01	-0.00347	-0.0419
	[-0.399,0.265]	[-0.432,0.282]	[-0.295,0.101]	[-0.337,0.317]	[-0.355,0.348]	[-0.238,0.154]
Constant	-1.265**	-2.096***	-0.369	-0.917*	-1.611***	-0.376
	[-2.070,-0.459]	[-2.988,-1.204]	[-0.839,0.101]	[-1.724,-0.111]	[-2.497,-0.725]	[-0.853,0.100]
N	468	468	468	468	468	468

*Note: This table shows the estimation results from regressing the impact of the personality traits Empathic Concern and Perspective-taking (IRI subscales) on participants' willingness to give up own resources (Donation), give their email address to sign a petition (Petition) and to support structural change (Policy approval). Models (1), (2), (4) and (5) show the coefficients of probit regressions on the likelihood of making a donation or giving their email address to sign a petition. Models (3) and (6) are based on an ordinary least squares regression model that estimates the effect of Empathic Concern and Perspective-taking on the average approval of 12 realistic policy measures for climate protection in Germany. 95% confidence intervals are shown in brackets. The symbols *, **, *** indicate significance at p<0.05, p<0.01, and p<0.001, respectively.*

A9 Treatment (Chapter 4)

Business case treatment

We now present you with important information regarding environmental sustainability in the context of business or other organizations. Please read it very carefully!

Once businesses start looking closely and in a holistic manner at their relationship with the environment, they usually recognize that there are many opportunities where more environmentally sustainable practices can serve the firm's financial profitability, in the short or long term. This is called the "business case" for sustainability.

Please carefully watch this video about the issue:

This video was shown to participants:
https://www.youtube.com/watch?v=KlW8-WW0k3g&feature=youtu.be

Following up on what you heard in the video, of course the specific "business case for sustainability" depends very much on the sector of a company, its production sites and processes, as well as the context of its activities - for instance its stakeholders, regulation, and level of public exposure.

Here are a few examples:
Securing natural resources can become a major factor for long-term profitability:

- The chemical industry is highly dependent on raw materials from both renewable and non-renewable resources. The suppliers of these raw materials, in turn, are dependent on sustainable provision of (clean) water or wood.
- The pharmaceutical industry needs biodiversity (in particular genetic diversity) for the development of new enzymes and micro-organisms.
- Pollination from bees and insects is essential for at least one third of the world's crop production. Protecting the pollinators and their habitats is thereby important for productivity of agricultural producers as well as for the industry and retailers in the food sector.

Good environmental performance is often essential for positive and beneficial relation with stakeholders:

- Regulators will be more likely to consider requests for access to resources or new production sites.
- Lenders will regard environmental performance for access to credit and good credit conditions.
- Consumers are more likely to purchase from a company with a positive image.
- Employees are more motivated to work for a sustainable company, and excellent employees are more likely to join.

By integrating environmental sustainability companies can limit strategic risks and prepare for the future:

- Companies can better adapt to environmental trends, such as climatic changes (e.g., switch agricultural crops) or resource scarcities.
- Companies are able to better anticipate new regulations and adapting to them early will give them a competitive advantage on the market.
- Companies are more likely to come up with green innovations (products and services) that meet consumer demands and are supported by policy.
- Companies are less likely to run into an environmental accident with large-scale consequences (compensation payments, consumer boycotts, etc.).

Now, we would like you to spend some time considering where could be a business case for improving environmental performance in a company or organization where you are currently working or have worked in the past. You can of course look at the examples and see which ones apply to your company, but feel free to think beyond.

Please describe two concrete examples. Be as specific as possible.

Free space

Since this is an important part of the study we would like to make sure that you spend time to think about it. After 10 minutes the button to continue will appear.

Responsibility treatment

We now present you with important information regarding environmental sustainability in the context of business or other organizations. Please read it very carefully!

Many people are concerned about the environment. Preserving the integrity of the environment and nature on our planet is even seen as a matter of concern for the long term survival of humanity.

Once businesses start looking closely and in a holistic manner at their relationship with the environment, they usually recognize that by the way they source and produce goods and services, they have a significant impact on many aspects of the environment.

Please watch this video about sustainability:

This video was shown to participants:
https://www.youtube.com/watch?v=B5NiTN0chj0&feature=youtu.be

As you saw in the video, meeting the needs of the present generations without compromising future generations' ability to meet their needs is the core challenge formulated by the idea of "Sustainable Development": In that sense , companies as social actors have a responsibility to consider the interests of those who are not born yet but will be affected by the actions taken today.

A company can be seen as a 'corporate citizen' with similar responsibilities towards other members of society like other citizens. Overall, a companies' 'license to operate' depends on its positive contribution to society within which it is operating.

Moreover, nature of course also has an intrinsic value, which needs to be respected within all human activities.

Since companies form part of a society and need to ensure their license to operate, they have a responsibility to contribute to sustainable development by making their corporate activities as sustainable as possible. They have a duty to protect the biosphere they operate in.

Of course the specific responsibility to better integrate environmental protection depends very much on the sector of a company, its production sites and processes, as well as the context of its activities - for instance the stakeholders, regulation, and level of public exposure.

Here are a few examples:

Through their environmentally-relevant performance, companies have an enormous influence on the well-being of stakeholders and on nature:

- Local communities may be affected by exposure to pollution or chemicals in water and develop related health problems.
- Water scarcity may occur due to irrigation of agricultural lands or industrial water use.
- The consumption of fossil fuel energies contributes largely to climate change, air pollution and the transformation of large areas of land. Intensive agriculture is associated with heavy fertilizer and pesticide use that damages soil and water bodies.
- Growing monocultures is a major threat to biodiversity and weakens the resilience of ecosystems.

Reducing negative impacts on people and nature is of tremendous importance: The polluter-pays principle is already established in many policies and liability schemes, but in many jurisdictions there is still room for improvement, especially in global operations. Thus, companies need to act beyond their legal obligations.

Now, we would like you to spend some time considering where and why your own company or organization has a responsibility towards its stakeholders, society at large or nature, to improve environmental performance and stewardship. You can of course look at the examples and see which ones apply to your company or organization, but feel free to think beyond.

Please write down two concrete examples. Be as specific as possible.

Free space

This is a very important part of the study, so we want to make sure that you spend time to think about it. After 10 minutes the button to continue will appear.

A10: Results of the linear regression for the belief variable (Chapter 4)

	Belief regarding how difficult it is to engage businesses in sustainability efforts
T_{BC}	-0.04
(1 = yes)	(0.26)
T_{RESP}	-0.71***
(1 = yes)	(0.26)
Private sector employment	-0.08
(1 =yes)	(0.25)
Decision competency	0.04
(0 = none to 4 = in four domains)	(0.08)
Experience with sustainability	0.17**
(0 = none to 6 = expert)	(0.08)
Gender	0.06
(1 = male)	(0.23)
Age	-0.01
(in years)	(0.01)
Political orientation	0.09
(-3 = strongly left-wing to 3 = strongly right-wing)	(0.08)
Constant	3.71***
	(0.51)
Observations	206
R-square	0.091
Adjusted R-square	0.055
F-value	2.491**

Note: Regression coefficient presented in the first line. Single, double and triple asterisks (, **, and ***) denote $p < 0.10, 0.05$, and 0.01, respectively. Standard errors in parentheses. Reference category is the control group.*

A11: Balancing table (Chapter 5)

	(1) Close		(2) Far Germany		(3) Far Global		t-test Difference	t-test Difference	t-test Difference
Variable	**N**	**Mean/SE**	**N**	**Mean/SE**	**N**	**Mean/SE**	**(1)-(2)**	**(1)-(3)**	**(2)-(3)**
Age	130	35.977	116	34.310	123	33.854	1.667	2.123	0.457
		[1.145]		[1.157]		[1.039]			
Gender (not male)	134	1.590	123	1.520	126	1.508	0.069	0.082	0.012
		[0.048]		[0.049]		[0.049]			
Disposable income (in EUR)	118	1,740.466	105	1,617.857	103	1,743.932	122.609	-3.466	-126.075
		[99.833]		[101.821]		[105.605]			
Migration background	132	0.152	118	0.246	121	0.182	-0.094*	-0.030	0.064
		[0.031]		[0.040]		[0.035]			
Interpersonal Reactivity Index (IRI)	134	3.516	123	3.577	126	3.535	-0.062	-0.020	0.042
		[0.043]		[0.045]		[0.048]			
New Ecological Paradigm (NEP)	134	5.421	123	5.388	126	5.351	0.032	0.070	0.037
		[0.070]		[0.076]		[0.087]			
Racism	130	2.149	115	2.145	120	2.381	0.004	-0.232	-0.236
		[0.095]		[0.101]		[0.117]			
Political orientation	131	5.107	120	5.142	113	5.204	-0.035	-0.097	-0.062
		[0.142]		[0.171]		[0.172]			
Flood experience	134	0.157	122	0.172	125	0.224	-0.015	-0.067	-0.052
		[0.032]		[0.034]		[0.037]			
Education	134	5.918	123	5.878	126	5.905	0.040	0.013	-0.027
		[0.108]		[0.115]		[0.123]			
Job	134	4.366	123	4.285	126	4.373	0.081	-0.007	-0.088
		[0.129]		[0.151]		[0.127]			
F-test of joint significance (F-stat)							0.294	0.786	0.750
F-test, number of observations							206	201	187

Note: The value displayed for t-tests are the differences in the means across the groups. The value displayed for F-tests are the F-statistics. ***, **, and * indicate significance at the 1, 5, and 10 percent critical level. SE denotes standard errors (in brackets).

A12: Regression results with sociodemographic controls and expected state aid (Chapter 5)

	(1) Donation	(2) Donation	(3) Petition	(4) Petition	(5) Policy approval	(6) Policy approval
Far Global	-0.0929	-0.0645	-0.493*	-0.534*	-0.0683	-0.0218
	(-0.51)	(-0.30)	(-2.51)	(-2.36)	(-0.65)	(-0.18)
Far Germany	0.245	0.245	-0.0149	-0.0162	0.129	0.128
	(1.38)	(1.38)	(-0.08)	(-0.09)	(1.23)	(1.22)
Disposable income (in EUR)	-0.0000556	-0.0000548	-0.000108	-0.000108	-0.000131**	-0.000129**
	(-0.75)	(-0.74)	(-1.35)	(-1.36)	(-3.01)	(-2.96)
Flood experience	-0.0243	-0.0234	0.0107	0.00922	-0.0576	-0.0557
	(-0.13)	(-0.12)	(0.05)	(0.05)	(-0.51)	(-0.50)
Migration background	-0.183	-0.184	0.280	0.282	0.0420	0.0408
	(-0.94)	(-0.95)	(1.41)	(1.42)	(0.37)	(0.36)
University degree	0.545***	0.540***	0.215	0.223	0.112	0.103
	(3.52)	(3.46)	(1.33)	(1.37)	(1.23)	(1.12)
Gender (not male)	-0.00966	-0.00824	0.0459	0.0446	0.274**	0.277**
	(-0.06)	(-0.05)	(0.29)	(0.28)	(3.11)	(3.13)
Age	-0.00131	-0.00127	0.0186**	0.0185**	0.00650	0.00653
	(-0.21)	(-0.20)	(2.88)	(2.87)	(1.78)	(1.79)
Expected state aid		0.0142		-0.0216		0.0236
		(0.25)		(-0.37)		(0.73)
Constant	-0.469	-0.542	-1.125***	-1.016*	0.326*	0.207
	(-1.66)	(-1.35)	(-3.77)	(-2.44)	(1.98)	(0.89)
N	315	315	315	315	315	315
p: Far Germany = Far Global	0.066	0.149	0.016	0.020	0.070	0.238

*Note: This table shows the estimation results from regressing the impact of the treatment conditions Far Global and Far Germany on the willingness to participate in mitigation actions, measured by three mitigation variables: Donation, Petition, and Policy approval. Model (1)–(2) and (4)–(5) show the coefficients probit regressions on the likelihood of a donation or petition. Models (5)-(6) are based on ordinary least squares regression models estimating the effect of the treatment conditions on the average approval of 12 realistic policy measures for climate protection in Germany. Model (2), (4) and (6) include as additional control the expected aid. Standard errors are indicated in parentheses. The symbols *, **, *** indicate significance at p<0.05, p<0.01, and p<0.001, respectively.*

Model (1), (3) and (5) correspond with Model (4)-(6) of Table 1 in the main text. Model (2), (4) and (6) control in addition for participants' expectations about whether the flooding victims will receive support through the state. As one can see, adding state aid as a further control did not impact our findings. There remains a significant negative effect of $T_{\text{Far Global}}$ on the willingness to sign the petition.

A13: Regression results with interaction terms for high racism (Chapter 5)

	(1) Donation	(2) Petition	(3) Policy approval
Far Global	-0.0245	-0.442*	-0.00937
	(-0.13)	(-2.14)	(-0.09)
Far Germany	0.308	-0.0205	0.210
	(1.67)	(-0.11)	(1.95)
High racism	-0.366	-0.223	-0.129
	(-0.77)	(-0.46)	(-0.51)
Far Global # High racism	-0.580	-0.362	-0.337
	(-0.82)	(-0.50)	(-1.02)
Far Germany # High racism	-0.828	0.116	-0.780*
	(-1.11)	(0.18)	(-2.20)
Disposable income (in EUR)	-0.0000441	-0.0000970	-0.000126**
	(-0.58)	(-1.21)	(-2.94)
Flood experience	0.0342	0.0391	-0.0210
	(0.18)	(0.19)	(-0.19)
Migration background	-0.192	0.277	0.0534
	(-0.97)	(1.39)	(0.48)
University degree	0.477**	0.170	0.0571
	(3.00)	(1.02)	(0.63)
Gender (not male)	-0.0512	0.0340	0.235**
	(-0.33)	(0.21)	(2.71)
Age	-0.0512	0.0340	0.235**
	(-0.33)	(0.21)	(2.71)
Constant	-0.459	-1.129***	0.313
	(-1.57)	(-3.72)	(1.91)
N	315	315	315
p: Far Germany = Far Global	0.088	0.048	0.054
p: Far Germany # High racism = Far Global # High racism	0.753	0.432	0.183

*Note: This table shows the estimation results from regressing the treatment conditions Far Global and Far Germany on the willingness to participate in mitigation actions, under consideration of an interaction with the dummy variable High racism, taking the value one when the individual's score was above the 90th percentile on the racism index. The three mitigation variables were Donation (Model(1)), Petition (Model(2)), and Policy approval (Model(3)). Standard errors are indicated in parentheses. The symbols *, **, *** indicate significance at p<0.05, p<0.01, and p<0.001, respectively.*

A14: Racism as predictor for mitigation actions (Chapter 5)

	(1)	(2)	(3)
	Donation	**Petition**	**Policy approval**
Racism	-0.243***	-0.175*	-0.208***
	(-3.32)	(-2.31)	(-5.61)
Disposable income (in EUR)	-0.0000487	-0.000140	-0.000140***
	(-0.63)	(-1.71)	(-3.33)
Flood experience	0.0807	0.0216	-0.0112
	(0.41)	(0.10)	(-0.10)
Migration background	-0.197	0.238	0.0357
	(-1.00)	(1.18)	(0.33)
University degree	-0.197	0.238	0.0357
	(-1.00)	(1.18)	(0.33)
Gender (not male)	-0.0835	-0.0470	0.190*
	(-0.54)	(-0.29)	(2.23)
Age	0.00128	0.0231***	0.00855*
	(0.20)	(3.46)	(2.42)
Constant	0.0705	-0.915**	0.822***
	(0.23)	(-2.84)	(4.89)
N	306	306	306

*Note: This table shows the estimation results from regressing the impact of racism on the willingness to participate in mitigation actions, measured by three mitigation variables: Donation (Model(1)), Petition (Model(2)), and Policy approval (Model(3)). Standard errors are indicated in parentheses. The symbols *, **, *** indicate significance at p<0.05, p<0.01, and p<0.001, respectively.*