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From Perception to Collective Action: The Role of Perceived Responsibility and Efficacy in Driving Pro-Environmental Intentions

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Abstract

Climate change, with its escalating impacts, necessitates coordinated efforts from all societal levels. Individual actions alone are insufficient to address the magnitude of this global issue; thus, collective action from governments, businesses, NGOs, and civilians is crucial. This thesis explores how perceptions of other societal actors' actions and responsibilities influence individuals' pro-environmental behavior intentions (PEBI). Utilizing a cross-sectional survey of Dutch participants, the study finds that higher perceptions of remedial responsibility among the government, the financial sector, and the Dutch population significantly predict higher PEBI, while perceptions of businesses' responsibility predict lower PEBI. The study reveals that collective response efficacy beliefs mediate these relationships, highlighting the importance of empowering individuals through collective action narratives. These findings provide insights for policymakers and communicators to design effective interventions and foster public engagement in climate action by emphasizing collective efficacy and the pivotal roles of key societal actors.

Keywords: pro-environmental behavior, remedial responsibility, perception of actors, self-efficacy, collective response efficacy

Contents

Introduction

Across the globe climate change is happening. The first negative consequences are already being felt and these effects will only get worse. As these effects intensify, the need for coordinated efforts becomes more apparent. Collective action is not just beneficial but necessary to address these escalating challenges (Intergovernmental Panel on Climate Change [IPCC] et al., 2023). Climate change is inherently a collective issue that requires action from all levels of society. Individual efforts alone are insufficient to address the magnitude of the problem; it necessitates coordinated actions from governments, businesses, industries, non-governmental organizations (NGOs), civilians, and other societal groups.

Recognizing collective action as a collection of individual behaviors and understanding the motivation and intentions behind pro-environmental actions becomes crucial. When motivations and intentions behind pro-environmental behaviors are better understood, actions can be taken to help mitigate climate change. Policies can be written and interventions can be introduced to help people act pro-environmentally.

Transitioning from the necessity of understanding motivations and intentions, it's important to note that understanding and predicting the underlying processes involves considering various factors. Generally, other people and their behavior are one of the strongest cues that influence the importance of one's own normative goal –to behave appropriately, and conform to social norms and rules– (Steg & De Groot, 2019). Therefore, an important factor influencing people's intention to act pro-environmentally is the perception of others' actions. Perceptions of others can have different effects depending on the entity "others" refers to. Others could mean other individuals, but others could also refer to other groups in society. In this thesis, the term "others" refers to main societal actor groups like government, business, industry, NGOs,

etc (Intergovernmental Panel on Climate Change [IPCC] et al., 2023). Perception of others helps people base their actions on what is perceived as normal or custom (Steg & De Groot, 2019). What is normal behavior is represented in a social norm, these norms can be descriptive (what other people do in certain situations) or injunctive (what people approve or disapprove of) and provide people with information on how to behave (Steg & De Groot, 2019). In the realm of pro-environmental behavior, the injunctive norm describes that people across the globe approve of taking climate action (Ritchie & Roser, 2024). In the context of pro-environmental behaviors descriptive norms would entail the actions others are taking to help mitigate climate change, the perception of these actions will therefore play an important role in determining the pro-environmental behavior intentions (PEBI) of people by shaping the descriptive norm. In this study, we will measure the descriptive norm on climate change mitigation using people's perceptions of other actors's actions on mitigating climate change.

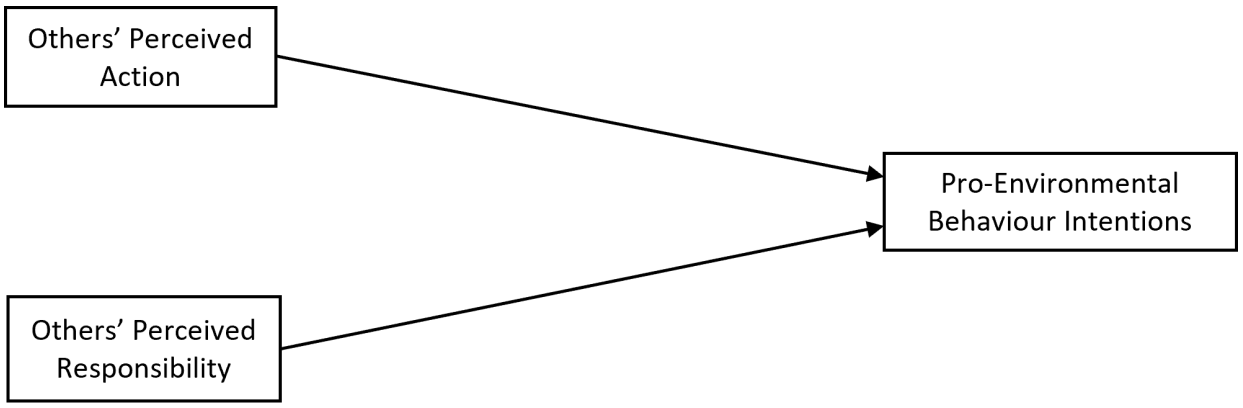
Next to perceptions of others's actions, perceptions of others' responsibilities have been shown to influence people's motivation to engage in pro-environmental behaviors (Buchanan & Russo, 2015; Davydova et al., 2018). Perceptions of the environmental responsibility of others, like organizations, can positively influence peoples' environmental self-identity, which in turn increases PEBI (Van Der Werff et al., 2021). On the other hand, if others do not live up to their environmental responsibilities people may also increase their pro-environmental efforts, to make up for the perceived shortcomings (Buchanan & Russo, 2015).

This study explores the interplay between perceptions of other main societal actors' actions and responsibility with individuals' PEBI (See Figure 1). Therefore, the first question this thesis aims to answer is

RQ1: How are pro-environmental behavior intentions influenced by the perception of other main societal actors' actions and responsibilities?

Figure 1

A Simple Visual Representation of the Influence of Perception of Others' Actions and Responsibilities on PEBI



Perceptions of Other Main Societal Actors' Actions

To test our theoretical reasoning, the effect of the perception of other main societal actors' actions on PEBI will be investigated first. We hypothesize that high perceptions of other main societal actors' actions lead to lower PEBI. The theoretical basis for this reasoning lies in two concepts from social psychology, the bystander effect and social loafing. The bystander effect is a phenomenon wherein individuals are less likely to help a victim when other people are present, often due to a diffusion of responsibility (Darley & Latané, 1968). In environmental psychology, this could translate into a scenario where individuals might feel less inclined to engage in pro-environmental actions if they perceive that others are not taking action either,

assuming that responsibility is shared among many (Darley & Latané, 1968). Social loafing can be defined as the decrease in an individual's effort if multiple people are involved in solving a task. In other words, people perceive others are taking action, so they do not feel the need to act and 'free-ride'. The effect size of social loafing depends on certain social and situational factors. Some of these include; members' input in the task not being noticeable, members not being evaluated on their performance on the task, the task at hand being of an interdependent nature and members feeling like other members are also putting in less effort (Johnson & Johnson, 2015). In the perspective of the current study, if other societal actors are perceived as taking action, individuals might use the opportunity to free-ride, especially if the societal actors are more influential in systematic change, like the government or businesses. This results in the individual showing less intention to act pro-environmentally. Using this literature we address the first part of our research question with the following hypothesis (See Figure 2).

H1a: High perception of other main societal actors' actions leads to lower PEBI.

Perceived Responsibility

Another factor influencing people's pro-environmental behavior intentions through the perception of others is the perception of others' responsibilities. Responsibility can be clustered into two different types when concerning environmental responsibility. The first type is causal responsibility, which refers to the responsibility attributed to an actor or actors for causing a problem. In the context of environmental issues, this responsibility is often attributed to those whose actions are perceived to have directly contributed to climate change (Davydova et al., 2018). The second type is the remedial responsibility, this type of responsibility concerns the attribution of responsibility for fixing or mitigating the problem. Remedial responsibility can include governments, businesses, industries NGOs, and civilians perceived as having the

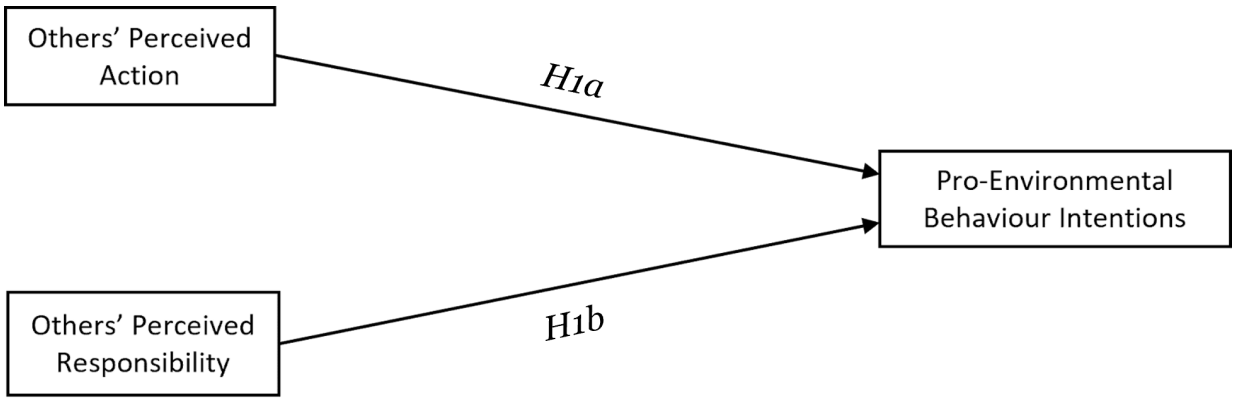
capacity to enact change or influence policies for environmental conservation (Davydova et al., 2018).

Both of these types of perceived responsibility of others have the potential to influence the pro-environmental behavior intentions of individuals. When the perceived remedial responsibility of a main societal actor is high, individuals often engage in self-serving denial, rejecting personal liability or responsibility (Birchall & Kehler, 2023). This behavior arises from the belief that their individual contribution to problems is undetectable, viewing environmental issues as outcomes of collective decisions rather than individual actions (Lindenberg & Steg, 2007) This form of denial is reinforced by a sense of powerlessness and the belief that others (e.g., government or other individuals) are responsible for taking action. This behavior concerning environmental issues is also known as a type of denial of self-involvement called displacing responsibility. In which individuals identify others (e.g. higher authorities) as legitimate decision-makers responsible for environmental problems (Opotow & Weiss, 2000). From the perspective of the current study, we expect that perceiving other societal actors as having a big responsibility in mitigating climate change, an individual will likely displace their personal responsibility for taking climate action and therefore show less intention to act. This reasoning (see Figure 2) leads us to:

H1b: A high perception of other main societal actors' responsibility leads to lower PEBI.

Figure 2

Hypotheses Included in the Visual Representation of the Theoretical Framework



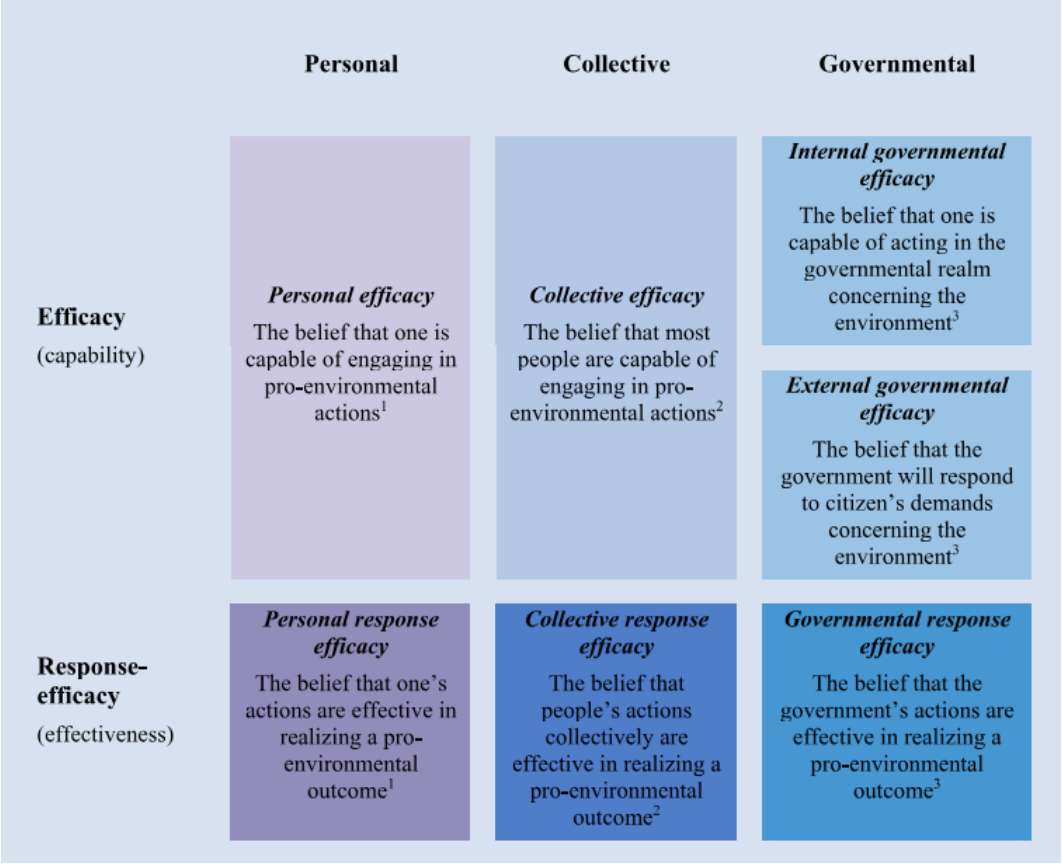
The Role of Efficacy Beliefs

If both our hypotheses are supported it would suggest that perceptions of others could only have negative effects. This could prove to be problematic for policymakers and addressing the climate issue as a whole, as people often look to others in times of crisis (Hungerford & Cleary, 2021). On the other hand, research has also shown that perceiving others as caring about the environment and taking action can motivate people to act pro-environmentally themselves (Bouman & Steg, 2022). Perceiving others taking action can create a chain reaction where multiple people and actors take more and more action. This 'spiral of action' is a self-maintaining and self-reinforcing process through which climate action can be promoted (Bouman & Steg, 2022). An important factor within this model of the 'spiral of action' and its counterpart the 'spiral of inaction' –the self-maintaining and self-reinforcing process of climate inaction as a consequence of perceiving others do not care– (Bouman & Steg, 2022) and people's motivation to act pro-environmentally is people's efficacy beliefs. Efficacy beliefs are a strong predictor of pro-environmental behavior, even stronger than people's risk perception of climate change (Meijers et al., 2023; Van Valkengoed et al., 2023).

Efficacy can be defined in the Personal-Collective-Governmental typology (PCG), where it can be divided into 2 main categories; efficacy beliefs reflect the capability of engaging in action and response efficacy beliefs represent the effectiveness of this behavior for addressing the problem (Meijers et al., 2023). Efficacy and response efficacy can be further divided into 3 subtypes, personal, collective, and governmental. In this definition personal (response) efficacy refers to the belief regarding oneself, collective (response) efficacy refers to the beliefs regarding most people and governmental (response) efficacy refers to beliefs regarding the government. (Meijers et al., 2023). See Figure 3 for an overview of the different defined subtypes of efficacy beliefs. For the current study, we will mainly focus on collective efficacy, collective response efficacy, self-efficacy, and self-response efficacy.

Figure 3

An Overview of the Different Efficacy Definitions within the Personal-Collective-Governmental Typology (PCG).



Note: *Reprinted from "Introducing and testing the personal-collective-governmental efficacy typology: How personal, collective, and governmental efficacy subtypes are associated with differential environmental actions" by M. H. C. Meijers, 2023, Journal of Environmental Psychology, 85, Article 101915, https://doi.org/10.1016/j.jenvp.2022.101915. © 2022 The Authors. Published by Elsevier Ltd. CC BY 4.0 (http://creativecommons.org/licenses/by/4.0/).*

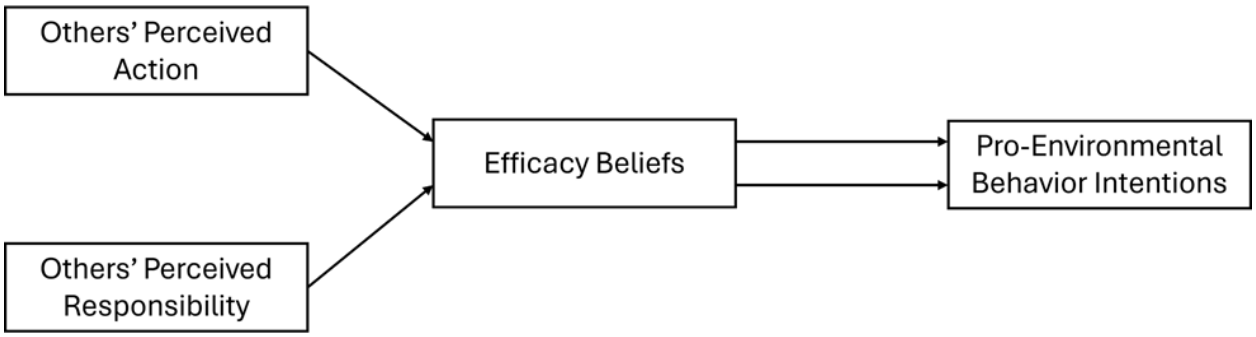
Efficacy beliefs could play an important role in motivating people to act more pro-environmentally as they are a strong predictor of pro-environmental behavior. Between efficacy and response efficacy, the latter has been shown to have a stronger effect on people's PEBI. In both the private and public spheres pro-environmental behavior intentions and policy support were more strongly affected by response efficacy (Meijers et al., 2023). Especially, stronger government and collective response efficacy beliefs and personal self-efficacy beliefs are both directly and indirectly associated with greater support for reducing the risks of climate change, regardless of an individual's ideology and causal beliefs about climate change (Bostrom et al., 2018; Van Valkengoed et al., 2023). Using this framework we aim to answer the second research question:

RQ2: How do efficacy beliefs influence the relationship between pro-environmental behavior intentions and the perception of other main societal actors' actions and responsibilities?

Where in the first model we hypothesize these relationships to be negative, we hypothesize the presence of efficacy beliefs to reverse this effect. In our second model, we expect efficacy to positively mediate the relationship between the perception of other main societal actors' actions and responsibilities with peoples' PEBI (See Figure 4 for a visual representation).

Figure 4

A Simple Visual Representation of the Influence of Perception of Others' Actions and Responsibilities on PEBI, and the Mediating Effect of Efficacy Beliefs



Efficacy and the Perception of Others' Actions

As discussed, efficacy beliefs are important predictors of an individual's PEBI. Therefore, we expect them to mediate in our new model. When looking at the effect efficacy beliefs can have on the relationship between others' perceived actions and peoples' PEBI, we hypothesize (See Figure 5):

H2a: High perception of other main societal actors' actions enhances efficacy beliefs, thereby increasing PEBI.

Observing others engage in pro-environmental actions can significantly boost an individual's intentions to behave similarly. According to Jugert et al. (2016), this phenomenon is mediated by the concept of collective efficacy, which when enhanced, increases individual self-efficacy. Essentially, when people see their group as capable of making environmental changes, by already engaging in pro-environmental behaviors, thereby forming the descriptive norm to act pro-environmentally (Steg & De Groot, 2019). This makes individuals feel more empowered and capable themselves. This sense of empowerment comes from a social identity

perspective, suggesting that one's actions are part of an effective collective effort. This psychological empowerment leads individuals to perceive their actions as integral to the group's success in combating environmental issues, thus motivating them to adopt pro-environmental behaviors.

Efficacy and the Perception of Others' Responsibilities

Not only do we expect efficacy beliefs to have an impact on the relationship between the perceived actions of other main societal actors and people's PEBI, but we also expect efficacy to mediate the relationship between the perceived responsibilities and PEBI. We hypothesize (See Figure 5):

H2b: A high perception of other main societal actors' remedial responsibility enhances efficacy beliefs, thereby increasing PEBI.

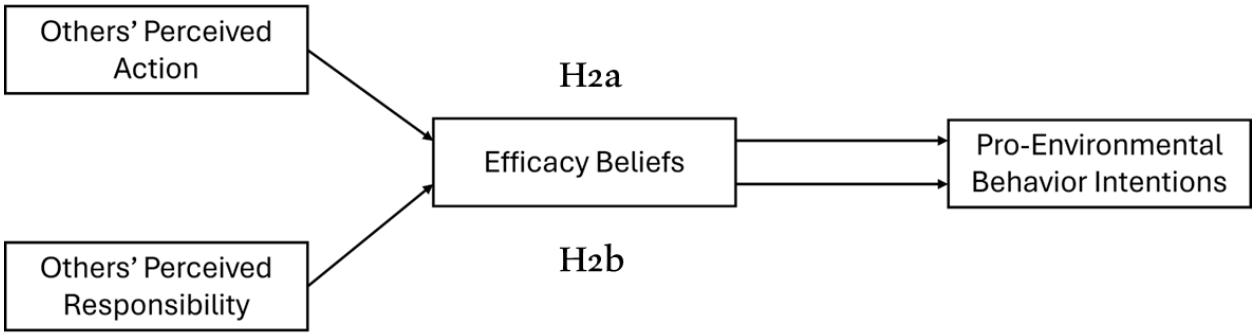
Davydova et al. (2018) discovered that attributing remedial responsibility to governmental entities positively mediated perceived collective efficacy. Remedial attributions tend to strengthen perceived control because attributing mitigation responsibility focuses on solutions and remedies, which can make the problem seem more manageable and solvable. When people believe that these actors are responsible for taking action, they feel that there are mechanisms and resources in place to tackle the issue. This perception can lead to increased confidence in collective efforts to combat climate change. When people believe that these actors not only have a responsibility but also the capability to mitigate climate change, it enhances confidence in collective efforts to manage the environmental crisis. This form of attribution emphasizes solutions and actions rather than mere blame. In contrast, attributions about who caused the problem do not inherently carry implications of solution or resolution. Knowing who caused the problem might increase awareness and concern, but it doesn't directly translate to

action or control. If people believe the government caused the problem, it might also invoke feelings of distrust or skepticism about the government's willingness or ability to address the issue effectively.

Davydova et al. (2018) suggest that remedial responsibility is a stronger mediator of perceived control than causal responsibility because it directly ties responsibility to actionable outcomes and solutions, rather than just identifying a problem source.

Figure 5

Hypotheses Included in the Visual Representation of the Influence of Perception of Others' Actions and Responsibilities on PEBI, and the Mediating Effect of Efficacy Beliefs



Methods

Participants

The participant sample consisted of 159 adult volunteers aged 18 years or older, currently working or residing in the Netherlands, fluent in English, and willing to provide informed consent. Participants were recruited between May 17, 2023, and June 11, 2023, through two main channels: the first-year Psychology SONA-practicum pool, an online recruitment platform

from the Rijksuniversiteit Groningen, and convenience sampling within the researcher's social circles via shared invitation messages on LinkedIn, Facebook, Instagram, and WhatsApp. First-year psychology students received 0.6 SONA credits for their participation. Participants were excluded if they did not complete the questionnaire, failed the attention check, or completed the survey in less than 3 minutes. After exclusions, 106 respondents remained.

Design

The study employed a cross-sectional survey design with an experimental manipulation, allowing exploration of the effects of framing on participants' perceptions of societal actors' actions and responsibilities, their efficacy beliefs, and Pro-Environmental Behavior Intentions (PEBI). Participants were randomly assigned to one of two manipulation conditions In both conditions, participants were asked to read seven statements from recent news articles framed to show positive or negative climate action facts by Dutch and European governments and businesses After reading the framed statements, participants completed the survey by first answering questions about their perceptions of other societal actors' remedial responsibility, followed by their perceptions of these actors' actions to mitigate climate change. Next, participants rated the response efficacy in mitigating climate change of these societal actors and finally, participants rated their pro-environmental (advocacy) behavior intentions.

Manipulation

Participants were randomly assigned to one of two conditions: a negative frame, which emphasized the inaction of various actors, or a positive frame, which highlighted the actions already being taken by different actors. Each condition consisted of seven statements displayed on a single page. For example, a positive framed statement could look like this: *"The climate law*

sets the target for a reduction of 55 percent by 2030, which means climate goals might be within reach for the first time. Source: NOS". See Appendix A for the complete list of statements used. Of our participants, 49 were assigned to the negative frame condition and 57 to the positive frame condition. By manipulating the perception of other main societal actors' actions we intend to manipulate the descriptive norm regarding taking pro-environmental action (Steg & De Groot, 2019). In doing so we aim to investigate if this hypothesized change in norm perception changes people's PEBI. Additionally, we test if our manipulation is a viable strategy to change people's perception of others' actions.

Power Analysis

A power analysis was conducted using the pwr package in R for detecting a medium effect size (0.3) in a one-way ANOVA between the two manipulation groups. 45 respondents were needed for each group to detect a medium effect with 0.05 significance and 80% power. Our sample size satisfied the requirement.

Measures

Perceptions of Other Main Societal Actors' Actions

For our first independent variable, participants evaluated the current climate change mitigating actions of societal actors (government, financial sector, businesses, environmental NGOs, media, and the Dutch population) on a 7-point Likert scale ranging from "not at all" to "to a great extent." They were asked, "To what extent are the following actors currently taking action to limit climate change?" Then to construct a general measure for all actors combined, the

total mean score for Others' Perceived Action was calculated by averaging the individual scores across all actors (α = 0.78, M = 3.76, SD = 0.83).

Perceptions of Other Main Societal Actors' Remedial Responsibility

For our second independent variable, participants assessed the remedial responsibility for limiting climate change of societal actors (government, financial sector, businesses, environmental NGOs, media, and the Dutch population) on a 7-point Likert scale from "not at all" to "to a great extent". They answered the question: "To what extent are the following actors responsible for taking action to limit climate change?" To construct a general measure for all actors combined the total mean score for Others' Perceived Remedial Responsibility was calculated by averaging the individual responsibility scores for the different actors (α = 0.86, M = 5.28, SD = 1.17).

Collective Response Efficacy

As discussed, collective efficacy beliefs can mediate the relationship between observing others engaging in pro-environmental actions and an individual's intentions to behave similarly (Jugert et al., 2016). Additionally, collective response efficacy is a stronger predictor for PEBI than collective efficacy (Meijers et al., 2023), therefore our design employs measures for collective response efficacy as the mediating variable.

For our mediating variable, participants rated the response efficacy of six societal actors (government, financial sector, businesses, environmental NGOs, media, and the Dutch population) in limiting climate change on a 7-point Likert scale ranging from "not at all" to "to a great extent". They answered the question: "To what extent do you think the actions of the following actors will help limit climate change?" The score for Collective Response Efficacy

was then calculated by combining the response efficacy ratings for all groups and averaging the scores (α = 0.88, M = 5.93, SD = 1.01).

Pro-Environmental Behavior Intentions (PEBI)

The Pro-environmental Behavior Intentions (PEBI) (α = 0.87, M = 3.10, SD = .76) was measured using the Pro-environmental Behavior Intention Scale, adapted from Stern et al. (1999) measured the likelihood of engaging in various environmental behaviors.

To measure personal behavior intentions participants were instructed to rate on a scale from 1 = "never" to 5 = "always" how frequently, in the coming 12 months, they intended to (1) save energy at home, (2) consume sustainable food, (3) be a sustainable consumer and (4) travel sustainably. For example, "In the coming 12 months, how often do you intend to take the following action? Saving energy at home (e.g., taking short showers, lowering/turning off the thermostat, turning off lights, using energy-efficient appliances)" Next to this participants were instructed to rate 8 items on a scale from 1 = "None" to 5 = "Many" on how frequently they intended to enact advocacy behaviors for limiting climate change. For example, "Urge friends, family, or colleagues to take action to limit climate change." Both scales measuring personal behavior intentions and advocacy behavior intentions were combined and the scores averaged to form our dependent variable PEBI. See Appendix A for the complete list of questions and response scales used.

Procedure

First, the study was approved by the university's Research Ethics & Scientific Integrity Board (RESI). After starting the study, participants were informed about the study's purpose, their voluntary participation, the confidentiality of their responses, and their right to withdraw at

any time without penalty. After providing informed consent, they completed an online survey, which took approximately 15 minutes to complete. The survey was administered using Qualtrics (https://www.qualtrics.com). To ensure confidentiality, all responses were anonymized after data collection by removing the participants' SONA IDs. No other identifiable personal data was recorded. Following the survey, participants had the opportunity to provide feedback. The study's design allowed for an examination of how framing influences perceptions of societal actors and subsequent pro-environmental behavior intentions.

Analytic Approach

Data analysis was conducted using IBM SPSS Statistics (Version 28). A manipulation check was performed using a multivariate analysis of variance (MANOVA) to test the effects of the manipulations and determine if the framing conditions significantly affected participants' perceptions of societal actors' actions and responsibilities. Descriptive statistics were calculated for perceptions of societal actors. Correlation analyses were conducted as preliminary analyses to examine relationships between relevant variables, including PEBI, efficacy beliefs, and perceptions of actors.

Subsequently, simple linear regressions were conducted to predict PEBI based on the total mean scores of Others' Perceived Action and Remedial Responsibility (H1a and H1b). Multiple regression analyses were used to assess the impact of perceptions of actions and remedial responsibility of individual societal actors on PEBI (H1a and H1b). Additionally, mediation analyses using the PROCESS macro Model 4 by Hayes (2022) were performed to examine the indirect effects of Others' Perceived Action and Remedial Responsibility on PEBI through Collective Response Efficacy (H2a and H2b).

Results

Manipulation check

A multivariate analysis of variance (MANOVA) was conducted to test if our manipulation affected collective perceptions of government and business actions. The MANOVA indicated that the manipulation condition did not significantly affect the combined perceptions of these societal actors' actions (Wilks' Lambda = .953, $F(6, 99) = 0.82$, $p = .560$). Separate univariate tests showed that neither the perception of government ($F(1, 104) = 0.32$, $p = .574$) nor the perception of businesses ($F(1, 104) = 0.52$, $p = .475$) were significantly influenced by the manipulation.

Descriptive statistics

First, descriptive statistics for and the perceptions of the main social actors were calculated and reported in Table 1. Overall, respondents perceived the Government as most remedially responsible compared to other actors, with the Financial Sector, Businesses, and Environmental NGOs also seen as significantly responsible. In comparison, the Media and the Dutch population were perceived as less responsible.

When considering the current actions of these actors, respondents rated Environmental NGOs the highest, indicating a strong belief in their active involvement. In contrast, the Financial Sector and Businesses were seen as less active, with the Government and the Media receiving moderate ratings. The Dutch population's actions were perceived more favorably than those of the Financial Sector and Businesses.

Finally, regarding response efficacy, the Government and Businesses were seen as most effective, closely followed by the Financial Sector. Environmental NGOs, the Media, and the Dutch population were perceived as less effective in addressing climate change.

Table 1

Mean scores for Measures of Perceptions of main Societal Actors

Measure	Societal Actor					
M (SD)	The Government	The Financial Sector	Businesses	Environmental NGO's	The Media	Dutch Population
Remedial Responsibility	5.95 (1.39)	5.19 (1.68)	5.48 (1.65)	5.31 (1.44)	4.93 (1.50)	4.82 (1.49)
Current Actions	3.75 (1.19)	2.94 (1.15)	3.07 (1.17)	5.24 (1.28)	3.44 (1.36)	3.61 (1.07)
Response Efficacy	5.73 (1.59)	5.28 (1.63)	5.68 (1.65)	4.91 (1.58)	4.82 (1.57)	4.67 (1.61)

Note: Perception of other actors' Causal Responsibility, Motivation, Efficacy, Need to Increase Efforts, and Intentions were also measured. Detailed statistics are presented in Appendix B, Table B1.

Hypothesis 1a High Perception of Other Main Societal Actors' Actions Leads to Lower PEBI.

We anticipate a negative correlation between both the Perception of Actions and PEBI and the Perception of Remedial Responsibility and PEBI while expecting a positive correlation between Collective Response Efficacy and PEBI. To assess these hypothesized relationships, we first examined the correlations between PEBI, Collective Response Efficacy, Perception of

Remedial Responsibility, and Perception of Actions (see Table 2). The analysis revealed that most variables were positively correlated. However, Perception of Actions did not show any significant correlation with the other variables.

To further investigate the relationship between the perception of other actors' actions and peoples' pro-environmental behavior intentions a simple linear regression was conducted on the total mean score of Others' Perceived Actions and PEBI. The model summary shows that the regression model was not statistically significant and explained negligible variance in PEBI, R^2 = .001, $F(1, 117) = 0.137$, $p = .712$. As shown in Table 3, the results indicated that Others' Perceived Action predicted a small decrease in PEBI although the effect was not significant (B = -0.031, p = .712). Therefore rejecting our hypothesis that perceiving other main societal actors as taking action toward limiting climate change results in a reduction in an individual's pro-environmental behavior intentions.

Table 2
Correlations between Pro-Environmental Behavior Intentions, Collective Response Efficacy, and Perceptions of Actors

	PEBI	Collective Response Efficacy	Perception of Remedial Responsibility	Perception of Actions
1	1	.346**	.435**	-.034
2	.346**	1	.442**	-.006
3	.435**	.442**	1	-.081
4	-.034	-.006	-.081	1

Note: **$p < 0.01$, *$p < 0.05$.

Table 3

Regression Table for the Perception of Other Actors' Actions on PEBI

	Predictor	B	Std. Error	β	t	p
Simple Linear	Constant	3.216	.314	-	10.246	<.001
Regression	Perceived Action Total	-.031	.083	-.034	-.370	.712
Multiple Linear	Constant	3.470	0.414		8.386	<.001
Regression	Government	-0.161	0.080	-0.237	-2.026	.045
	Financial Sector	0.023	0.098	0.030	0.239	.811
	Businesses	-0.027	0.089	-0.037	-0.310	.757
	Environmental NGOs	0.076	0.060	0.127	1.262	.210
	Media	-0.026	0.064	-0.046	-0.410	.683
	Dutch Population	-0.016	0.095	-0.020	-0.165	.869

Next, a multiple regression analysis was conducted to examine the effects of the perception of actions by individual actors (the government, financial sector, businesses, environmental NGOs, the media, and the Dutch population) on PEBI (See Table 3). The regression model was not statistically significant, $F(6, 99) = 1.357$, $p = .239$, explaining only 7.6% of the variance in PEBI, as confirmed by the ANOVA results, $F(6, 118) = 1.420$, $p = .213$.

Table 3 shows results that indicate that the perception of the government's current action was the only significant predictor of PEBI ($B = -0.161$, $p = .045$). All other predictors were not significant but still indicated a negative relationship between perception of actions and PEBI,

except for perceptions of Environmental NGOs and the Financial Sector, which hinted toward a positive relationship.

In conclusion, our findings do not support the first hypothesis, indicating that the perception of other societal actors taking action does not significantly reduce an individual's PEBI. However, there is evidence to suggest that perceiving governmental action is associated with a slight decrease in PEBI, though the effect size is small.

Assumption Checks

For the simple linear regression, collinearity statistics showed no issues with multicollinearity, as indicated by a VIF of 1.000 and a tolerance of 1.000. The residual statistics indicated that the assumptions of linearity, normality, and homoscedasticity were adequately met. The assumption checks for the multiple linear regression analysis indicated that the model met the necessary assumptions of linearity, normality, and homoscedasticity. The collinearity statistics showed no issues with multicollinearity, as evidenced by VIF values all below 2 and tolerance levels well above the commonly accepted minimum threshold of 0.1.

Hypothesis 1b High Perception of Other Main Societal Actors' Responsibility Leads to Lower PEBI.

A simple linear regression was conducted based on the total mean score on Remedial Responsibility. The regression model was statistically significant and explained a moderate proportion of the variance in PEBI, $R^2 = .189$, $F(1, 117) = 27.307$, $p < .001$. The total mean perceived Remedial Responsibility across actors accounted for about 18.2% of the variance in PEBI. As shown in Table 4, the direction of this effect is positive and significant ($B = 0.277$, $p <$

.001), indicating that an increase in perceiving other societal actors as responsible for mitigating climate change leads to an increase in people's PEBI.

Table 4

Regression Coefficients for the Remedial Responsibility of Other Actors on PEBI

	Predictor	B	Std. Error	β	t	p
Simple Linear Regression	(Constant)	1.639	0.287	-	5.709	<.001
	Remedial Responsibility Total	0.277	0.053	0.435	5.226	<.001
Multiple Linear Regression	(Constant)	1.419	0.329	-	4.314	<.001
	The Government	0.187	0.086	0.333	2.157	.033
	Financial sector	0.201	0.066	0.460	3.045	.003
	Businesses	-0.212	0.078	-0.469	-2.714	.008
	Environmental NGOs	-0.019	0.052	-0.037	-0.368	.714
	The Media	0.034	0.058	0.066	0.587	.559
	Dutch population	0.130	0.061	0.246	2.135	.035

Then, a multiple regression analysis was conducted to examine the effect perceptions of individual societal actors' (the government, financial sector, businesses, environmental NGOs, the media, and the Dutch population) remedial responsibility have on people's PEBI (Table 4). The regression model was statistically significant $F(6, 99) = 8.063$, $p < .001$, explaining 28.8% of the variance in PEBI.

These results do not support our hypothesis that attributing remedial responsibility for mitigating climate change to other societal actors would lead to a decrease in PEBI. Instead, the findings suggest that perceiving the government, financial sector, and Dutch population as responsible is associated with an increase in PEBI (see Table 4). In contrast, the perceived remedial responsibility of businesses significantly predicts a decrease in PEBI, while the responsibility attributed to environmental NGOs and the media does not significantly affect PEBI ($p > .05$). Overall, the results indicate that attributing remedial responsibility to most societal actors tends to increase PEBI, except in the case of businesses, where the opposite effect is observed.

Assumption Checks

For the simple linear regression, collinearity statistics showed no issues with multicollinearity, as indicated by a VIF of 1.000 and a tolerance of 1.000. The residual statistics indicated that the assumptions of linearity, normality, and homoscedasticity were adequately met. The assumption checks for the multiple linear regression analysis indicated that the model adequately met the assumptions of linearity, normality, and homoscedasticity. However, there were some concerns regarding multicollinearity. Specifically, the VIF for remedial responsibility attributed to businesses (VIF = 4.410), the government (VIF = 3.515), and the financial sector (VIF = 3.360) suggest moderate to high multicollinearity, though still within acceptable limits (Repala, 2023). Tolerance values were correspondingly low, particularly for these predictors, but they did not fall below the critical threshold of 0.1. Despite these concerns, the model's assumptions were considered sufficiently robust to proceed with the analysis.

Hypothesis 2a High perception of other main societal actors' actions enhances efficacy beliefs, thereby increasing PEBI.

To test if Collective Response Efficacy and Others' Perceived Action affect pro-environmental behavior (PEBI) through direct and indirect pathways, we applied regression and mediation analyses. We tested our model in two steps: first, we examined the effects of Collective Response Efficacy and Others' Perceived Action separately (i.e., Collective Response Efficacy predicting PEBI, or Others' Perceived Action predicting PEBI) to evaluate each variable's ability to predict PEBI. Then, we included the interaction between Collective Response Efficacy and Others' Perceived Action to assess how much variance the interaction uniquely explained when controlling for the other variables.

As displayed in Figure 6, we found that Collective Response Efficacy significantly increased PEBI *(B* = .237, $p < .001$), supporting previous findings that higher levels of Collective Response Efficacy are associated with greater pro-environmental behavior intentions. In contrast, Others' Perceived Action was not a significant predictor of Collective Response Efficacy (*B* = -.005, $p = .967$) or PEBI (*B* = -.030, $p = .706$). The interaction between Others' Perceived Action and Collective Response Efficacy on PEBI was also insignificant $F(1, 115) = .336$, $p = .563$.

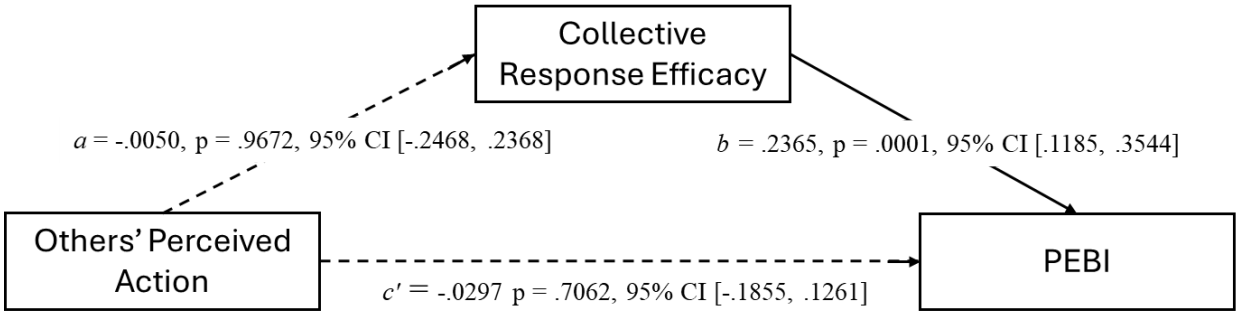
The regression model showed an $R^2 = .121$, $F(2, 116) = 7.957$, $p < .001$, indicating that Collective Response Efficacy explained a significant portion of the variance in PEBI. The total effect model demonstrated that Others' Perceived Action did not significantly predict PEBI, either directly or indirectly through Collective Response Efficacy (*B* = -.031, $p = .712$).

The mediation analysis further clarified these relationships: while Collective Response Efficacy was a significant direct predictor of increased PEBI, the indirect effect of Others' Perceived Action on PEBI through Collective Response Efficacy was not significant. This result

suggests that the hypothesized mediation—whereby an increase in Others' Perceived Action would lead to an increase in Collective Response Efficacy, thereby increasing PEBI—was not supported. Consequently, our hypothesis that perceiving others as taking action indirectly influences PEBI via Collective Response Efficacy was rejected.

Figure 6

Model of Mediation Analysis for Others' Perceived Action and Collective Response Efficacy on PEBI



Assumption Checks

The assumption checks for mediation analysis conducted using PROCESS Model 4 showed that the analysis's assumptions were adequately met. The R-squared value for the mediator model suggested no significant deviation from linearity. The covariance matrices supported the absence of multicollinearity issues, with low covariances between predictors (e.g., Perceived Action and Collective Response Efficacy, covariance = -.023). Overall, the results suggest that the model met the necessary assumptions for mediation analysis, ensuring that the findings are robust.

Hypothesis 2b High Perception of Other Main Societal Actors' Remedial Responsibility Enhances Efficacy Beliefs, thereby Increasing PEBI.

To test whether Remedial Responsibility influences Pro-Environmental Behavior Intention (PEBI) both directly and indirectly through Collective Response Efficacy, we conducted a similar series of regression and mediation analyses as used for hypothesis 2a. We examined the direct effects of Remedial Responsibility on Collective Response Efficacy and PEBI separately and we tested the indirect effect of Remedial Responsibility on PEBI through Collective Response Efficacy.

As displayed in Figure 7, we found support for our hypothesized pathways: the regression analysis indicated that Remedial Responsibility significantly increased Collective Response Efficacy $R^2 = .196$, $F(1, 117) = 28.45$, $p < .001$, suggesting that a higher perception of Remedial Responsibility enhances beliefs in Collective Response Efficacy. Similarly, the analysis showed that Remedial Responsibility significantly increased PEBI R^2 of .218, $F(2, 116) = 16.21$, $p < .001$. Both Remedial Responsibility ($B = .277$, $p < .001$) and Collective Response Efficacy ($B = .130$, $p = .039$) were significant predictors of PEBI.

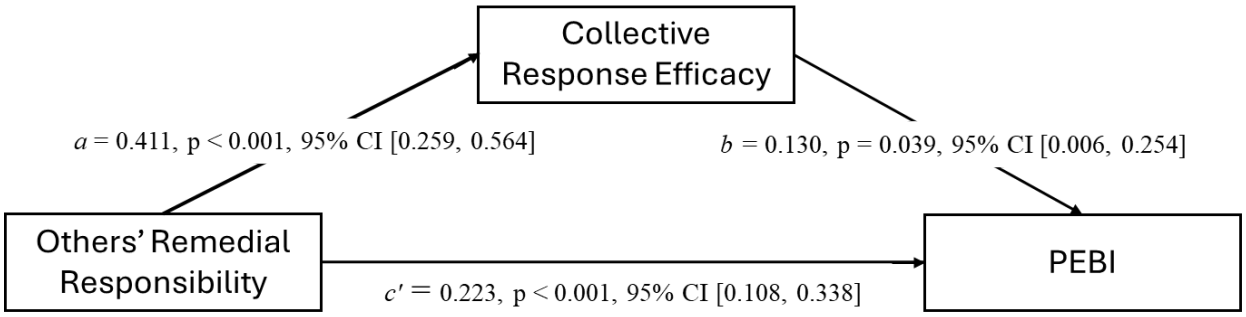
The interaction between Remedial Responsibility and Collective Response Efficacy on PEBI was not significant $F(1, 115) = .930$, $p = .337$, indicating that the combined effect of remedial responsibility perceptions and collective response efficacy beliefs does not explain additional variance in PEBI beyond their individual contributions.

The total effect model was significant $R^2 = .189$, $F(1, 117) = 27.31$, $p < .001$ and Remedial Responsibility significantly predicted PEBI ($B = .277$, $p < .001$). The mediation analysis revealed a significant indirect effect of Remedial Responsibility on PEBI through Collective Response Efficacy ($B = .054$, 95% *CI* [.001, .124]).

These findings indicate that Remedial Responsibility positively influences PEBI both directly and indirectly by enhancing Collective Response Efficacy. Specifically, a high perception of other main societal actors' remedial responsibility not only directly increases PEBI but also does so indirectly by boosting Collective Response Efficacy, thus supporting our hypothesis.

Figure 7

Model of Mediation Analysis for Others' Perceived Responsibility and Collective Response Efficacy on PEBI



Assumption Checks

The assumption checks for mediation analysis conducted using PROCESS Model 4 indicated that the necessary assumptions were adequately met. The model summary statistics showed that the residuals for both the mediator (Collective Response Efficacy) and the outcome variable (PEBI) adhered to the assumptions of normality, linearity, and homoscedasticity. Additionally, the F-tests for the models did not indicate significant deviations from linearity. Multicollinearity was assessed using the covariance matrices of the regression parameter estimates. The covariance between the independent variable (Perceived Responsibility) and the mediator (Collective Response Efficacy) was low (covariance = -.063), and the covariance

between the mediator and the outcome variable (PEBI) was also low (covariance = -.012), indicating no significant multicollinearity issues.

Exploratory Analyses

Correlation analyses showed that perceptions of action are generally interrelated, with significant associations, particularly among the more prominent societal actors (government, financial sector, businesses, and the Dutch population). Environmental NGOs and media perceptions also show significant correlations but to a lesser extent (See Appendix B, Table B2). The correlations between the responsibility perceptions of different actors show that perceptions of remedial responsibility are also generally interrelated, again among the more prominent societal actors like the government, financial sector, and businesses (Appendix B, Table B3). The media and the Dutch population also show significant associations, while Environmental NGOs' perceptions are more independent. When assessing multicollinearity statistics, the VIF ranged from 1.45 to 4.41, therefore showing multicollinearity was not an issue (Repala, 2023).

Because some of the statements used in the manipulation could be influencing participants' perception of remedial responsibility we conducted a MANOVA on remedial responsibility perceptions and manipulation conditions to see if our manipulation affected the participants' remedial responsibility perceptions. The manipulation condition did not significantly affect any of the perceptions measured regarding remedial responsibility in limiting climate change for the Government $F(1, 104) = 0.20$, $p = .658$ or Businesses $F(1, 104) = 0.08$, $p = .772$.

In addition to our main analyses, we conducted further exploratory analyses to examine the potential mediating effects of Collective Efficacy and Self-Efficacy on the relationships between perceptions of societal actors' actions and responsibilities and PEBI. Detailed models of

these mediation analyses are provided in Appendix B (Figures B1 and B2). The mediation analyses indicated that Others' Perceived Action did not significantly influence Collective Efficacy. However, Collective Efficacy was a significant predictor of PEBI, suggesting its direct influence on pro-environmental behavior intentions. Moreover, there was a significant interaction effect between Others' Perceived Action and Collective Efficacy on PEBI, implying that the relationship between Others' Perceived Action and PEBI may depend on the levels of Collective Efficacy.

Self-efficacy was found to be a significant predictor of PEBI, indicating a direct influence on pro-environmental behavior intentions. In this case, Others' Perceived Action did not have a significant direct effect on PEBI, nor did it have an indirect effect through Self-Efficacy. Regarding Remedial Responsibility, the analyses showed that it did not significantly affect Collective Efficacy, and Collective Efficacy did not significantly influence PEBI. However, Remedial Responsibility had a significant direct effect on PEBI and also indirectly boosted PEBI through Self-Efficacy. Specifically, Remedial Responsibility significantly enhanced Self-Efficacy, which in turn significantly increased PEBI.

Discussion

In this thesis, we aimed to research the interplay between perceptions of other main societal actors' actions and responsibility with individuals' pro-environmental behavior intentions (PEBI). We hypothesized perception of other main societal actors' actions and responsibilities have negative effects on an individual's PEBI. Additionally, we were interested in the potential mediating role of efficacy beliefs in this relationship. To see if the hypothesized negative effects could be reversed, we hypothesized that efficacy beliefs would positively mediate the effect between perceptions of other main societal actors' actions and responsibility

with individuals' PEBI. We assessed these relationships through a series of analyses including correlations, MANOVAs, regressions, and mediation analyses.

Most variables were positively correlated, except for Others' Perceived Action, which did not significantly correlate with other variables, indicating that our first and second hypotheses were not supported. To test this further, regression analyses showed that hypothesis 1a was not supported. Others' Perceived Action was not a significant predictor of PEBI in simple or multiple regression analyses. ANOVA results also showed no significant differences in PEBI based on perceptions of different societal actors. We did find a significant negative effect of perceptions of governmental actions on PEBI. All other actor perceptions were not significant. Notably, the regression coefficients for the financial sector and NGOs did point to a positive relationship, as opposed to a negative one. We did not find evidence for the bystander effect, social loafing, or free-riding for PEBI when perceiving other societal actors as taking action except for perceptions of governmental action. An explanation can be found in conflicting injunctive and descriptive social norms (Smith et al., 2012). It is critical to recognize that the influence of social norms is dependent on the relationship between injunctive and descriptive norms. Conflicting injunctive and descriptive norms can weaken the influence on PEBI, whereas alignment of injunctive with descriptive norms can significantly enhance PEBI. The insignificant effect of perception of others' actions could indicate that the perceived actions of different societal actors do not form a coherent normative message if societal actors are perceived to be acting independently rather than as part of a unified effort, their influence on PEBI may be weakened (Smith et al., 2012). The positive regression coefficient for the environmental NGOs suggests that they may be perceived as more supportive (injunctive norms), which can positively influence PEBI. However, without a strong and consistent injunctive norm from influential

actors like the government, the overall effect may be diluted. Exploratory analysis of our sample revealed a difference in injunctive norms. The mean perceived biospheric values –reflecting a concern for the quality of nature and the environment (Steg & De Groot, 2019)–, were measured using a 7-point Likert scale ranging from "not at all" to "to a great extent", for the government was 3.97 (*SD* = 1.41). Environmental NGOs had mean perceived biospheric values of 5.74 (*SD* = 1.36). These perceived biospheric value orientations can indicate the injunctive norm present for the societal actors, a high score on biospheric values would indicate an injunctive norm of caring about addressing climate change. These results suggest that for environmental NGOs the injunctive and descriptive norms can work together to increase PEBI in individuals, less so for the government.

Testing of hypothesis 1b revealed that this hypothesis was only partially supported. While perceptions of remedial responsibility significantly predicted PEBI, it did so positively rather than negatively. Higher remedial responsibility was associated with higher PEBI. The multiple regression model showed that the remedial responsibility of the government, financial sector, and Dutch population significantly predicted higher PEBI, while businesses' remedial responsibility predicted lower PEBI. The reasoning for this can be found in research by Frank et al. (2024) and Jugert et al. (2016), where people feel a sense of empowerment from their social identity and that their actions are part of a collective effort. In our case, all significant positive predictors were societal actors that individuals can partake in either by voting (government), investing (financial sector), or their actions (dutch population). That way when these actors are seen as responsible for mitigating climate change, people have ways to contribute to this responsibility. Other research found that a stronger perceived environmental responsibility is associated with a stronger environmental self-identity (Van Der Werff et al., 2021), which in turn is related to an

increase in pro-environmental actions. Specifically, perceived environmental responsibility positively influences pro-environmental behavior both directly and indirectly through enhancing environmental self-identity. This relationship holds for employees, customers of organizations, and citizens of their government. Whereas businesses are more distant from an individual's social identity and therefore harder to partake in. The negative prediction of businesses' remedial responsibility could stem from a perceived lack of genuine commitment to climate action. Businesses might be seen as prioritizing profit over environmental sustainability, which can reduce trust and demotivate individuals from engaging in pro-environmental behaviors (Kellstedt et al., 2008).

To test hypothesis 2a, mediation analyses were conducted and revealed that Others' Perceived Action did not significantly influence PEBI directly or indirectly through collective response efficacy. Exploratory analyses assessed potential mediating effects for collective efficacy and self-efficacy. Collective response efficacy, collective efficacy, and self-efficacy were significant predictors of PEBI. Others' Perceived Action did not significantly interact with collective response efficacy and self-efficacy to predict PEBI. This could be explained by people separating themselves from these societal actors because the actors were perceived as not similar to themselves. This way perceptions of their actions do not influence their efficacy beliefs, or change the social norms as appeals involving social norms appear to be more effective when their content involves a more similar referent group (Buchanan & Russo, 2015; Goldstein et al., 2008) However, a significant interaction effect between Others' Perceived Action and collective efficacy on PEBI was found, suggesting that the relationship between Others' Perceived Action and PEBI may depend on levels of collective efficacy.

When testing hypothesis 2b, mediation analyses showed that remedial responsibility positively influenced PEBI both directly and indirectly through increasing collective response efficacy. Exploratory analyses found a similar mediating effect for self-efficacy. Remedial responsibility significantly enhanced collective response efficacy and self-efficacy, which in turn significantly boosted PEBI. Remedial responsibility did not significantly influence collective efficacy, and collective efficacy did not significantly mediate the relationship between remedial responsibility and PEBI. No significant interaction effects were found between remedial responsibility and any of the efficacy beliefs. These results are in line with previous research which has shown response efficacy types to be a stronger predictor of PEBI than efficacy (Meijers et al., 2023). Personal response and personal efficacy were associated with private sphere intentions, including behaviors such as recycling waste or conserving water use at home. A similar study found that collective response efficacy significantly influences public-sphere climate actions (Doherty & Webler, 2016). This includes voting, donating, volunteering, contacting government officials, and protesting. Collective response efficacy mediates the relationship between descriptive social norms and public climate actions. This means that if individuals believe that their group can effectively address climate change, they are more likely to engage in public actions themselves (Doherty & Webler, 2016). In our study, we did not measure governmental efficacy types (Meijers et al., 2023). Governmental efficacy can be divided into external and internal governmental efficacy; where internal efficacy is the belief that one is capable of acting in the governmental realm, and external efficacy regards the belief that the government will respond to citizens' demands.

Practical Implications

Emphasizing the responsibility and potential remedial abilities of key societal actors (government, financial sector, etc.) can positively influence public pro-environmental behavior intentions. Informing policymakers and communication strategies aimed at enhancing public engagement in environmental initiatives. Specifically, communication efforts that seek to motivate collective action on mitigating climate change may benefit from messaging that highlights the key role that governments have in reducing the threat. Highlighting the effectiveness of those governmental and collective climate actions and developing interventions that thereby boost collective response efficacy and self-efficacy can further enhance pro-environmental intentions and behaviors (Intergovernmental Panel on Climate Change [IPCC] et al., 2023; Kashima et al., 2023).

Limitations and Future Research

One limitation of this study was the effectiveness of our manipulation, as our experimental manipulation did not significantly influence Others' Perceived Action. Therefore no causality claims can be made. Reasoning for why the manipulation did not work could be that changing people's perceptions of others regarding climate change is not feasible in a questionnaire because of the scale and the potential personal importance of the climate problem. Additionally, the news statements used in the manipulation were aimed at manipulating the perception of others' actions, not at manipulating the perceptions of remedial responsibility. However, in some statements, an indication of the remedial responsibility of actors and their fulfillment of this responsibility could be found. For example: *"The Dutch economy is lagging behind in terms of sustainability according to World Economic Forum's recent report. Source:*

Trouw". Next to this, according to feedback from participants, the questionnaire was very long and hard to understand. This led to a selection bias where only highly educated people who were fluent in English could participate in our study or people not finish the questionnaire (properly) due to boredom. Additionally, participants were not debriefed on the manipulation of the perception of others' actions through news statements once the questionnaire was completed. Our reasoning behind this was that no true deception was at play, all statements came from real news articles which meant that the participants received a framed view of real-world events. We adopted this procedure from the paper by Buchanan and Russo (2015) where a similar strategy was used, without debriefing participants afterward. Additionally, the sample size was not sufficiently large according to the power analysis. In light of this limitation, future research with a larger, more adequately powered sample is recommended to validate the findings reported here and to more robustly assess the relationships under investigation. Additional data collection and/or supplementary analyses, such as Bayesian methods, could also be explored to strengthen the conclusions drawn from this study.

Future research could examine the possible moderating effect of collective efficacy on the relationship between perceptions of others' actions and PEBI, which should be tested further. as the effect could be explained by the 'spiral-of-action' (Bouman & Steg, 2022) Which states that perceiving others as caring about climate change and (willing to) take climate action, leads to individual climate actions feeling more useful. Also, the effect governmental efficacy perceptions (Meijers et al., 2023) can have on PEBI should be further explored. The study's findings should be validated in different contexts and populations to enhance generalizability, one example could be to compare the results from Western individualistic cultures to those from more collectivistic cultures. Future studies should consider stronger or different manipulations to

more effectively influence perceptions of societal actors' actions and responsibilities. Additionally, further research could explore other variables that might interact with perceptions of actions and responsibilities to influence environmental behavior intentions. Since collective response efficacy and self-efficacy turned out to be consistent predictors of PEBI, future research could explore factors enhancing these beliefs. Where research in collective response efficacy might take priority as a larger body of research already exists on enhancing self-efficacy. Google Scholar turned up about 637.000 results for “enhancing collective response efficacy” and about 4.630.000 results for enhancing self-efficacy. This difference should be addressed as knowledge on enhancing other types of efficacy beliefs besides self-efficacy will be very useful for policymakers in designing effective interventions.

Conclusion

In conclusion, this study examined the intricate dynamics between perceptions of societal actors' actions and responsibilities and their impact on individuals' pro-environmental behavior intentions (PEBI). Contrary to our initial hypotheses, the findings revealed that perceptions of societal actors' actions did not significantly influence PEBI. However, perceptions of remedial responsibility did have a notable positive effect on PEBI, indicating that individuals who perceive greater responsibility in societal actors are more likely to engage in pro-environmental behaviors. This highlights the importance of emphasizing societal actors' roles in mitigating climate change to foster public engagement in environmental initiatives.

Moreover, the study demonstrated that efficacy beliefs, particularly collective response efficacy and self-efficacy, play a crucial role in enhancing PEBI. While Others’ Perceived Action did not directly influence efficacy beliefs, the perception of remedial responsibility significantly boosted both collective response efficacy and self-efficacy, which in turn increased PEBI. These

findings underscore the potential of efficacy-enhancing interventions to motivate pro-environmental behaviors.

The implications for policymakers and communicators are clear: strategies that highlight the responsibility and effectiveness of societal actors, alongside efforts to strengthen collective and individual efficacy beliefs, can significantly promote environmental action. Future research should explore more robust manipulations of societal perceptions and further investigate the factors that enhance efficacy beliefs, particularly in diverse cultural contexts. By leveraging these insights, we can better address the urgent challenge of climate change through coordinated, collective action.

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Appendix A

Questionnaire Design

INFORMATION ABOUT THE RESEARCH

Thank you for participating in our study!
Before you start the questionnaire, the following information is provided so you can understand the purpose, procedure, and consequences of participation.

□ Why do I receive this information?
You are invited to this study because you are over the age of 18, currently working or residing in the Netherlands. This study investigates your perceptions of different societal actors and their efforts towards mitigating climate change. This study is conducted by Vester van Beek and Xinran Wang from the University of Groningen.

□ Do I have to participate in this research?
Participation in the research is voluntary. However, your consent is needed. Therefore, please read this information carefully. Ask all the questions you might have, for example because you do not understand something. Only afterwards you decide if you want to participate. If you decide not to participate, you do not need to explain why, and there will be no negative consequences for you. You have this right at all times, including after you have consented to participate in the research.

□ Why this research?
The purpose of this study is to examine the effect of perceived responsibility, of different societal actors in limiting climate change on personal pro-environmental behavior intentions. With your participation, you are contributing to scientific research and helping us understand the actors and actions needed for societal-wide climate action.

□ What do we ask of you during the research?
First, you will be asked to give your consent to participate. After that, you will answer questions about your opinions of how different actors are taking action on climate change. You will also answer questions on your own behaviors and intentions. There are no right or wrong answers, so please answer honestly and give your best estimates. Participation will take about 10-15 minutes.

□ What are the consequences of participation?
You are directly assisting our research study and contributing to the scientific output of the

university. The time commitment is low. No known risks or discomforts are foreseen.

How will we treat your data?

Your data will be treated anonymously and confidentially. Your data, in aggregate, may be used for the purposes of scientific publications. The data will be handled and protected in accordance with university codes and the General Data Protection Regulation. As a participant, you have the right to access, rectify, and erase your personal data. You may request a summary of the findings. But we cannot provide your individual response since we do not collect identifying information (e.g., names, emails). If you enrolled in this study through the SONA panel, your SONA number will only be used for the purpose of awarding you with credits after your participation. Your responses will not be used for identification purposes. We will anonymize the dataset by removing your SONA ID from the dataset before our analysis of the data, so your response will not be identifiable.

What else do you need to know?

You may always ask questions about the research: now, during, and after the end of the research. You can do so by emailing Vester: v.d.van.beek@student.rug.nl

Do you have questions or concerns about your rights as a research participant or about the conduct of the research? You may also contact the Ethics Committee of the Faculty of Behavioural and Social Sciences of the University of Groningen: ec-bss@rug.nl.

Do you have questions or concerns regarding the handling of your personal data? You may also contact the University of Groningen Data Protection Officer: privacy@rug.nl.

As a research participant, you have the right to a copy of this research information. You may save a screenshot of this page if you wish.

INFORMED CONSENT

By answering “yes”, you are explicitly giving your informed consent to participate and agree to the following: I have read the information about the research. I have had enough opportunity to ask questions about it. I understand what the research is about, what is being asked of me, which consequences participation can have, how my data will be handled, and what my rights as a participant are. I understand that participation in the research is voluntary. I myself choose to participate. I can stop participating at any moment. If I stop, I do not need to explain why. Stopping will have no negative consequences for me.

O Yes, I consent to participate. (1)

O No, I do not consent to participate. The survey will end. (2)

Please read the following information carefully. It will help you understand the questionnaire.

To prevent the negative consequences of human-caused climate change (hereinafter referred to as "climate change"), individuals and various societal actors can take action. Different organisations can help by developing and implementing policy (e.g., the government), financing resources devoted to limiting climate change (e.g., financial sector), implementing products, processes and services with lower climate impacts (e.g., businesses), mobilising individuals and organisations into action (e.g., Non-Governmental Organisations/NGO's), and informing the public (e.g., the media). Individuals can help by taking personal actions and advocating for climate action.

On the next page, you will see a couple of statements from recent news articles on the topic of climate change and sustainability. Please take your time and read them thoroughly.

Positive Manipulation

The climate law sets the target for a reduction of 55 percent by 2030, which means **climate goals might be within reach for the first time**.
Source: NOS

In 2023, the electricity sector emitted **22% less CO2** which lowered greenhouse gas emissions by 34% below 1990 levels.
Source: Centraal Bureau voor de Statistiek

In 2023, **48%** of Dutch electricity production came **from renewable sources** such as sun, wind, and water, increasing production by renewable sources by 21% in 2023. *Source: Centraal Bureau voor de Statistiek*

The majority of **companies** (**82%**), including industry, automotive, retail, and services, have taken measures this year to make their business operations **more sustainable**. *Source: Centraal Bureau voor de Statistiek*

EU Member States have put in place **3,000 policies** and measures to **prevent** the worst **impacts of climate change**, including targeting greenhouse gas emissions in key sectors of the economy, promoting the use of renewable energy and low-carbon fuels, improving energy efficiency in buildings, and many more.
Source: European Environment Agency

Existing **EU measures** would lead to a **reduction of 43% in 2030** for total net greenhouse gas emissions, including international aviation, while further measures currently being planned would boost reductions to 48%.
Source: European Environment Agency

EU recently past a **law** that obliges companies to implement more **concrete sustainable plans**.
Source: NRC

Negative manipulation

The Dutch Cabinet will **vote against nature restoration law** in the European Council of Ministers
Source: NOS

The Dutch economy is **lagging behind in terms of sustainability** according to World Economic Forum's recent report.
Source: Trouw

EU nature restoration laws, designed to reverse damage to wildlife, **face collapse** as member states withdraw support.
Source: The Guardian

KLM's fly sustainably plan (e.g., offsetting CO2 emissions with reforestation projects or using alternative fuels) **only marginally reduces** the negative environmental aspects.
Source: NU.nl

Gas extraction in the Wadden Sea is **still underway** and possibly more drilling soon.
Source NU.nl

Shell weakens its CO2 targets in a new sustainability strategy that lowered the emission reduction target.
Source: NU.nl

Most Dutch companies (82%) have **not** yet met the European Union's Corporate Sustainability Reporting Directive (CSRD) standards.
Source: Dutch IT Channel

On the next pages, you will be asked about **your own** beliefs, attitudes, and intentions in limiting climate change.

To what extent...?

	Not at all (1)	To little extent (2)	To a moderately little extent (3)	To a moderate extent (4)	To a moderately large extent (5)	To a large extent (7)	To a great extent (8)
...are you responsible for causing climate change (self_resp_causal)	O	O	O	O	O	O	O
...are you responsible for taking action to limit climate change (self_resp_remedial)	O	O	O	O	O	O	O
...are you motivated to take action to limit climate change (self_resp_4)	O	O	O	O	O	O	O

self_motiv To what extent...?

	Not at all (1)	To little extent (2)	To moderately little extent (8)	To a moderate extent (3)	To a moderately large extent (4)	To a large extent (5)	To a great extent (6)
...can you take action to limit climate change (self_motiv_6)	O	O	O	O	O	O	O
...are you currently taking action to limit climate change (self_current)	O	O	O	O	O	O	O
...do you intend to take more action to limit climate change in the near future (self_intent)	O	O	O	O	O	O	O
...will your actions help limit climate change (self_outcome_eff)	O	O	O	O	O	O	O

On the following pages, you will be asked about your opinions of the role of **various groups** in limiting climate change. The groups include the government, financial sector (e.g., banks, insurance, investors), businesses, non-governmental organisations (e.g., environmental advocacy groups, charities), the media (e.g., newspapers, TV, radio, social media) and citizens.

To what extent are the following actors responsible for causing climate change?

	Not at all (1)	To little extent (2)	To moderately little extent (3)	To a moderate extent (4)	To a moderately large extent (5)	To a large extent (6)	To a great extent (7)
The Government (1)	O	O	O	O	O	O	O
Financial sector (e.g., banks, insurance, investors) (2)	O	O	O	O	O	O	O
Businesses (e.g., industries, corporations) (3)	O	O	O	O	O	O	O
Environmental NGOs (4)	O	O	O	O	O	O	O
The Media (e.g., newspapers, TV, radio, social media) (5)	O	O	O	O	O	O	O

Dutch population (6)	O	O	O	O	O	O	O

To what extent are the following actors responsible for taking action to limit climate change?

	Not at all (1)	To little extent (2)	To moderately little extent (3)	To a moderate extent (4)	To a moderately large extent (5)	To a large extent (6)	To a great extent (7)
The Government (x1)	O	O	O	O	O	O	O
Financial sector (e.g., banks, insurance, investors) (x2)	O	O	O	O	O	O	O
Businesses (e.g., industries, corporations) (x3)	O	O	O	O	O	O	O
Environmental NGOs (x4)	O	O	O	O	O	O	O

The Media (e.g., newspapers, TV, radio, social media) (x5)	O	O	O	O	O	O	O
Dutch population (x6)	O	O	O	O	O	O	O

To what extent is each of the following actors motivated to take action to limit climate change?

	Not at all (1)	To little extent (2)	To moderately little extent (3)	To a moderate extent (4)	To a moderately large extent (5)	To a large extent (6)	To a great extent (7)
The Government (x1)	O	O	O	O	O	O	O
Financial sector (e.g., banks, insurance, investors) (x2)	O	O	O	O	O	O	O
Businesses (e.g., industries,	O	O	O	O	O	O	O

corporations) (x3)							
Environmental NGOs (x4)	O	O	O	O	O	O	O
The Media (e.g., newspapers, TV, radio, social media) (x5)	O	O	O	O	O	O	O
Dutch population (x6)	O	O	O	O	O	O	O

To what extent can each of the following actors take action to limit climate change?

	Not at all (1)	To little extent (2)	To moderately little extent (3)	To a moderate extent (4)	To a moderately large extent (5)	To a large extent (6)	To a great extent (7)
The Government (x1)	O	O	O	O	O	O	O
Financial sector (e.g., banks,	O	O	O	O	O	O	O

insurance, investors) (x2)							
Businesses (e.g., industries, corporations) (x3)	O	O	O	O	O	O	O
Environmental NGOs (x4)	O	O	O	O	O	O	O
The Media (e.g., newspapers, TV, radio, social media) (x5)	O	O	O	O	O	O	O
Dutch population (x6)	O	O	O	O	O	O	O

curr_act To what extent are the following actors currently taking action to limit climate change?

	Not at all (1)	To little extent (2)	To moderately little extent (3)	To a moderate extent (4)	To a moderately large extent (5)	To a large extent (6)	To a great extent (7)

The Government (x1)	O	O	O	O	O	O	O
Financial sector (e.g., banks, insurance, investors) (x2)	O	O	O	O	O	O	O
Businesses (e.g., industries, corporations) (x3)	O	O	O	O	O	O	O
Environmental NGOs (x4)	O	O	O	O	O	O	O
The Media (e.g., newspapers, TV, radio, social media) (x5)	O	O	O	O	O	O	O
Dutch population (x6)	O	O	O	O	O	O	O

curr_eff To what extent do you think the following actors should increase their efforts to limit climate change?

	Not at all (1)	To little extent (2)	To moderately little extent (3)	To a moderate extent (4)	To a moderately large extent (5)	To a large extent (6)	To a great extent (7)
The Government (x1)	O	O	O	O	O	O	O
Financial sector (e.g., banks, insurance, investors) (x2)	O	O	O	O	O	O	O
Businesses (e.g., industries, corporations) (x3)	O	O	O	O	O	O	O
Environmental NGOs (x4)	O	O	O	O	O	O	O
The Media (e.g., newspapers, TV, radio, social media) (x5)	O	O	O	O	O	O	O

Dutch population (x6)	O	O	O	O	O	O	O

intent To what extent do you think the following actors intend to take more action to limit climate change in the near future?

	Not at all (1)	To little extent (2)	To moderately little extent (3)	To a moderate extent (4)	To a moderately large extent (5)	To a large extent (6)	To a great extent (7)
The Government (x1)	O	O	O	O	O	O	O
Financial sector (e.g., banks, insurance, investors) (x2)	O	O	O	O	O	O	O
Businesses (e.g., industries, corporations) (x3)	O	O	O	O	O	O	O
Environmental NGOs (x4)	O	O	O	O	O	O	O

The Media (e.g., newspapers, TV, radio, social media) (x5)	O	O	O	O	O	O	O
Dutch population (x6)	O	O	O	O	O	O	O

outcome_eff To what extent do you think the actions of the following actors will help limit climate change?

	Not at all (1)	To little extent (2)	To moderately little extent (3)	To a moderate extent (4)	To a moderately large extent (5)	To a large extent (6)	To a great extent (7)
The Government (x1)	O	O	O	O	O	O	O
Financial sector (e.g., banks, insurance, investors) (x2)	O	O	O	O	O	O	O
Businesses (e.g., industries,	O	O	O	O	O	O	O

corporations) (x3)							
Environmental NGOs (x4)	O	O	O	O	O	O	O
The Media (e.g., newspapers, TV, radio, social media) (x5)	O	O	O	O	O	O	O
Dutch population (x6)	O	O	O	O	O	O	O

systhk To what extent do you agree or disagree with the following statements?

	Strongly disagree (1)	Disagree (2)	Somewhat disagree (3)	Neither agree nor disagree (4)	Somewhat agree (5)	Agree (6)	Strongly agree (7)
All actors in society contribute to climate change (systhk_contri)	O	O	O	O	O	O	O

No single actor can limit climate change on their own so all actors need to engage in climate actions (systhk_engage)	O	O	O	O	O	O	O
Government, businesses, NGOs, media, and citizens all have an important role in limiting climate change (systhk_imp)	O	O	O	O	O	O	O
Climate change can be limited only if the government, businesses, NGOs, media and citizens act together (systhk_act_together)	O	O	O	O	O	O	O
If different actors do not act collectively, the climate crisis will not be prevented (systhk_not_act)	O	O	O	O	O	O	O

It is possible for human beings to limit climate change (response_eff_1)	O	O	O	O	O	O	O
Together people can limit climate change through joint efforts (response_eff_2)	O	O	O	O	O	O	O
I trust that everyone can behave in a more pro-environmental manner. (systhk_13)	O	O	O	O	O	O	O
For most people behaving in a pro-environmental way is hard. (systhk_14)	O	O	O	O	O	O	O

self_effi In this part of the survey, we'd like to ask about the actions you can take personally that help limit climate change.

For example, there are some things **you** as an individual could do. Please select to what extent you agree with the following statements:

	Strongly	Disagree (2)	Somewhat disagree (3)	Neither agree or	Somewhat agree (5)	Agree (6)	Strongly agree (7)

	disagree (1)			disagree (4)			
I think I know how I can save energy in everyday life. (1)	O	O	O	O	O	O	O
I am confident that I can be a sustainable citizen. (2)	O	O	O	O	O	O	O
By consuming in a sustainable way, I can help solve environmental issues. (3)	O	O	O	O	O	O	O
It is too difficult for me to do much about the environment. (4)	O	O	O	O	O	O	O

In the coming 12 months, how often do you intend to take the following actions?

	Never (1)	Rarely (2)	Sometimes (3)	Most of the time (4)	Always (5)
Saving energy at home (e.g., taking short showers, lowering/turning off the thermostat, turning off lights, using energy efficient appliances) (perbeh_energy)	O	O	O	O	O
Sustainable food consumption (e.g., eating no or little meat and dairy, eating locally produced foods, reducing food waste) (perbeh_food)	O	O	O	O	O
Sustainable consumption (e.g., only purchasing items if necessary, repairing items instead of buying new ones, purchasing second hand items, purchasing sustainably	O	O	O	O	O

produced products) (perbeh_consump)					
Traveling in a sustainable way (e.g., walking, cycling or public transport instead of using a car, travel less, avoiding flying) (perbeh_travel)	O	O	O	O	O

advbeh In this part of the survey, you will be asked about the actions you can take to encourage others to help limit climate change.

How often do you intend to take the following action?

	None (1)	Once (2)	A few times (2-3 times) (3)	Several times (4-5) (4)	Many (6+) (5)
Vote for candidates that support actions on climate change (1)	O	O	O	O	O

Join public demonstrations or protests to urge governments and industries to take action to limit climate change (2)	O	O	O	O	O
Sign a petition in support of limiting climate change (3)	O	O	O	O	O
Donate money to an organisation working on climate change (4)	O	O	O	O	O
Boycott companies that have a great impact on climate change (5)	O	O	O	O	O
To show that you are still paying attention, please select	O	O	O	O	O

"Once" for this question (6)					
Urge friends, family, or colleagues to take action to limit climate change (7)	O	O	O	O	O
Advocate for climate actions in your organisation (e.g., calling out unsustainable practices) (8)	O	O	O	O	O

emo_soc Think about the current societal progress to limit climate change, to what extent do you feel...?

	Not at all (1)	To little extent (2)	To moderately little extent (3)	To a moderate extent (4)	To a moderately large extent (5)	To a large extent (6)	To a great extent (7)
Angry (1)	O	O	O	O	O	O	O
Disappointed (2)	O	O	O	O	O	O	O

Fearful (3)	O	O	O	O	O	O	O
Hopeless (4)	O	O	O	O	O	O	O
Hopeful (5)	O	O	O	O	O	O	O
Anxious (6)	O	O	O	O	O	O	O

per_bio To what extent do you believe the following actors value protecting nature and the environment?

	Not at all (1)	To little extent (2)	To moderately little extent (3)	To a moderate extent (4)	To a moderately large extent (5)	To a large extent (6)	To a great extent (7)
The Government (x1)	O	O	O	O	O	O	O
Financial sector (e.g., banks, insurance, investors) (x2)	O	O	O	O	O	O	O

Businesses (e.g., industries, corporations) (x3)	O	O	O	O	O	O	O
Environmental NGOs (x4)	O	O	O	O	O	O	O
The Media (e.g., newspapers, TV, radio, social media) (x5)	O	O	O	O	O	O	O
Dutch population (x6)	O	O	O	O	O	O	O

value To what extent do you personally value... ?

	Not at all (1)	To little extent (2)	To moderately little extent (3)	To a moderate extent (4)	To a moderately large extent (5)	To a large extent (6)	To a great extent (7)
Protecting nature and the	O	O	O	O	O	O	O

environment (1)							
Wealth, power and achievement (2)	O	O	O	O	O	O	O
Wellbeing and equal opportunity for all (3)	O	O	O	O	O	O	O
Pleasure and enjoying life (5)	O	O	O	O	O	O	O

other_actor_txt Are there other individuals or groups you think should take action to limit climate change? Please list these in the box below.

barrier_txt In general, what do you think are the main barriers in our society that need to be removed to achieve climate goals? Please list these in the box below

feedback Please leave any feedback or comments you might have in the box below

You have now reached the end of our study! We greatly appreciate your input. If you have any concerns or comments regarding the study, please reach out to Vester: v.d.van.beek@student.rug.nl.

Please click on the **Submit** button to submit your response.

Appendix B

Tables used for Explotatory Analyses

Table B1

Mean scores for Perceptions of main Societal Actors

Measure	Societal actor					
M (SD)	The Government	The Financial sector	Businesses	Environmental NGO's	The Media	Dutch population
Causal Responsibility	5.51 (1.35)	5.25 (1.51)	5.90 (1.35)	3.94 (1.84)	4.39 (1.59)	4.75 (1.48)
Remedial Responsibility	5.95 (1.39)	5.19 (1.68)	5.48 (1.65)	5.31 (1.44)	4.93 (1.50)	4.82 (1.49)
Motivation	3.98 (1.33)	3.01 (1.33)	3.08 (1.34)	5.83 (1.26)	3.80 (1.43)	3.78 (1.16)
Efficacy	5.95 (1.31)	5.57 (1.56)	6.00 (1.35)	5.15 (1.40)	4.91 (1.59)	4.88 (1.48)
Current Actions	3.75 (1.19)	2.94 (1.15)	3.07 (1.17)	5.24 (1.28)	3.44 (1.36)	3.61 (1.07)
Increase Efforts	6.10 (1.32)	5.88 (1.39)	6.07 (1.29)	4.98 (1.76)	5.43 (1.54)	5.54 (1.38)
Intentions	3.88 (1.59)	3.31 (1.47)	3.61 (1.48)	5.47 (1.44)	3.83 (1.50)	3.92 (1.27)
Response Efficacy	5.73 (1.59)	5.28 (1.63)	5.68 (1.65)	4.91 (1.58)	4.82 (1.57)	4.67 (1.61)

Table B2

Correlations Between Perceptions of Different Societal Actors' Actions

Actor	The Government	Financial sector	Businesses	Environmental NGOs	The Media	Dutch population
1	1	.491**	.383**	.112	.307**	.419**
2	.491**	1	.546**	.031	.260**	.421**
3	.383**	.546**	1	.063	.256**	.339**
4	.112	.031	.063	1	.227*	.221*
5	.307**	.260**	.256**	.227*	1	.479**
6	.419**	.421**	.339**	.221*	.479**	1

Note: **. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Table B3

Correlations Between Remedial Responsibility Perceptions of Different Societal Actors

	The Government	Financial sector	Businesses	Environmental NGOs	The Media	Dutch population
1	1	.745**	.819**	.295**	.523**	.557**
2	.745**	1	.817**	.148	.497**	.431**
3	.819**	.817**	1	.274**	.532**	.500**
4	.295**	.148	.274**	1	.446**	.494**
5	.523**	.497**	.532**	.446**	1	.593**
6	.557**	.431**	.500**	.494**	.593**	1

Note: **. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Mediation analyses with Total Effect and Mediation Effects Included

Figure B1

Mediation Models for Hypothesis 2a

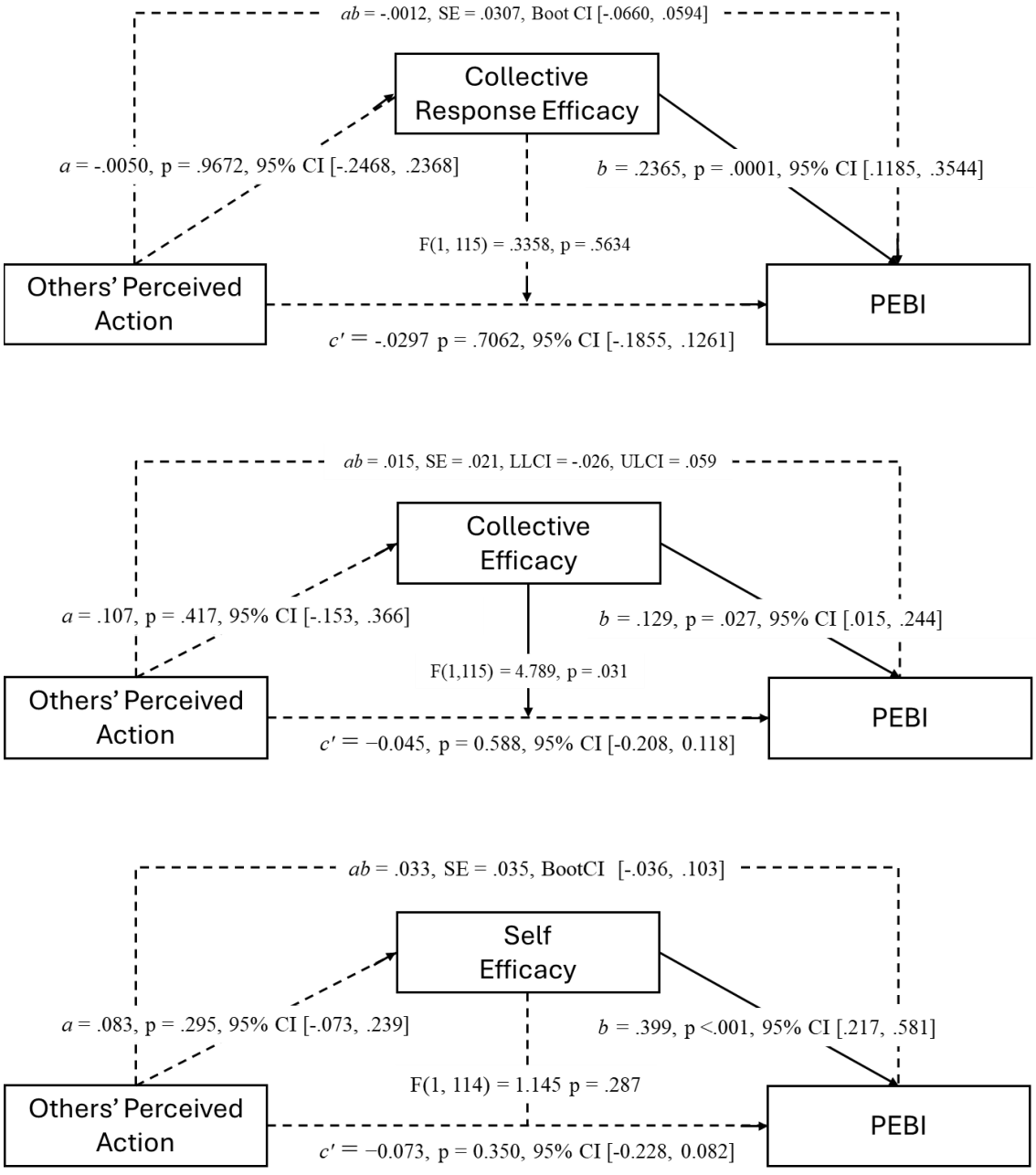

Figure B2

Mediation Models for Hypothesis 2b