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

Distance to climate change consequences reduces willingness to engage in low-cost mitigation actions

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Abstract (max 300 words)

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 found 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.

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1. Introduction

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 [1], most harm is inflicted on people living in the Global South [2,3]. 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 [4,5], the experimental evidence is more ambiguous [6]. 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.

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 [6,7]. The 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 [5,8,9], lower (stated) behavioral intentions or willingness to act [4,8,10,11] and lower policy support for mitigation [4]. Usually, participants were asked to indicate their agreement to statements such as “Climate change is mostly affecting areas that are far away” [11] or “Climate change will particularly affect me, my family and my friends” [12], 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 [12,13]. 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 [12] and (stated willingness to engage in) mitigation behaviors [12–14].

However, not all studies found that distance reduces the willingness to engage in climate mitigation. Brügger et al. [15], 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 [16], intentions to mitigate [17–19], stated willingness to make a donation to address climate change [20] or policy support [17,19,21,22]. In line with these findings, a study by Kyselá et al. [23] 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 that find 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 [18], 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 [24]. This could counter the effect of distance and hence explain the null results in Busse and Menzel's [18] study. For example, Spence et al. [11] 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. [21] 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. [25] indicate the opposite in their study), while at the same time such information becomes less personally relevant. Schuldt et al. [26] 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 [14]). In sum, it might be that effects of distance on pro-environmental behaviors are, indeed, depending on the type of environmental problem at stake [23]. 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 [27,28]). In fact, the differences in the measures of mitigation actions between the studies likely explain some of the ambiguity of the results.

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. [5] found in their

study that spatial distance was linked to concern, Gubler et al. [9] could not find evidence of an effect of spatial distance, but of social distance. Stanley et al. [8], 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 [11,14]. Greater exposure to effects [29] or greater attribution of relevance [13] 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 [19,22]. 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. 12,21] refer to as a theoretical framework to explain the effects, is the Construal Level Theory (CLT – [30]). According to CLT [30], 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” [30, p.440]. Some studies found support that greater psychological distance may have been the channel through which effects took place [12,13]. It is unclear, however, whether psychological distance as part of CLT is in fact the best explanatory concept [4]. Brügger et al. [31] 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 [32]. 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 [33].

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.

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 [34]. 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 policies – 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 paper is structured as follows: The second section presents the methodological details of our experiment, giving information about our sample, procedure and operationalization of the concepts looked at. The third section 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. The fourth section concludes by drawing implications for research and policy.

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 the supporting information S1. Afterwards, participants were asked to write a short newspaper article about what happened.

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 [34]. Further, India is an emerging economy so the specific effects induced by the status of a developing country as suggested by some studies [11] 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 1 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.




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		

Figure 1. Treatment operationalization

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 CO₂ 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 include, for instance,

higher CO₂ 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 the supporting information S2.

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 [35] . 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 can 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 [36]. 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 $T_{\text{Far Germany}}$ and 126 in $T_{\text{Far Global}}$. 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 A3 for details).

Analysis: We used non-parametric tests (Chi2 and Mann-Whitney-U tests) to assess if treatments had an effect on 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 $\alpha \leq 5\%$.

3. Results and Discussion

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.

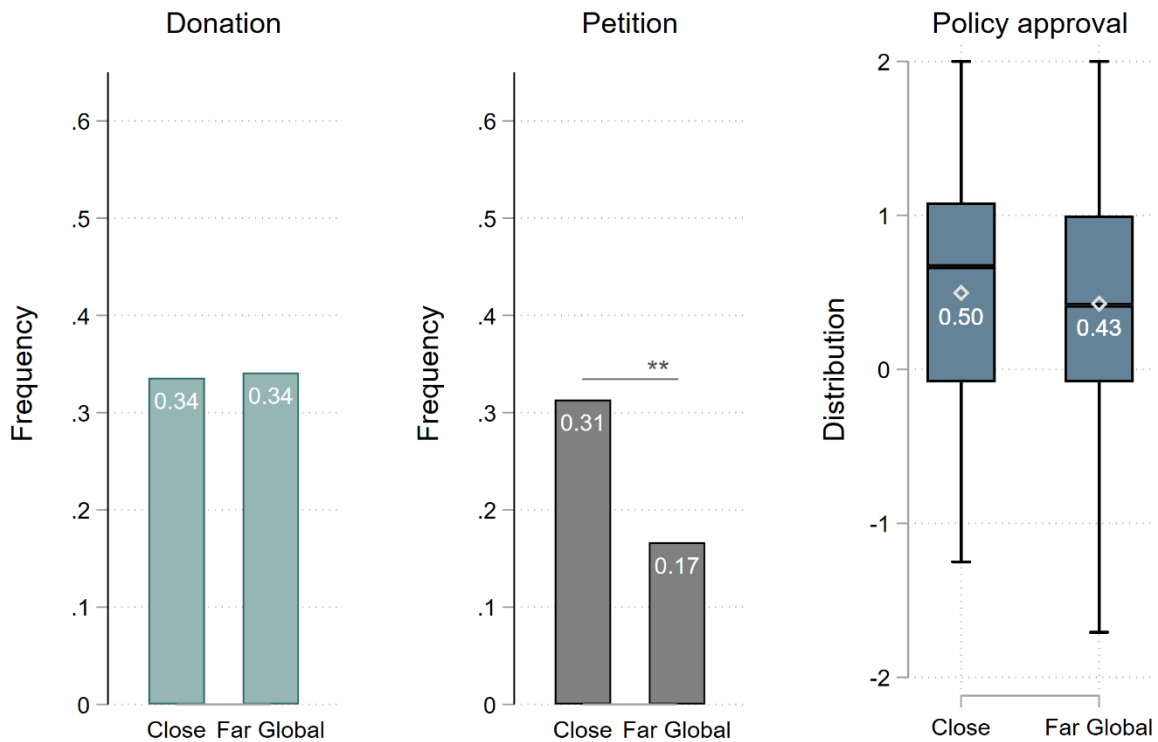


Figure 2. Mitigation actions, comparing treatments Close and Far Global

Figure 2 shows the bar graphs for all three dependent variables, comparing T_{Close} and $T_{Far Global}$. For the statistical analysis we employed Chi2- 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} : $\chi^2(1) = 7.62$, $p = .006$). For the mitigation measures donation and policy approval, our hypothesis could not be sustained ($\chi^2(1) = .009$, $p = .93$ and $Z = .83$, $p = .41$, 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.

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 1 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 A4 in the supporting information), 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 ($p=.012$ 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 A4). 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.

	(1) Donation	(2) Petition	(3) Policy approval	(4) Donation	(5) Petition	(6) Policy approval
Far Global	-0.0835 (-0.46)	-0.503* (-2.52)	-0.0740 (-0.68)	-0.0929 (-0.51)	-0.493* (-2.51)	-0.0683 (-0.65)
Far Germany				0.245 (1.38)	-0.0149 (-0.08)	0.129 (1.23)
Constant	-0.368 (-1.07)	-1.182** (-3.16)	0.328 (1.60)	-0.469 (-1.66)	-1.125*** (-3.77)	0.326* (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

*Notes: 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 $n = 383$.*

Table 1. Regression results for treatment effects

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 petition, 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 [37,38]. 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 [17,19,21,26].

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.

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

We found robust evidence that people in Germany were less willing to sign a petition for more climate protection, when a person in India with a name of Indian origin was 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 was responsible for the effect on our dependent variable likelihood to sign a petition. For this purpose, we used our third treatment condition $T_{Far\ Germany}$ – 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 1 (Models (4)-(6)). The resulting sample size for these regressions including controls was 315. We compared $T_{Far\ Germany}$ and $T_{Far\ Global}$, 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 ($\chi^2(1) = 5.59$, $p = .018$). 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 $T_{Far\ Global}$ ($M = 1.96$, $SD = 1.28$) and somewhere in-between in $T_{Far\ Germany}$ ($M = 2.77$, $SD = 1.44$). Table 2 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 $T_{Far\ Global}$.

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

Notes: 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 $n = 383$.

Table 2: Regression results for possible mediation pathways

As can be seen in Table 2, Model (1), both $T_{Far\ Germany}$ ($p = .016$) and $T_{Far\ Global}$ ($p < .001$) 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 $T_{Far\ Global}$ ($F(1,306) = 17.09$, $p < .001$), 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 $T_{\text{Far Germany}}$ and $T_{\text{Far Global}}$ 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 ($p=.21$ in Model (2) and $p=.68$ 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 $T_{\text{Far Global}}$) as predictors in Model (3), the influence of spatial distance continues to be significant ($p=.013$). 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.

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. [17] 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. 29]. 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 $T_{\text{Far Global}}$ significantly reduced the extent to which people felt personally affected by climate change (Model (4)) compared to T_{Close} ($p=.007$) and $T_{\text{Far Germany}}$ ($F(1, 306) = 19.89$,

$p < .001$). 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 was a significant predictor for the mitigation actions. Indeed, perceived personal affectedness predicted our outcome variable petition ($p = .04$, 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. From this analysis, we can conclude 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.

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 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 A5 in the supporting Information). The interaction terms were not significant for donating money (High Racism* $T_{Far\ Germany}$: $b = -.83$, $p = .27$; High Racism* $T_{Far\ Global}$: $b = -.58$, $p = .41$) nor for signing the petition (High

Racism* $T_{Far\ Germany}$: $b=.12$, $p=.86$; High Racism* $T_{Far\ Global}$: $b=-.36$, $p=.61$). For policy approval, we found a significant interaction with the $T_{Far\ Germany}$ treatment ($b= -.78$, $p=.03$), yet none for $T_{Far\ Global}$ ($b=-.34$, $p=.31$).

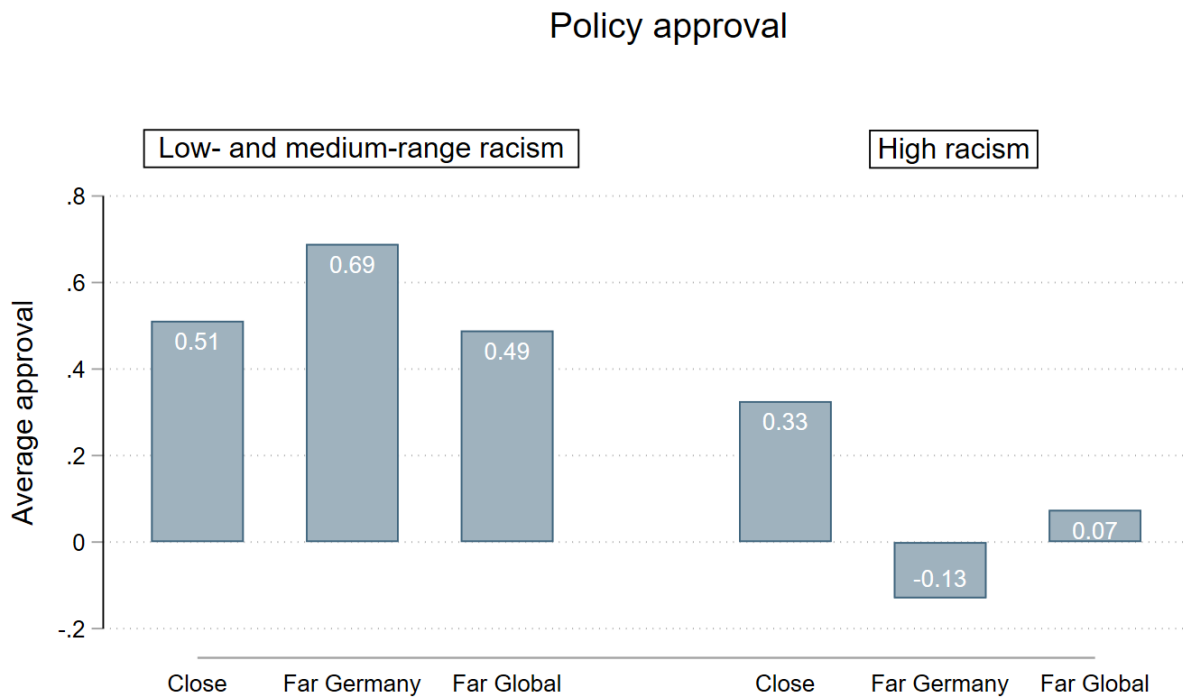


Figure 3: Different reaction patterns (policy approval) to the treatments depending on racist attitudes

Figure 3 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: $b=-.24$, $p=.001$; petition: $b=-.18$, $p=.021$; policy support: $b=-.21$, $p<.000$, controls included – Table A6). 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 here 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.

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 CO₂ 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 find weak evidence that racism might moderate the effects of social distance, even to an extent 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 [11,12]. 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 [39,40]. 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 [39]. 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.

5. References

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Appendix

A3 Balancing table

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

A4 Regression results with sociodemographic controls and expected state aid

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

Notes: 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 $T_{Far\ Global}$ on the willingness to sign the petition.

A5 Regression results with interaction terms for high racism

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

Notes: 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.

A6 Racism as predictor for mitigation actions

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

Notes: 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.