The Effects of Climate Change Information on Charitable Giving for Water Quality Protection: A Field Experiment

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This study uses a field experiment involving 251 adult participants to determine which messages related to climate change, extreme weather events, and decaying infrastructure are most effective in encouraging people to pay more for investments that could alleviate future water-quality risks. The experiment also assesses whether people prefer the investments to be directed toward gray or green infrastructure projects. Messages about global warming induced climate change and decaying infrastructure lead to larger contributions than messages about extreme weather events. The results suggest that people are likely to pay more for green infrastructure projects than for gray infrastructure projects.

Key Words: charitable giving, global warming messaging, gray infrastructure, green infrastructure, water quality

Climate change poses the threat of increasing the frequency and severity of extreme weather events, which could compromise the quality of drinking water resources in the United States. Despite overwhelming agreement among climate scientists that global warming, accelerated by human use of fossil fuels, is hastening climate change (International Panel on Climate Change 2014), numerous surveys have shown that 40 percent or more of Americans believe either that humans are not causing the acceleration or that the acceleration is not occurring (Gallup 2015). This lack of public support

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has discouraged U.S. policymakers at all levels from implementing plans to combat the effects of greenhouse gas emissions and begin the process of adapting to the potential negative consequences of climate change.

Using a field experiment, we examine how messages related to global warming induced climate change, extreme weather events, and decaying infrastructure affect people's willingness to contribute charitable donations for projects meant to improve the quality of drinking water. The experiment evaluates the effect of alternative linguistic framing in treatments involving commonly used phrases related to climate change and infrastructure investment to determine how such messages encourage or discourage the allocation of economic resources to efforts to adapt to these future problems.

Utilities that provide drinking water in the United States and elsewhere around the world face a multitude of challenges ranging from aging infrastructure to rising treatment costs and increasingly stringent regulations. The U.S. Environmental Protection Agency (EPA) reports that a significantly greater percentage of the country's precipitation over the past 25 years has come from intense single-day events, a change that scientists widely attribute to climate change (EPA 2014). At the same time, the American Society of Civil Engineers (ASCE) noted in its 2011 Failure to Act report (ASCE 2011) that the gap in funding needed for capital investments in water infrastructure continues to rise and predicted that it will expand from $54.8 billion in 2010 to $143.7 billion in 2040 (Figure 1). Administrators of utilities that provide drinking water must find ways to pay for much-needed improvements and repairs by increasing rates without seeming unreasonable or extravagant. Thus, gauging customers' responses to requests for rate increases is essential. Numerous stated-preference studies have indicated that income, household size, education, age, employment status, gender, and distance to a water source influence consumers' willingness to pay (WTP) for improved water resources (Moffat, Motlaleng, and Thukuza 2011, Veronesi et al. 2014, Kotchen, Boyle, and Leiserowitz 2013). The Water Research Foundation (2011) noted that information received through previous studies had aided a water utility in prioritizing investments and in developing and strengthening the utility's relationship with its customers.

To date, information on customer preferences and WTP for future investments in water quality has been collected through surveys. For example, the Water Research Foundation used surveys to gauge customers' WTP for proposed investments in infrastructure, water reuse, and renewable energy projects by the Albuquerque Bernalillo County Water Utility Authority in New Mexico (Water Research Foundation 2011). Although the surveys did not address projects specifically associated with water quality, the results are useful for understanding how survey techniques can be used in a utility-specific analysis. The surveys elicited WTP using a hypothetical stated-preference mechanism, which raises concern that respondents might have overstated their WTP because they did not actually purchase the good with their own money at that time (Water Research Foundation 2011).

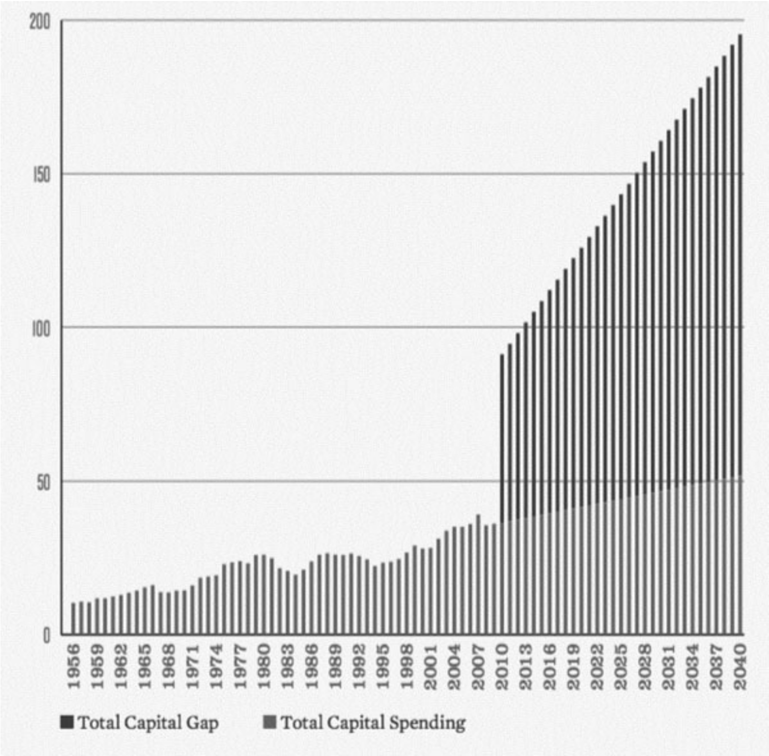

Figure 1. Overall Capital Investment Gap for U.S. Water Infrastructure for 1956–2040 in Billion Dollars

Source: Needs calculated from EPA (1997a, 1997b, 2001, 2002, 2003, 2005, 2008, 2009, 2010). Spending calculated from the Congressional Budget Office (2010) and the U.S. Census Bureau (2011a, 2011b). Consumer price-index adjustment is from the U.S. Bureau of Labor Statistics (2011). Projections by Downstream Strategies and EDR Group.

The terms used in discussions of political issues are critical to public perceptions. For instance, a 2013 *Huffington Post* poll (Swanson 2013) found that approximately 20 percent of Americans identified themselves as "feminists" while 82 percent believed in social, political, and economic equality for men and women. The difference between those who identified themselves as feminists and those who fit the definition but rejected the label is, according to the poll, attributable to negative associations with the term feminist. The same type of branding issues influence policy debates about global warming and climate change. This is important—utilities that provide drinking water and seek funding for investments to address the effects of extreme weather events want to avoid messages that users of public water and relevant policymakers find unappealing. On the other hand, messaging related to human causes of global warming could be an effective way to communicate the importance of the investment to individuals who accept global warming and climate change but might otherwise view the projects as unnecessary.

This study addresses four key questions:

1. Are people willing to pay an additional cost to fund infrastructure investments aimed at adapting to problems associated with extreme weather events such as droughts and floods, which are predicted to increase as a result of climate change?
2. Do people prefer to address the impacts of climate change on the quality of drinking water through gray infrastructure improvements such as modification of treatment plants or through green infrastructure improvements such as watershed protection?
3. Does people's willingness to contribute depend on the terms used to describe the reason for the need to invest in the future quality of drinking water (i.e., typical upgrades, increases in extreme weather events, climate change brought on by global warming, decaying infrastructure)?
4. What is the relationship between people's willingness to contribute and their demographic characteristics, political views, and average water bills?

Table 1 summarizes these questions and our basic conclusions.

We find that the language of messaging about climate change and whether a proposed infrastructure improvement is gray or green significantly affect people's willingness to contribute. Interestingly, individuals are less likely to contribute and, on average, give significantly less when they are exposed to language that emphasizes the connection between extreme weather events and climate change. Phrasing concerning climate change induced by global warming and the importance of investing in decaying infrastructure had little effect on an individual's likelihood of contributing, but participants who chose to contribute made significantly larger donations. Our results also indicate that contributions to water-quality improvements are larger for green infrastructure projects than for gray infrastructure projects. However, the difference in donations to the two types of projects narrows when language concerning global warming induced climate change, extreme weather events, and decaying infrastructure is included relative to a standard message of routine infrastructure upgrades.

Literature

Our study is similar to Bulte et al.'s (2005) analysis of whether alternative causes of an environmental problem affect peoples' WTP to resolve it; however, we employ a revealed-preference model of WTP instead of the hypothetical discrete choice model they used. Bulte et al. (2005) presented

Table 1. Research Questions

Question	Hypothesis Statement	Conclusion
Are people willing to pay an additional cost so that infrastructure investments can be made to adapt to future problems with extreme weather events, such as droughts and floods, which are predicted to increase as a result of global warming?	For each donation *D* to organization *i* with message *j* H_0: $D_{i,j} = 0$ H_A: $D_{i,j} > 0$	Reject H_0 (displayed in Table 2, all significant at 1 percent level). On average, contributions ranged from 2 percent to 6 percent of earnings.
Do people prefer to address the impacts of climate change on the quality of drinking water through modifications of treatment plants (gray infrastructure) or by some other means such as watershed protection (green infrastructure)?	H_0: $D_{TCF,j} = D_{AWWA,j}$ H_A: $D_{TCF,j} \neq D_{AWWA,j}$	Reject H_0 (Table 2). In the control treatment, donations for AWWA on average were 6.5 percentage points lower than donations for TCF (significant at 1 percent). There are significant countervailing effects in the other information treatments but the net effect is still significantly lower.
Does people's willingness to contribute depend on the terms used to describe the reason for the need to invest in future drinking water quality (i.e., typical upgrades, increases in extreme weather events, climate change brought on by global warming)?	H_0: $D_{i,A} = D_{i,B} = D_{i,C} = D_{i,D}$ H_A: $\sim H_0$	Reject H_0 (Table 2). Treatment B (extreme event language) was significantly lower than treatment A (control) at 1 percent while treatment C (global warming) was significantly higher than treatment A at 1 percent. There was no significant difference between treatments A and D (infrastructure).
What is the relationship between customers' willingness to contribute and their demographic characteristics, political views, and average water bills?	For each demographic variable *k* H_0: $\beta_k = 0$ H_A: $\beta_k \neq 0$	Reject H_0 (Table 2). The primary significant effects are for political orientation, amount of water bill, and household income.

each participant with one of three causes for declining seal populations in the northern Netherlands: a virus, climate change, or oil and gas drilling. Each participant's WTP was measured by asking one of three types of discrete choice-valuation questions—hypothetical, hypothetical with cheap talk, and consequentialism. In the consequentialism type, the participants were told that their answers were going to be used in a study that could potentially influence policymakers' decisions. The authors found that variations in the language of the script affected WTP, particularly when the script incorporated what Kahneman et al. (1993) referred to as the "outrage effect"—that people's WTP increases when they believe an environmental issue is caused by humans. They also found that the elicitation method mattered. The hypothetical with cheap talk and consequentialism valuation methods elicited markedly lower WTP estimates than the purely hypothetical evaluation method.

Cameron et al. (2001) emphasized the deviations between WTP elicited via open-ended hypothetical stated-preference models and revealed-preference models, which are the preferred method of assessing the value of a good. The authors compared one revealed-preference mechanism with six hypothetical stated-preference mechanisms and found that WTP estimates from the open-ended hypothetical stated-preference method were among the least consistent with estimates from the revealed-preference method. Balistreri et al. (2001) demonstrated deviation in WTP values assessed using a revealed-preference mechanism (an English auction experiment), an open-ended hypothetical stated-preference survey, and a hypothetical dichotomous-choice survey with a stated preference and found upward bias in the results from the survey methods. Since water utilities fund investment projects through fees and taxes, it is crucial for them to avoid such bias and to accurately assess customers' WTP for investments before they make them.

To obtain revealed-preference values, this study implements a charitable-giving experiment with a real-effort task. Several studies have shown that participants act in more self-interested ways when they feel that they earned their money rather than having been endowed with it. Cherry, Frykblom, and Shogren (2002) conducted several rounds of a dictator game using three treatments. The first was a baseline treatment in which each participant's endowment was determined randomly. The second was an earnings treatment in which each participant's endowment was determined by the participant's performance on a cognitive task (answering questions from the Graduate Management Admission Test). The last was a double-blind earnings treatment that was the same as the first earnings treatment except for providing greater subject-experimenter anonymity. In the earnings and double-blind earnings treatments, participants were significantly less generous than participants in the baseline treatment.

Reinstein and Riener (2012) and Carlsson, He, and Martinsson (2013) obtained similar results from charitable-giving experiments. In Reinstein and Riener (2012), participants earned their endowments by completing a simple task—summing five randomly generated numbers. The number of sums successfully completed in five minutes determined their earnings. In Carlsson, He, and Martinsson (2013), participants completed a lengthy questionnaire about the use of plastic bags at the supermarkets in which they were recruited and completed part of the experiment. All participants received the same endowment for completing the survey. Using a simple task rather than a cognitive one essentially levels the playing field so that all participants have a better chance of making money that can be used to pay for water protection. This approach is especially important when valuing improvements to water quality because the impacts of such improvements affect everyone in the water community and each person affected bears a portion of the cost.

Though studies that use a stated-preference mechanism to elicit WTP are associated with hypothetical bias, they offer valuable insights into correlations between WTP for improvements in water quality and demographic characteristics and political views. Moffat, Motlaleng, and Thukuza (2011) investigated WTP for improved water quality and reliability in Chobe ward in Maun, Botswana, and found that WTP increased with income and age and decreased as family size and education increased. Veronesi et al. (2014) assessed WTP to adapt Switzerland's wastewater discharge system to climate change. They found that a majority of people were willing to pay a higher local annual tax to reduce the risk of wastewater damaging public goods such as rivers, lakes, and streets when the risk was high but not when the risk was low. The majority of participants were not willing to protect private properties such as cellars from wastewater flooding regardless of the level of risk. Participants' WTP increased with wealth and education and decreased as the distance the person lived from a body of water increased. WTP was also closely tied to participants' perceptions of climate change; it was greater for politically liberal respondents than for conservative ones. Age, gender, language, and living in a rural versus an urban area had no effect on WTP.

Kotchen, Boyle, and Leiserowitz (2013) used two nationally representative surveys to estimate WTP for a national climate-change policy that would reduce domestic greenhouse gas emissions by 17 percent by 2020. They also investigated whether the type of policy affected WTP using three policy treatments: a cap and trade program, a carbon tax, and a greenhouse gas regulation. Participants' WTP was not affected by the type of policy but was affected by political affiliation; liberal respondents had a significantly higher WTP than conservative respondents. That result aligned with their finding that the largest factor in WTP was whether the participant believed that global warming was occurring.

Little work has been done to date to elicit revealed-preference measurements of WTP for improvements in water treatment infrastructure. We implement a charitable-giving field experiment involving a real-effort task to assess people's willingness to contribute to projects that would improve the quality of their drinking water. In particular, the experiment evaluates the effect of commonly used phrases related to climate change and infrastructure investment to determine how different messages affect people's inclination to provide economic resources to efforts to adapt to potential future water quality issues.

Experiment Design

To measure consumers' willingness to contribute to maintaining or improving the quality of drinking water, we used a field experiment involving charitable giving in which participants earned money. After earning money, they were given the opportunity to donate some of it to two charitable organizations that work to improve the quality of drinking water. The experiment was conducted in three locations: (i) a large community agricultural-education event and plant sale hosted annually by the local university, (ii) a countywide indoor-outdoor flea and farmer's market that ran every weekend, and (iii) a community center in a low-income urban neighborhood. In each case, eight to twelve computer stations were set up on folding tables.

Participants were initially paid a $5 fee for taking part and had the opportunity to earn an additional $14.40 through the real-effort task. After the task was completed, they were given the option to either keep the money they had earned or donate some, all, or none of it to one or both of the charities, The Conservation Fund (TCF) and the American Water Works Association (AWWA). TCF is a leading national nonprofit organization that focuses on a variety of conservation problems and promotes green infrastructure as a low-cost alternative to traditional gray infrastructure methods of water management such as storm drains, sewers, and treatment plants. AWWA is another leading national nonprofit organization but its focus is on improving the quality of drinking water using traditional civil engineering methods.

Once participants decided whether to keep and/or donate the money they had earned, they completed a survey that collected information on their demographic characteristics, political views, and average water bills. The survey also asked participants to state their level of agreement with statements about TCF, AWWA, global warming, climate change, green infrastructure, gray infrastructure, and how to fund public goods. The survey is included in Online Appendix A.

The goal of the field experiment was to observe how participants spent money they had earned on improvements to drinking water. The real-effort task consisted of a game that simulated earning money through work using a slider task similar to the one developed by Gill and Prowse (2012). Since the experiment was computer-based and used z-Tree (Fischbacher 2007), the code used to implement it was also based on Gill and Prowse (2012).

During the experiment, each participant was individually presented with a single computer screen containing 48 slider bars (Figure 2). All of the sliders were initially set at 0 and could be repositioned using the computer mouse and/or arrow keys to any integer between 0 and 100. Participants were asked to set as many of the sliders as they could to the exact mid-point of 50 in a fixed amount of time (see Figure 3 for examples of the sliders set at 0 and 50). One untimed practice round was provided to give participants experience in repositioning the sliders before they moved on to three 120-

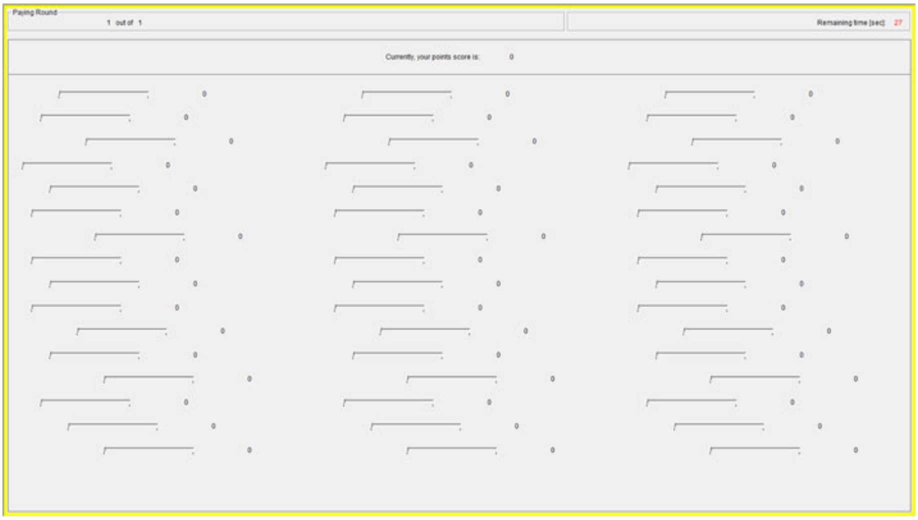

Figure 2. Subject Interface

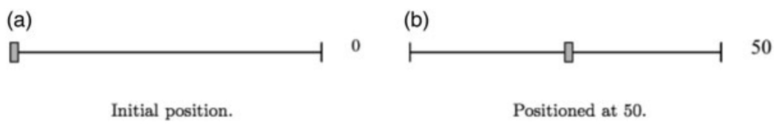

Figure 3. Slider Task

second rounds in which they earned money. They earned one point for each slider that they correctly repositioned to 50 during each round, and each point was worth 10 cents. Thus, participants could earn $4.80 per round and $14.40 total. At the end of each round, the screen displayed the number of points and amount of money earned thus far. The instructions for the task were presented individually on the computer screens with administrators assisting and answering questions as needed during the practice round.

The total amount of money earned, including the $5 participation payment, was displayed on the screens once the rounds were completed, and the participants then chose to either keep all of the money earned or donate some or all of it to the designated charities. This portion of the experiment involved four between-subject treatments in which different terms were used to describe the need for funds for drinking water infrastructure. The following language for the baseline treatment shows the differences in the language used to describe TCF and AWWA in bold.[1]

[1] In the field experiment, the language was not presented in bold.

Treatment A – Baseline generic message

"A donation to the **Conservation Fund** to help pay for **green infrastructure** investments that will protect drinking water quality when storms occur. The **Conservation Fund** is a national non-profit organization that focuses on improving drinking water through **minimizing the need** for traditional methods of water management, such as storm drains, sewers, and water treatment plants."

"A donation to the **American Water Works Association** to help pay for **infrastructure** investments that will protect drinking water quality when storms occur. The **American Water Works Association** is a national non-profit organization that focuses on improving drinking water quality through **traditional methods of water management**, such as storm drains, sewers, and water treatment plants."

The other three treatments kept the language related to TCF and AWWA the same and changed the message related to weather events:

Treatment A – Baseline generic message: "A donation to the Conservation Fund to help pay for green infrastructure investments that will protect drinking water quality **when storms occur.** The Conservation Fund is a national non-profit organization that focuses on improving drinking water through minimizing the need for traditional methods of water management, such as storm drains, sewers, and water treatment plants."

Treatment B – Extreme weather events message: "A donation to the Conservation Fund to help pay for green infrastructure investments that will protect drinking water quality **when storms occur with increasing frequency due to extreme weather events.** The Conservation Fund is a national non-profit organization that focuses on improving drinking water through minimizing the need for traditional methods of water management, such as storm drains, sewers, and water treatment plants."

Treatment C – Extreme events resulting from human-caused, global-warming message: "A donation to the Conservation Fund to help pay for green infrastructure investments that will protect drinking water quality **when storms occur with increasing frequency due to human caused, global warming induced climate change.** The Conservation Fund is a national non-profit organization that focuses on improving drinking water through minimizing the need for traditional methods of water management, such as storm drains, sewers, and water treatment plants."

Treatment D – Decaying infrastructure message: "A donation to the Conservation Fund to help pay for green infrastructure investments that will protect drinking water quality **when storms occur, given that decaying infrastructure could lead to decreased reliability**. The Conservation Fund is a national non-profit organization that focuses on focuses on improving drinking water through minimizing the need for traditional methods of water management, such as storm drains, sewers, and water treatment plants."

The instructions for this portion of the experiment, including the information presented in each treatment, are included in Online Appendix B.

Results

The study sample consisted of 251 adults from various parts of New Castle County, Delaware. The majority of the participants (67 percent) were recruited at the agricultural event; 16 percent were recruited at the local flea/farmer's market, and 17 percent were recruited at the neighborhood community center. The participants were between 18 and 77 years of age with a mean of 31. In terms of political affiliation, 27 percent identified themselves as liberal, 19 percent as conservative, and 54 percent as independent or other, a ratio that is fairly typical for the region (U.S. Census Bureau 2014). Reported annual household income ranged from $25,000 to $200,000 with a mean of $79,000 and a median of $55,000. There were 58 participants in treatment A (baseline), 58 in treatment B (extreme events), 66 in treatment C (global warming), and 69 in treatment D (infrastructure).

Figures 4, 5, and 6 present the results for the average contributions by treatment and donation recipient. Figure 4 reports the average percentage of earnings donated for all participants. Since many participants chose not to donate, Figure 5 shows the percentage of participants who made a donation

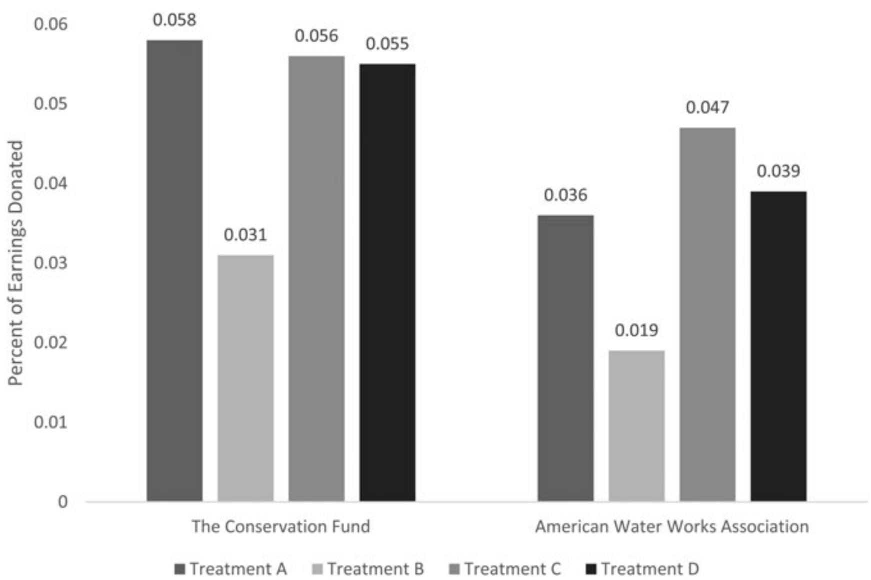

Figure 4. Average Percentage Donated by Information Message and Organization

Treatment A: Control Message

Treatment B: Extreme Event Message

Treatment C: Global Warming Message

Treatment D: Infrastructure Message

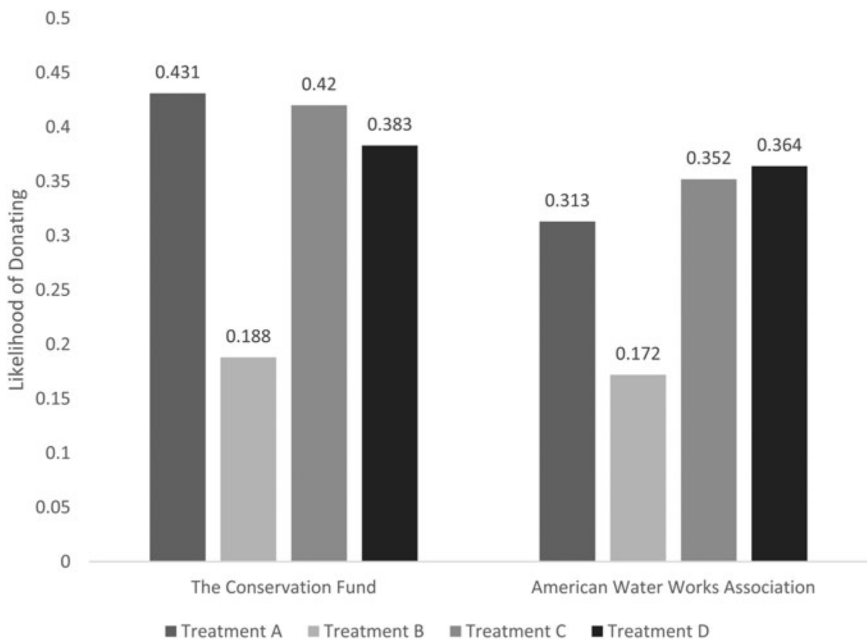

Figure 5. Likelihood of Donating by Information Message and Organization

Treatment A: Control Message

Treatment B: Extreme Event Message

Treatment C: Global Warming Message

Treatment D: Infrastructure Message

of any size and Figure 6 reports the average percent of earnings donated by all participants who made a donation.

An immediate and striking observation from Figures 4 and 5 is that the percentage of earnings donated in treatment B (extreme events: "infrastructure investments that will protect drinking water quality when storms occur with increasing frequency due to extreme weather events") is much lower than the percentage of earnings donated in the other treatments. The average percentages of earnings donated to TCF in treatments A, C, and D are approximately equal and quite a bit larger than the average percent donated in treatment B. The average percentages of earnings donated to AWWA in the A, C, and D treatments are somewhat more diverse but are still generally larger than the percentage of earnings donated in treatment B.

Differences in the participants' likelihood of giving any amount largely drive the variations in average contributions. This result is consistent with previous research on the impacts of various fundraising mechanisms employed by charities, such as lotteries (Landry et al. 2006), matching gifts (Karlan and

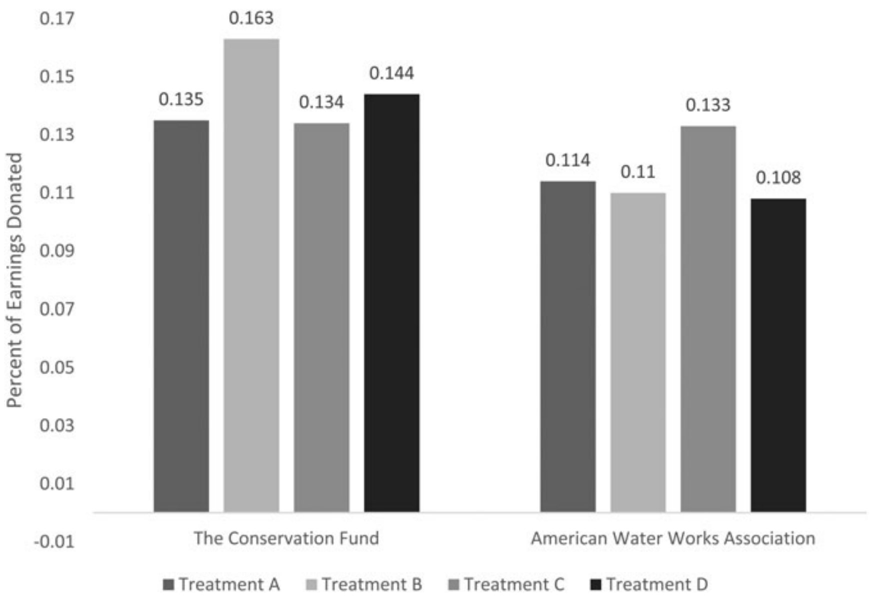

Figure 6. Percent of Positive Donations by Information Message and Donation Recipient

Treatment A: Control Message

Treatment B: Extreme Event Message

Treatment C: Global Warming Message

Treatment D: Infrastructure Message

List 2007), and unconditional gifts (Falk 2007). Interestingly, as shown in Figure 6, participants who chose to donate in a treatment typically contributed a relatively large share of their earnings. Thus, a relatively small number of participants were responsible for much of the amount of donations received. This is particularly true in treatment B where there was a decrease in the number of people contributing (people were "turned off" by the message) but an increase in the average percent of earnings donated by the small number of participants who gave. Practically speaking, this result suggests that certain types of messaging could increase contributions from some individuals. It would be important to carefully target individual messages to avoid discouraging other potential contributors.

As shown in Figure 7, attitudes toward global warming induced climate change and humans' role in it do not seem to be important factors as there is no statistically significant difference in the average level of agreement regarding statements about global warming or climate change.

To isolate the effect of each treatment and explore the effects of demographic characteristics on donations, we consider two models. The first is a Tobit model

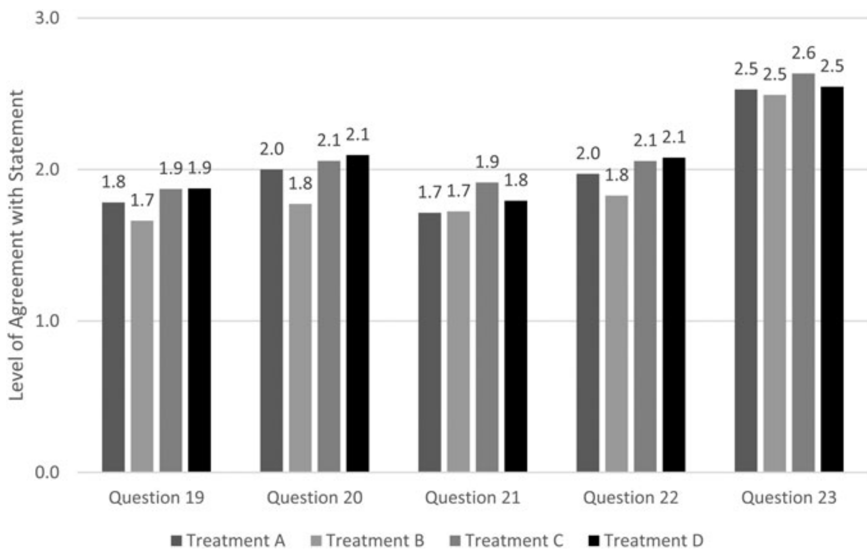

Figure 7. Average Agreement with Statement by Information Message and Survey Question

Treatment A: Control Message

Treatment B: Extreme Event Message

Treatment C: Global Warming Message

Treatment D: Infrastructure Message

with censoring at 0 percent and 100 percent of earnings. In that case, the same process governs the decision to donate and the amount donated. The second is a two-stage "hurdle" specification that first uses a logit model to estimate the likelihood of donating across all participants and then uses a linear model for participants who choose to donate. This two-stage specification estimates marginal effects that are more intuitive than the effects estimated in a Tobit model and more sensible when the censoring process is significantly different from the donation decision. The marginal effects from both models are reported in Table 2. The p-values are reported in parentheses, and effects that are significant at the 0.05 level or greater are reported in bold.

Qualitatively, the results of the Tobit and hurdle models are consistent; however, the results from the hurdle model offer further insight into the decisions underlying donations. First, we see that the extreme-event message (treatment B) does, in fact, have a significant and substantial negative effect (−0.185) on the likelihood of contribution. However, it increases the amount donated by 0.066 percentage points and thus has a small net negative effect on the margin. The effect of treatment B for contributions to AWWA is smaller—a countervailing 0.139 increase in the likelihood of giving and the

Table 2. Marginal Effects from the Tobit and Hurdle Models

	Tobit Model	Hurdle Model	
	Percent of Earnings Donated	**Likelihood of Donating**	**Percent Donated Given a Donation Greater than Zero**
Information Treatment			
Extreme events (B)	−**0.067***** **(0.000)**	−**0.185***** **(0.000)**	**0.066***** **(0.000)**
Global warming (C)	**0.052***** **(0.000)**	**0.132***** **(0.000)**	0.022 (0.121)
Infrastructure (D)	−0.001 (0.957)	−0.001 (0.907)	0.015 (0.689)
Donation Recipient Treatment			
American Water Works Association (AWWA)	−**0.065***** **(0.000)**	−**0.135***** **(0.000)**	0.005 (0.734)
AWWA*B	**0.031**** **(0.030)**	**0.139***** **(0.001)**	−**0.063***** **(0.005)**
AWWA*C	**0.045***** **(0.005)**	**0.084**** **(0.041)**	−0.004 (0.786)
AWWA*D	**0.057***** **(0.002)**	**0.189***** **(0.001)**	−0.041 (0.214)
Demographic Characteristics			
Politically conservative	0.024* (0.097)	0.043 (0.101)	0.022 (0.146)
Quarterly water bill ($100)	−**0.016***** **(0.000)**	−**0.023***** **(0.003)**	−**0.019***** **(0.001)**
Male	0.135 (0.322)	−0.020 (0.135)	**0.041***** **(0.000)**
Household income ($1,000)	0.022 (0.790)	−**0.517***** **(0.007)**	**0.321***** **(0.000)**
Age	−0.002 (0.385)	−0.005 (0.135)	**0.001***** **(0.000)**
Years of schooling	0.008 (0.211)	**0.013**** **(0.048)**	0.002 (0.795)
Lower censored	292	–	–
Total N	459	459	167
Pseudo R^2	0.406	0.198	0.195

Notes: These include standard errors clustered by day. Screening questions (12, 14, and 16 from the survey) and location fixed effects are included. P-values are reported in parentheses. Coefficients with $P < 0.05$ are bold. *, **, and *** indicate significance at the 0.1, 0.05, and 0.01 level respectively.

increase in the percentage donated is now insignificant. Thus, if a utility that provides drinking water can carefully target messages about extreme weather events, their customers' WTP may be better than expected. However, if the messages cannot be carefully targeted, WTP for future enhancements to drinking water could be lowered.

Under the control treatment (A), the average donation to AWWA is less than the average donation to TCF. The difference is again driven by the decision to donate. The difference in the average percentage donated to the two groups is smaller in the messaging treatments.

In terms of demographic characteristics, respondents who identified as politically conservative donated more than respondents who identified as politically liberal or independent/other on average, which is consistent with prior studies of charitable giving.[2] Those with higher water bills were less likely to donate and donated less than people with lower water bills. Interestingly, respondents who had relatively high household incomes were less likely to donate but donated a larger percentage when they contributed. We do not have a solid explanation for these results but can offer some speculation. Households that already paid large water bills might feel that they had already contributed sufficiently (or over-contributed) to the development and maintenance of the utility. What's more, those who were wealthier or currently had higher water bills were also more likely to have homes with larger lawns that accounted for a large portion of their water usage, a factor that could lead to different attitudes about water use, perceptions of risk associated with water, and flexibility in adapting to changing water conditions.

Conclusions

In this study, we used a field experiment to measure the willingness of water utility customers to contribute to investments designed to alleviate threats to the quality and reliability of drinking water supplies posed by an increase in extreme weather events. In an experiment, participants completed a real-effort task to earn money and were then presented with an opportunity to donate some or all of their earnings to two nonprofit organizations that take different approaches in their efforts to improve water quality. The four between-subject treatments used in the experiment consisted of language used to describe the reason for investing in infrastructure improvements—a generic baseline description, extreme weather events, climate change caused by global warming, and decaying infrastructure—and a within-subject

[2] Replacing the political-conservative variable in the Tobit and hurdle models with alternative variables that measured participants' beliefs in climate change and humans' role in climate change did not provide any further explanation of the differences in likelihood of giving or percentage of earnings given. This suggests that these variables capture similar effects.

treatment for green versus gray infrastructure investments defined by the recipient of the donation.

We find that the participants were willing to donate more of their earnings to the green infrastructure organization, TCF, than to the gray infrastructure organization, AWWA. The difference was largest in the baseline treatment and narrower in the information treatments.

The results of the message treatments are striking. The differences between the control message and the global-warming-induced climate change and decaying-infrastructure messages were small, but respondents were significantly less likely to give and, on average, gave significantly less when the message referred to extreme weather events. Our experiment does not allow us to fully determine the reasons for this difference. Perhaps people feel less of a sense of responsibility for random acts of nature such as weather and a greater sense of responsibility for decaying infrastructure and global warming induced climate change. The extreme-event language is associated with natural disasters, and people may expect government agencies such as the Federal Emergency Management Agency (FEMA) to take responsibility for protection from such events. Further work in this area could refine the messages to isolate this difference and explore other messages, different types of charitable organizations, and the effect of education about the role of such organizations in providing safe drinking water.

Supplementary Materials

To view supplementary material for this article, please visit http://dx.doi.org/10.1017/age.2016.17

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