Supplemental Materials

1. Correlational Pilot Study

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1. Correlational Study

In this study, we tested the relationship between perceptions of past generations' sacrifices, gratitude, and a sense of obligation towards future generations using a correlational design.

Method

Participants.

Sixty participants were recruited through Amazon Mechanical Turk (AMT) and compensated for their participation. One additional person participated, thus the full sample was 33 men, 28 women, (M_{age} = 35.00 years, SD = 10.26). The study was run online using Qualtrics survey software. A sensitivity analysis indicated that this sample size allowed 80% power to detect a minimum effect of r = 0.34 (two-tailed α = .05; Faul, Erdfelder, Lang, & Buchner, 2007).

Procedure and materials.

The primary measures assessed participants' perception of past generations' sacrifices, their gratitude for those sacrifices, and their sense of obligation towards future generations. Participants were presented these measures in a random order, and responded on 7-point scales from 1 = *strongly disagree* to 7 = *strongly agree*. Perceptions of past generations' sacrifices were assessed with a single item: "Past generations made sacrifices that have greatly benefited current generations." Gratitude was assessed with three items, presented in a random order (e.g., "I am grateful for the sacrifices made by past generations"; α = .899), as was obligation (e.g., "In deciding how to live, I have a responsibility to consider the welfare of future generations"; α = .870). The obligation items were based on those developed by Markowitz (2012). Finally, participants indicated their age, gender, political orientation (1 = *very liberal*, 7 = *very conservative*; we also included *libertarian* and *apolitical/not interested* as additional response options), religious identification, and level of religiosity. They were then thanked and debriefed.

Results and Discussion

As predicted, the perception that past generations made beneficial sacrifices was positively correlated with a sense of gratitude and with a sense of obligation towards future generations (see Table P1). We tested the indirect effect of sacrifices on obligation via gratitude, using the PROCESS Macro for SPSS, Model 4 (Hayes, 2012). This analysis revealed evidence consistent with gratitude mediating the relationship between perceptions of sacrifice and the sense of obligation (see Figure P1; indirect effect = 0.270, 95%CIs [0.091, 0.529]). However, we note that mediation analysis of this sort cannot uniquely identify the true mediator, and merely provides evidence consistent with an assumed mediation model (Fiedler, Harris, & Schott, 2018; Fiedler, Schott, & Meisser, 2011). This point applies to all of our later studies as well, in which we also test for alternative mediation pathways.
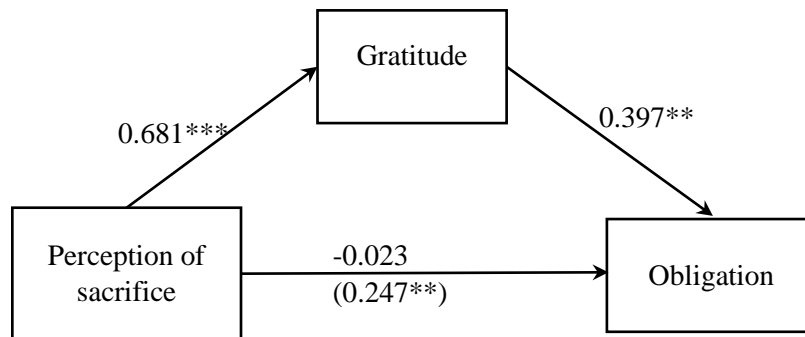
This study thus provides the first correlational evidence that positively appraising, and feeling grateful for, the broad set of sacrifices made by past generations is positively related to a sense of obligation towards future generations. But, of course, this constitutes only limited evidence, because these correlations could be driven by an assortment of third variable confounds.

Table P1

Descriptive Statistics and Zero-order Correlations for the Primary Measures in this Correlational Pilot Study.

	Measure	Mean (*SD*)	2	3
1	Perception of sacrifice	5.44 (1.39)	.712***	.338**
2	Gratitude	5.21 (1.32)		.496***
3	Obligation	5.78 (1.01)		

Note. ** p < .01, *** p < .001

Figure P1: Summary of mediation model in this (correlational) study. The direct effect was not significant, suggesting that gratitude mediates the relationship between perceptions of sacrifice and obligation. (Total effect in brackets.) The indirect effect was significant, point estimate = 0.270, 95%CIs [0.091, 0.529].
** *p* < .01, *** *p* < .001.

2. Exploratory factor analysis of pro-environmental outcome measures, in Study 1.

We asked participants to indicate which out of a range of issues they thought were the most and least important (1 = *not at all important*, 4 = *moderately important*, 7 = *extremely important*). The 12 issues were presented to participants in a random order, but we were primarily interested in their responses to the three "environmental policy" issues: "Putting policies in place that reduce our future carbon emissions, thus curbing global warming"; "Managing our natural resources – forests, rivers, oceans – in a way that is sustainable for the long term"; "Preventing environmental pollution, such that people can continue to enjoy clean air and water in the future." The full list is presented in Table S1. We factor analyzed these items using maximum likelihood extraction and direct oblimin rotation (because we were not assuming that the factors were uncorrelated). In this analysis, three factors had an Eigenvalue > 1, and were interpretable. These factors together accounted for 50.67% of the variance. The pattern matrix is presented in Table S1.

Table S1
Pattern Matrix for Exploratory Factor Analysis of Items Concerning Various Social and Political Issues

	Factor 1	Factor 2	Factor 3
Preventing environmental pollution, such that people can continue to enjoy clean air and water in the future	.964		
Putting policies in place that reduce our future carbon emissions, thus curbing global warming	.774		
Managing our natural resources – forests, rivers, oceans – in a way that is sustainable for the long term	.651		
Ensuring access to adequate contraception and safe abortions for all women who need them	.440		
Tightening immigration laws and increasing border patrol		.786	
Increasing the defense budget in order to ensure the nation's security		.718	
Training more police in order to reduce crime		.690	
Cutting back on spending on welfare in order to reduce national debt		.630	
Repairing infrastructure such as roads, railways, and bridges			.682
Expanding Social Security Benefits to lift more people out of poverty			.604
Reducing unemployment by increasing the number of jobs available			.393
Reforming campaign finance rules			.388
% variance	27.52	17.19	5.96

Note. Loadings < .30 are hidden.

The first factor included the three environmental items, as well as an item about access to adequate contraception; it looks like a typically "liberal policy" factor. The second factor included all the conservative-sounding items: Tightening immigration laws, increasing the defense budget, training more police, and cutting back on welfare spending to reduce national debt. The final factor includes the more "bipartisan" policies, including repairing infrastructure, expanding social security, creating more jobs, and reforming campaign finance rules.

In addition, we asked participants to indicate whether the intended benefits of each policy would be realized immediately, or in the future (1 = *the benefits would be realized immediately;* 7 = *the benefits would be realized in the distant future*). The three environmental policies were the only ones for which mean responses were significantly above the midpoint of the scale (4); most of the other responses were significantly below the midpoint of the scale (see Table S2).

Based on the results from these two analyses, we decided to combine the three environmental measures for analysis in the main manuscript (Environmental items α = .859; Conservative items α = .802; Bipartisan items α = .622).

Table S2
Mean Responses Regarding Whether the Benefits of Each Policy Would be Realized Immediately (1) or in the Distant Future (7), and the Results of a t-test Against the Midpoint of the Scale (4).

	Mean	SD	t(198)	p
Preventing pollution	**5.08**	**1.689**	**9.025**	**<.001**
Reducing carbon emissions	**5.29**	**1.603**	**11.322**	**<.001**
Managing natural resources	**5.22**	**1.652**	**10.428**	**<.001**
Access to contraception	3.09	1.820	-7.090	<.001
Immigration law	3.53	1.614	-4.129	<.001
Defense budget increase	4.05	1.641	0.432	.666
Training police	3.48	1.611	-4.577	<.001
Reduce national debt	4.15	1.833	1.160	.247
Repairing infrastructure	3.26	1.784	-5.882	<.001
Expanding social security	3.53	1.699	-3.880	<.001
Reducing unemployment	3.19	1.758	-6.531	<.001
Reforming campaign finance	3.75	1.739	-1.997	.047

3. Study 1R - Replication

We ran an additional study, very similar to Study 1, which replicated the main effects of Study 1 with regard to gratitude and obligation. The main difference from Study 1 reported in the main manuscript was that we also included a different set of pro-environmental measures. Rather than focusing on the perceived importance of environmental policies (as in Study 1), we instead asked participants the extent to which they would be willing to make sacrifices in their own lives, for the sake of the environment. Full methods and results are provided below.

Method

Participants.

We again recruited two-hundred participants through AMT (115 male, 80 female, 5 missing or other; Mean age = 33.46, SD = 10.06). The study was run online using Qualtrics survey software.

Materials and procedure.

The materials and procedure were the same as in Study 1, with the following exception: After responding to the writing prompt about either past fashion or past sacrifices, and the gratitude ($\alpha = .805$) and obligation ($\alpha = .791$) measures, participants also responded to a number of items assessing their willingness to make sacrifices for the environment (e.g. "I am willing to give things up that I like doing if they harm the natural environment," "I am willing to go out of my way to do what is best for the environment," 1 = *strongly disagree,* 7 = *strongly agree,* Davis, Le, & Coy, 2011; $\alpha = .923$). The five items about the environment were embedded among seven additional items about sacrifice (e.g. "I am willing to give things up that I like eating (e.g. sugar, fat) if it harms my health," "I am willing to go out of my way to do what is best for my well-being") in an attempt to mask the purpose of the environmental items.
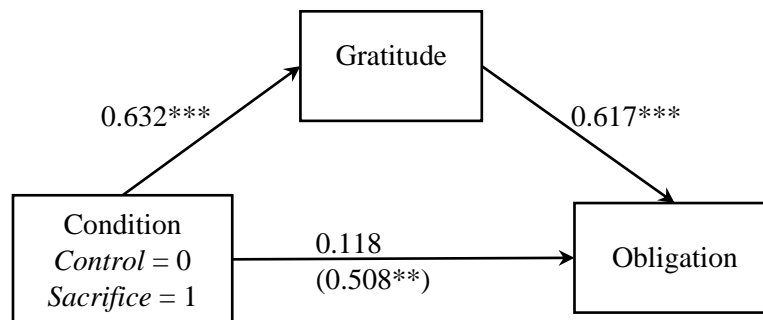
Table S3

Descriptive Statistics and Zero-order Correlations for all Measures in Study 1R

	Measure	Condition, *M* (*SD*)		Correlations	
		Control (*n* = 97)	Sacrifice (*n* =100)	2	3
1	Gratitude	5.61$_a$ (1.19)	6.24$_b$ (0.79)	.481***	.322***
2	Obligation	4.90$_a$ (1.47)	5.41$_b$ (1.25)		.492***
3	Willingness to sacrifice	4.78$_a$ (1.57)	5.35$_b$ (1.09)		-

Note: different subscripts indicate significant differences between conditions, at $p < .011$. For the correlations, ** $p < .01$, *** $p < .001$

Results and discussion

Three participants wrote nonsense in response to the writing prompt (e.g. "blah blah blah"), and were excluded from analysis. Descriptive statistics and correlations among all measures are presented in Table S3. Consistent with Study 1, participants reported greater gratitude towards past generations, $t(195) = -4.412$, $p < .001$, $d = 0.62$), and a greater sense of obligation towards future generations, $t(195) = -2.610$, $p = .010$, $d = 0.37$, when they had reflected on sacrifices made by past generations, as predicted. Furthermore, in line with Study 1 and the correlational study, there was an indirect effect of condition on obligation through gratitude: indirect effect $= 0.390$, 95%CIs [0.225, 0.605], see Figure S1.[1]

Figure S1: Summary of mediation model, Study 1R. In this study, the effect of condition on obligation was mediated by gratitude, as indicated by the non-significant direct effect (Baron & Kenny, 1986). Total effect in brackets.

In this study there was also an effect of condition on the pro-environmental measure, $t(195) = -2.988$, $p = .003$, $d = 0.42$; participants who had reflected on the sacrifices made by past generations were more willing to make sacrifices of their own for the sake of the environment. To explore the relationship between this measure and a sense of obligation (see Table S3), we again ran a serial mediation analysis, depicted in Figure S2. The indirect effect of condition on willingness to sacrifice (through gratitude and obligation) was significant, indirect effect $= 0.167$, 95%CIs [0.088, 0.299], and the direct effect was not significant (direct effect $= 0.287$, 95%CIs [-0.058, 0.632]) indicating mediation.[2]

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[1] This indirect effect held even when age, gender, and political orientation were included as covariates of gratitude and obligation; indirect effect $= 0.376$, 97% CIs [0.205, 0.626].

[2] This indirect path was significant also when age, gender, and political orientation were included as covariates; indirect effect $= 0.163$, 95% CIs [0.081, 0.294].
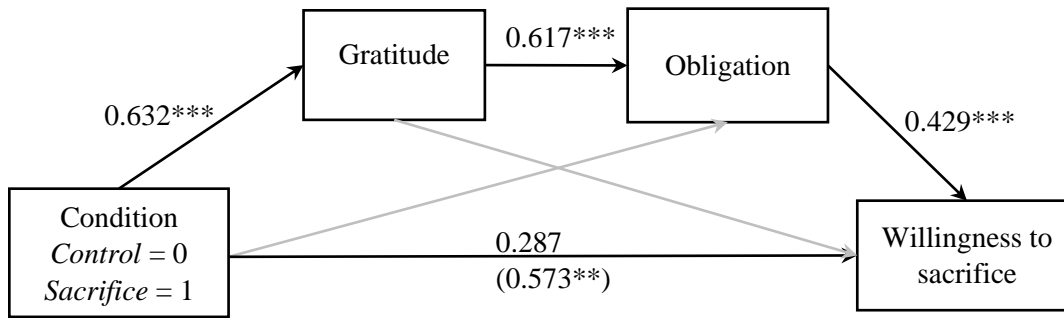
Figure S2: Summary of serial mediation model, Study 1R. Non-significant paths are in grey. The total effect (in brackets) was significant and positive, yet the direct effect was not significant, indicating that gratitude and obligation mediate the effect of condition on willingness   to   sacrifice. ** *p* < .01, *** *p* < .001.

Overall, this study replicated the main result of Study 1 – reflecting on past sacrifices increases a sense of obligation towards future generations – but also found that this sense of obligation can drive a willingness to make sacrifices of one's own.

Interestingly, in the present study the effect of condition was also significant for the filler items, *t*(195) = -2.128, *p* = .035, *d* = 0.30; sacrifice condition: *M* = 5.43, *SD* = 0.79, control condition *M* = 5.14, *SD* = 1.12, raising the possibility that the manipulation can motivate a willingness to sacrifice in general, not just for future generations. Another possibility, however, is that this result is a false positive. The effect is smaller than the effect on the subset of items assessing willingness to sacrifice for the environment, and – speculatively – it could be a form of response bias, if participants' responses to the environmental items contaminated their responses to the non-environmental items. We have not explored these possibilities further, but (assuming the effect is real) it is worth studying – interested researchers could perhaps draw on the broader literature on (the effects of) gratitude (e.g., McCollough, Kimeldorf, & Cohen, 2008).

References

McCullough, M. E., Kimeldorf, M. B., & Cohen, A. D. (2008). An adaptation for altruism: The social causes, social effects, and social evolution of gratitude. *Current Directions in Psychological Science, 17*(4), 281-285.

4. Results for additional measure in Study 2

As reported in footnote 5 of the main manuscript, in Study 2 we also asked participants to complete a measure of ability or control (Gifford & Comeau, 2011). This 6-item measure includes items like, "I feel able to meet the challenge of controlling the greenhouse gases that I am responsible for," "I can improve my ability to cut my greenhouse gas emissions" (1 = *strongly disagree,* 7 = *strongly agree*; $\alpha = .914$). We thought that participants might agree more with these items when they had reflected on the sacrifices made by past generations.

We did not find a significant effect of condition on this measure, $F(2,448) = 2.239$, $p = .11$, $\eta_p^2 = .01$; see descriptive statistics in Table S4.

Table S4
Descriptive Statistics for the Ability/Control Measure Across the Three Conditions in Study 2, and Correlations Between This Measure and the Other Measures in Study 2.

	M(SD)			Correlations with…		
	Control	Sacrifice	Lack	Gratitude	Obligation	Giving up income
Ability/control	4.68 (1.52)	4.97 (1.16)	4.96 (1.37)	$r = .092, p = .051$	$r = .446, p < .001$	$r = .593, p < .001$

5. Study 3

Emotion items

The full list of emotions we assessed in Study 3, and descriptive statistics across the three conditions, are presented in Table S5, below.
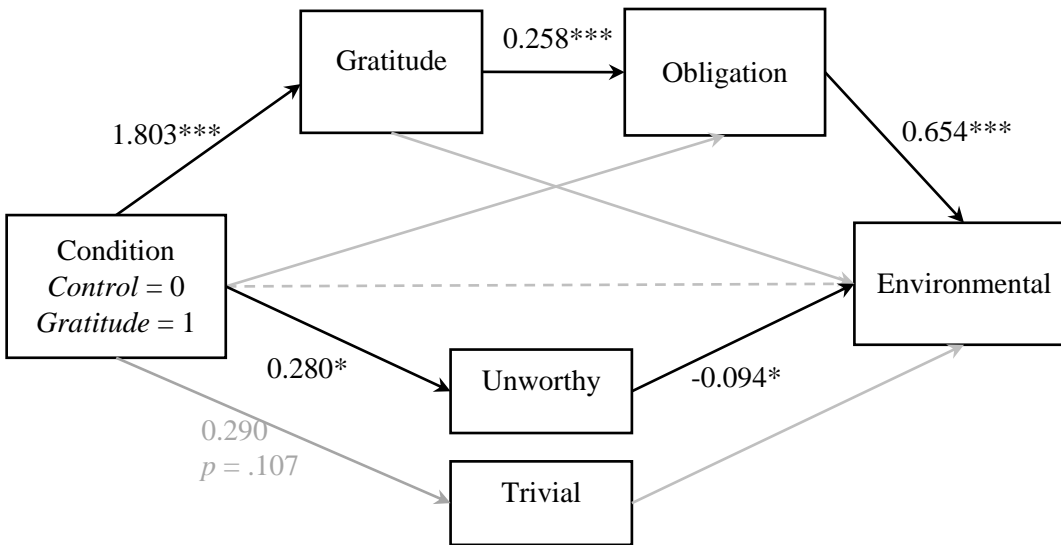
Table S5

Descriptive Statistics and Zero-order Correlations for all Emotion Items in Study 3

		Condition, *M* (*SD*)			Correlations					
	Measure	Control (*n* = 157)	Sacrifices (*n* =140)	General (*n* = 157)	2	3	4	5	6	7
1	Thankful	4.16$_a$	5.93$_b$	5.96$_b$	.023	.436***	-.032	.014	-.155**	
		(1.98)	(1.51)	(1.27)						.658***
2	Unworthy	1.49$_a$	2.30$_b$	1.77$_a$		.169***	.534***	.619***	.370***	-.009
		(1.07)	(1.64)	1.22)						
3	Sympathetic	3.10$_a$	4.18$_b$	3.64$_b$			.218***	.176***	.059	
		(1.95)	(2.00)	(1.86)						.369***
4	Sad	1.61$_a$	2.16$_b$	1.75$_a$				.562***	.490***	.020
		(1.16)	(1.54)	(1.19)						
5	Guilty	1.40$_a$	1.85$_b$	1.57$_{a,b}$					.478***	.040
		(0.91)	(1.24)	(1.09)						
6	Angry	1.36	1.51	1.39						-.102*
		(0.84)	(1.15)	(1.03)						
7	Proud	3.81$_a$	5.16$_b$	4.68$_b$						
		(1.91)	(1.80)	(1.81)						

Note: different subscripts indicate significant differences between conditions, at p < .05, Bonferroni corrected for multiple comparisons. For the correlations, * *p* <.05** *p* < .01, *** *p* < .001

Path Model comparing Control and General Gratitude Conditions

In the main manuscript we conducted an exploratory path analysis comparing the control and sacrifice conditions, in order to test the relationships between gratitude, obligation, a potential suppressor variable (unworthiness), and pro-environmental outcome measures. For the sake of completeness, we here present a similar path model, comparing only the control and general gratitude conditions (Figure S3). Many of the paths yielded similar results. First, the direct effect of condition on the pro-environmental measures (dashed grey line) was not significant (effect estimate = 0.138, *p* = .270). Second, the indirect path "condition → gratitude → obligation → environmental outcomes" was significant, (indirect effect = 0.304, *p* < .001), which is consistent with previous studies and with results presented in Figure 9 in the main manuscript. However, the indirect path "condition → unworthiness → environmental outcomes" was not significant in this model (indirect effect = -0.026, *p* = .124). Nor was the effect of condition on perception of trivialness significant (effect estimate = .290, *p* = .107). In other words, it appears that the main qualitative difference between the gratitude condition and the sacrifice condition (compared to control) is that the sacrifice condition also induced more negative emotions, one of which (unworthiness) in turn had a negative effect on the environmental outcome measures.

Figure S3: Summary of path model, Study 3; comparing only control and general gratitude conditions, *n* = 214. Non-significant paths are in grey. The fit of this path model was less than adequate, *RMSEA* = .065, 95%CI (.013, .115). In this study, gratitude was assessed by a single item asking participants to indicate how "thankful" they felt.

Pro-environmental items

As reported in the main manuscript, in Study 3 we included two sets of pro-environmental measures: The first pro-environmental measures assessed the willingness to endure hardships *as a group* (e.g. "In order to protect the environment in the future, we should accept making painful compromises that will cause discomfort for people in the present day", α = .939); these measures were adopted and modified from a scale tapping perceptions of group suffering in the context of intergroup conflict (Kahn, Klar, & Roccas, 2017). The second set of measures comprised a scale assessing participants' willingness to sacrifice for the environment (e.g. "I am willing to do things for the environment, even if I'm not thanked for my efforts", α = .953; Davis, Le, & Coy, 2011). These two sets of measures were presented to participants in a random order, and items within each scale were also randomized.

All of these items all loaded on a single factor in an exploratory factor analysis (see Table S6 below), and were therefore combined into a single measure of pro-environmental intentions for analysis in the main manuscript.

Table S6
Factor Matrix For Exploratory Factor Analysis of Pro-Environmental Items in Study 3

Scale	Item	Factor 1
W	I am willing to go out of my way to do what is best for the environment.	.914
W	I am willing to give things up that I like doing if they harm the natural environment.	.898
W	Even when it is inconvenient for me, I am willing to do what I think is best for the environment.	.882
W	I am willing to take on responsibilities that will help conserve the natural environment.	.875
W	I am willing to do things for the environment, even if I'm not thanked for my efforts.	.866
H	Even if aspirations towards environmental protection require us to endure hardships in the present, we should endure these hardships for the sake of the future environment.	.814
H	We as a group should be ready to endure hardships now in order to improve the environment for the future.	.786
H	In order to protect the environment in the future, we should accept making painful compromises that will cause discomfort for people in the present day.	.769
	% variance	72.58

Note. "W" represents items from the Davis et al. (2011) scale; "H" represents items from the Kahn et al. (2017) scale. Maximum likelihood extraction was used.

6. Comment about MTurk participant recruitment

The order in which the studies are reported in the present manuscript does not exactly correspond to the order in which they were conducted. Specifically, Studies 1, 2, and 3 were conducted in order: in October 2016, January 2017, and February 2017, respectively; and the correlational pilot study was conducted in October 2017. The replication of Study 1 was conducted in November 2016 (approximately three weeks after the original Study 1). Supplemental Study S1 was conducted in December 2016 (between the replication of Study 1, and Study 2). Supplemental Study S2 was conducted in August, 2017 (after Study 3 but before the correlational study). Supplemental Study S3 was conducted in November 2017 (shortly after the correlational study).

In early 2017, the authors became aware of the potential problem of MTurk participants completing multiple studies from the same lab or project; at this point they also learned how to exclude MTurk workers who have already completed a study in the same project. Thus, from ~March 2017 onwards, any MTurk worker who completed one study in this project was excluded from completing any subsequent studies. This means that the correlational study, Supplemental Study S2, and Supplemental Study S3 have distinct participants. But, for the remaining studies we cannot rule out the possibility that some workers participated in more than one study. That said, Studies 1 and 2, and Studies 2 and 3, were conducted at least 6 weeks apart.

7. Supplemental Study S1: Sacrifice for the Environment

We ran an additional (early) study investigating the effect of reflecting on sacrifices made by past generations specifically *for the environment.* In this study we did not assess a sense of obligation towards future generations, which is why this study is not included in the main manuscript. However, we describe it here for the sake of completeness.

This study had three conditions: control, sacrifices, and "sacrifices for the environment." In the control condition, participants wrote about past clothing fashions (compared to current clothing fashions). In the sacrifices condition, they wrote about "the sacrifices made by members of past generations during their lives, and the way those sacrifices preserved or improved the society you live in." In the environment condition, participants wrote about "the sacrifices made by members of past generations during their lives, and the way those sacrifices preserved or improved the natural environment you live in." Full materials are provided on the OSF: osf.io/4yfvm

A manipulation check asked in all conditions, "To what extent did past generations make meaningful sacrifices that benefited the current generation?" (1 = *not at all*; 7 = *a great deal*). Participants then reported how they "feel towards past generations and their actions" (including gratitude, the emotion of interest); on a scale from 1 = *not at all,* to 7 = *a great deal.* They then completed the 5-item measure of willingness to sacrifice from Study 4 (e.g., "I am willing to do things for the environment, even if I'm not thanked for my efforts," 1 = *strongly disagree, 7 = strongly agree, α = .953*).

Results

Descriptive statistics are summarized in Table S7. There was an effect of condition on the manipulation check, $F(2, 446) = 64.976$, $p < .001$, $\eta_p^2 = .23$; and on gratitude, $F(2, 446) = 48.04$, $p < .001$, $\eta_p^2 = .18$; but not on willingness to sacrifice for the environment, $F(2, 446) = 0.251$, $p = .778$, $\eta_p^2 < .01$.

Table S7
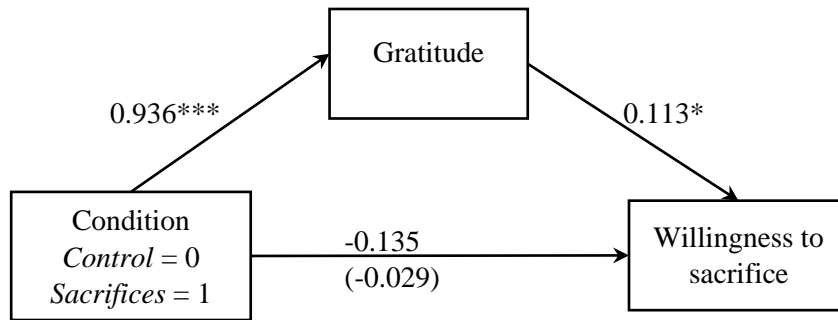
Descriptive Statistics and Zero-order Correlations for all Measures in Supplemental Study S1

		Condition, *M* (*SD*)			Correlations	
	Measure	Control ($n = 157$)	Sacrifices ($n =144$)	Environment ($n = 148$)	2	3
1	Manipulation Check	5.04$_a$ (1.35)	6.37$_b$ (1.00)	4.37$_c$ (2.04)	.689***	.093*
2	Gratitude	4.36$_a$ (1.86)	6.23$_b$ (1.20)	4.53$_a$ (2.21)		.068
3	Willingness to sacrifice	5.32 (1.32)	5.37 (1.42)	5.21 (1.48)		

Note. Different subscripts indicate significant differences between conditions, at *p* < .01.
For the correlations, ** p = .050, *** p < .001.

Figure S4: Summary of mediation model, Supplemental Study S1; comparing only control and sacrifices conditions, *n* = 301. The total effect (in brackets) was not significant, and nor was the direct effect.* *p* < .05, *** *p* < .001

In this study we did not assess a sense of obligation towards future generations. However, the indirect effect of condition on willingness to sacrifice via gratitude was significant, indirect effect = 0.106, 95% CIs [0.010, 0.210]; see Figure S4.

Since we did not assess a sense of obligation towards future generations, this study is not included in the mini-meta-analysis in the main manuscript.

8. Supplemental Study S2: Open-ended Sacrifice Manipulation

In all of our studies we either asked participants to write about sacrifices that members of past generations *had made,* or had *failed* to make (in Study 2). In this additional study, we included the sacrifices conditions of the earlier studies, but we also added a condition in which participants were asked to write about whether members of past generations had or had not made adequate sacrifices for the benefit of current generations. That is, we left the manipulation text more "open-ended," because we were concerned that in the previous studies we had forced participants' hand somewhat. Another difference from the earlier studies was that in this study, the control condition involved no writing at all.

A manipulation check was asked in all conditions: "Past generations made sacrifices that have benefited current generations" (1 = *strongly disagree,* 7 = *strongly agree*). Participants also indicated their feelings of gratitude (e.g., "I am grateful for the sacrifices of past generations," 1 = *strongly disagree,* 7 = *strongly agree*; 3 items, α = .890), their sense of obligation towards future generations (e.g., "I have a personal duty not to harm future generations," 1 = *strongly disagree,* 7 = *strongly agree;* 3 items, α = .825), and, finally, their willingness to sacrifice for the sake of future generations (e.g., "I am willing to go out of my way to do what is best for the natural environment of future generations," 1 = *strongly disagree,* 7 = *strongly agree,* 3 items, α = .931). Full materials are available on the OSF: osf.io/k9rd4.
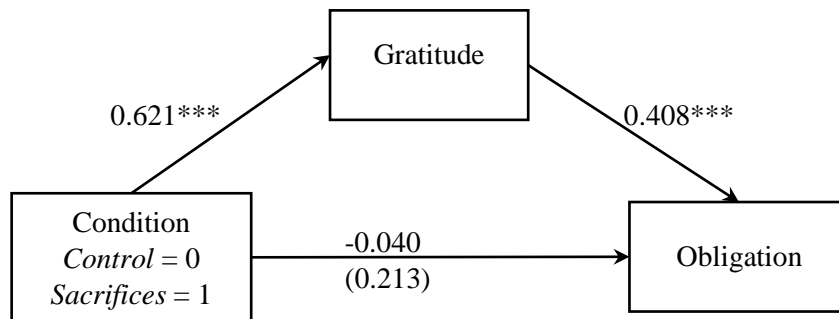
Results

Descriptive statistics are summarized in Table S8. There was an effect of condition on the manipulation check, $F(2, 221) = 5.863$, $p = .003$, $\eta_p^2 = .05$; and on gratitude, $F(1, 221) = 7.035$, $p = .001$, $\eta_p^2 = .06$; but not on a sense of obligation, $F(1, 221) = 1.683$, $p = .188$, $\eta_p^2 = .02$, nor on willingness to sacrifice for the environment, $F(1, 221) = 0.995$, $p = .371$, $\eta_p^2 = .01$. Comparing just the control and the standard sacrifice condition, we did not observe an effect on a sense of obligation, $t(149) = -0.444$, $p = .657$, mean difference = -0.08, 95% CIs [-0.45, 0.29].

Table S8

Descriptive Statistics and Zero-order Correlations for all Measures in Supplemental Study S2

		Condition, *M* (*SD*)			Correlations		
	Measure	Control (*n* = 92)	Sacrifices (*n* =59)	Open-Ended (*n* = 73)	2	3	4
1	Manipulation Check	5.48$_a$ (1.29)	6.07$_b$ (0.85)	5.96$_b$ (1.18)	.711***	.255***	.172**
2	Gratitude	5.08$_a$ (1.16)	5.67$_b$ (1.24)	5.74$_b$ (1.29)		.449***	.266***
3	Obligation	5.66 (1.08)	5.75 (1.16)	5.98 (1.15)			.526***
4	Willingness to sacrifice	5.43 (1.06)	5.64 (1.43)	5.34 (1.40)			-

Note. Different subscripts indicate significant differences between conditions, at *p* < .01
For the correlations, ** p = .010, *** p < .001.

Figure S5: Summary of mediation model, Supplemental Study S3; comparing the control to the two sacrifices conditions combined, *n* = 224. The total effect (in brackets) was not significant, and nor was the direct effect. *** *p* < .001

For consistency with earlier studies, we nonetheless ran the mediation analysis depicted in Figure S5. For this analysis, we combined the two sacrifices conditions (original and open-ended). The indirect effect of condition on obligation via gratitude in this study was significant, indirect effect = 0.254, 95% CIs [0.120, 0.384].

The results of this study are included in the meta-analyses (combining the two sacrifices conditions, and comparing to control), because in this study we included a sense of obligation as an outcome measure, and the manipulations were quite similar to the ones used in our main studies.

9. Main analyses repeated with demographic variables

We report here the correlations between the main measures in each study, and demographic variables. In brief, older participants tended to report more gratitude towards past generations, and (less consistently) greater obligation towards future generations. The relationship between gender, political orientation, and religiosity, and the measures of gratitude and obligation were less consistent. However, as in previous research, political orientation was consistently related to environmental attitude measures, such that political liberals were more pro-environmental than were conservatives.

Each table number below corresponds to a table number in the main manuscript (the "D" here stands for "Demographics"). We also summarize the main results again.

Correlational pilot study

Table DP

Descriptive Statistics and Zero-order Correlations for the Primary Measures and Demographic Variables in Study 1.

	Measure	Mean (*SD*)	2	3	Age	Gender	Politics	Religiosity
1	Perception of sacrifice	5.44 (1.39)	.712***	.338**	.285*	.105	.146	.309*
2	Gratitude	5.21 (1.32)		.496***	.378**	-.110	.294*	.364**
3	Obligation	5.78 (1.01)			.181	-.086	.095	.232

Note. ** p < .01, *** p < .001; gender coded 0 = women, 1 = men, 3 = other (coded as missing); for political orientation, anyone responding "libertarian" or "apolitical/not sure" was filtered out.

In this correlational study, older, more conservative, and more religious participants tended to perceive greater sacrifice, and also to report greater gratitude. However, the indirect effect reported in Figure P1 held also when these demographic variables were included as covariates (of gratitude and obligation); indirect effect = 0.247, 95% CIs [0.050, 0.567].

Table D1

Descriptive Statistics and Zero-order Correlations for all Measures and Demographic Variables in Study 1.

		Condition, *M* (*SD*)		Correlations				
	Measure	Control (*n* = 106)	Sacrifices (*n* = 93)	2	3	Age	Gender	Politics
1	Gratitude	5.70 (1.17)$_a$	6.15 (0.87)$_b$	.366***	.186**	.074	-.103	.104
2	Obligation	4.89 (1.44)$_a$	5.57 (1.19)$_b$		.271***	.116	-.150*	-.007
3	Environmental Importance	5.72 (1.25)	5.60 (1.36)		-	.086	-.056	-.334***

Note. Different subscripts indicate significant differences between conditions, at *p* < .01. For the correlations, ** *p* < .01, *** *p* < .001; gender coded 0 = women, 1 = men, 3 = other (coded as missing); for political orientation, anyone responding "libertarian" or "apolitical/not sure" was filtered out.

In this study, in contrast to the correlational pilot study, men were more likely to report an obligation towards future generations than were women. Politically liberal participants were more likely to assign importance to environmental issues than were politically conservative participants (this variable was not assessed in the correlational pilot study. In this study, we did not assess strength of religiosity, and we did not replicate the effect of age observed in the correlational study.

The indirect effect reported in Figure 1 still held when these demographic variables were included as covariates of gratitude and obligation; indirect effect = 0.193, 95% CIs [0.057, 0.412]. In Figure 2 in the main manuscript, we report an indirect path from experimental condition (control vs. sacrifice) to gratitude, to obligation, to environmental importance. This path also remained significant when demographic variables were included as covariates; indirect effect = 0.039, 95% CIs [0.006, 0.246].

Table D2

Descriptive Statistics and Zero-order Correlations for all Measures and Demographic Variables in Study 2

	Measure	Condition, M (SD)			Correlations				
		Control (n = 160)	Sacrifices (n =154)	Lack (n = 137)	2	3	Age	Gender	Politics
1	Gratitude	5.73$_a$ (1.29)	6.30$_b$ (1.09)	4.54$_c$ (1.71)	.210***	.021	.167***	-.017	.056
2	Obligation‡	5.01$_a$ (1.50)	5.39$_b$ (1.20)	5.22$_{a,b}$ (1.50)		.350***	.170***	-.058	-.106*
3	Giving up income	4.50 (1.84)	4.53 (1.62)	4.41 (1.84)		-	.010	-.064	-.446***

Note. Different subscripts indicate significant differences between conditions, at p < .001. ‡For obligation, the difference between control and past sacrifices conditions was significant at p = .017. For the correlations, ** p < .01, *** p < .001; gender coded 0 = women, 1 = men, 3 = other (coded as missing); for political orientation, anyone responding "libertarian" or "apolitical/not sure" was filtered out.

Older participants reported more gratitude and obligation; and liberal participants reported a greater obligation towards future generations, as well as a greater willingness to give up income. However, gender was not significantly correlated with either of these measures. The indirect effect of sacrifices on obligation through gratitude, reported in Figure 3 in the main manuscript, was significant even when controlling for age, gender, and political orientation; indirect effect = 0.194, 95%CIs [0.086, 0.340].

Similarly, the serial indirect effect of condition on willingness to give up income, via gratitude and obligation (see Figure 4 in the main manuscript), was significant when including demographic covariates; indirect effect = .085, 95%CIs [0.035, 0.169].

When comparing just the control condition to the *lack* of sacrifices condition, we again find a significant indirect effect of condition on obligation via gratitude, when controlling for demographic variables; indirect effect = 0.161, 95% CIs [0.008, 0.350]. The negative direct effect is also significant in this analysis; direct effect = -0.438, 95% CIs [-0.813, -0.063]. See Figure 5 in the main manuscript for comparison.

Table D3

Zero-order Correlations for all Measures and Demographic Variables in Study 3

	Measure	Correlations									
		2	3	4	5	6	7	Age	Gender	Politics	Religiosity
1	Gratitude	.305***	.023	.123**	.127**	.198***	.173***	.199**	-.065	.178**	.252***
2	Obligation		-.012	-.025	.531***	.625***	.616***	.190**	-.130*	-.082	.080
3	Unworthy			.136***	-.060	-.117*	-.094*	-.128*	.062	.077	.110
4	Trivial				-.063	-.093*	-.083	-.074	.000	.217***	.106
5	Willingness to Endure Hardship					.759***	.939***	-.010	-.019	-.369***	-.227***
6	Willingness to Sacrifice						.936***	.039	-.081	-.361***	-.186***
7	Combined Environmental Outcome						-	.015	-.053	-.388***	-.220***

Note. For the correlations, ** p < .01, *** p < .001. In this study, gratitude was assessed by a single item asking participants to indicate how "thankful" they felt. gender coded 0 = women, 1 = men, 3 = other (coded as missing); for political orientation, anyone responding "libertarian" or "apolitical/not sure" was filtered out.

　　　In Study 3, gratitude was positively correlated with age, political conservatism, and strength of religiosity. Older participants were also more likely to report an obligation towards future generations; as were women (compared to men). Older participants were *less* likely to report feeling unworthy when reflecting on past generations' sacrifices, and political conservatives were more likely (than political liberals) to consider current generations' problems to be trivial compared to past generations'. Again, political orientation and strength of religiosity negatively predicted willingness to sacrifice and endure hardships for the environment.

Table D4

Descriptive Statistics and Zero-order Correlations for Potential Mediating and Dependent Variable (Obligation) Measures in Study 4

		Correlations									
	Measure	2	3	4	5	6	7	Age	Gender	Politics	Religiosity
1	Gratitude	.843***	.360***	.569***	.441***	.399***	.326***	.273***	-.068	.247***	.104*
2	Inspiration		.334***	.538***	.435***	.392***	.307***	.239***	-.067	.259***	.139**
3	Unworthiness			.361***	.639***	.064	.015	.018	.003	.193***	.078
4	Downward Comparison				.434***	.230***	.199***	.144*	-.048	.141**	.030
5	Upward Comparison					.102*	.076	.037	.037	.122*	.056
6	Obligation						.738***	.128*	-.145**	-.116*	.083
7	Sacrifice for environment						-	.068	-.139**	-.217***	.015

Note. For the correlations, * $p < .05$, *** $p < .001$.

In Study 4, as in Study 3, age, political conservatism, and strength of religiosity predicted gratitude; and in this study also inspiration. Older people and conservatives also reported more downward comparison, and conservatives also reported more upward comparison and unworthiness. Meanwhile, obligation was predicted by age, female gender, and liberal politics, and willingness to sacrifice for the environment was predicted by female gender and politics.