



Measuring Belief in Climate Change With a Single Item

Sebastian Berger¹ , David Hauser² , Anna Lange³ , Sander van der Linden⁴ 





[1] *Department of Sociology, University of Bern, Bern, Switzerland.* [2] *Institute of Organization and Human Resources, University of Bern, Bern, Switzerland.* [3] *Institute of Social and Preventive Medicine, University of Bern, Bern, Switzerland.* [4] *Department of Psychology, University of Cambridge, Cambridge, United Kingdom.*

Global Environmental Psychology, 2025, Vol. 3, Article e10895, <https://doi.org/10.5964/gep.10895>

Received: 2022-12-21 • Accepted: 2023-10-17 • Published (VoR): 2025-07-07

Handling Editor: Isabel Richter, Norwegian University of Science and Technology, Trondheim, Norway

Corresponding Author: Sebastian Berger, Institut für Soziologie, Fabrikstrasse 8, 3012 Bern, Switzerland. E-mail: sebastian.berger@unibe.ch

Badges for Good Research Practices:  Code.  Data.  Materials.  Preregistration.

Abstract

Brief, but psychometrically valid assessments of psychological constructs are increasingly needed to be included in larger psychological and other social scientific studies, such as *Many Labs* projects or representative surveys. Here, we provide a novel one-item measure of individual differences in belief in climate change. Based on two studies ($N = 913$, $N = 288$) recruited from various global regions, we establish convergent, predictive, and discriminant validity. More specifically, we find that the single-item measure correlates with other constructs measuring belief in climate change and with relevant downstream constructs, among them intentions to engage in pro-environmental behavior, actual consequential behavior, and self-reported everyday behaviors. We therefore conclude that the single item is a suitable instrument to measure belief in climate change when multiple-item assessments are either too costly or otherwise unfeasible.

Keywords

single-item measures, climate change, measurement, pro-environmental intention, pro-environmental behavior

Non-Technical Summary

Background

Previous research showed that belief in climate change is associated with pro-environmental behavior (e.g., harming the environment as little as possible or benefiting the environment)



or policy support. Because people vary in the degree to which they believe that climate change is real, detrimental, and caused by humans, it is essential to assess people's belief in climate change.

Why was this study done?

To date, belief in climate change is often assessed with multiple-item questionnaires. Our goal was to test a novel one-item measure to offer a measurement of belief in climate change that is less costly and less time-consuming than multiple-item questionnaires.

What did the researchers do and find?

Our single item combines three dimensions capturing climate change with one question: the occurrence of climate change, the fact that climate change is caused by humans and that climate change is detrimental. We conducted two studies to test the relationship of our single item with existing measures assessing belief in climate change. We find that the single item is positively correlated with established questionnaires measuring belief in climate change and environmental concern. Similar to other empirical findings, correlations of the single item are larger with environmental concern and smaller with pro-environmental intentions and behavior.

What do these findings mean?

Our single-item measure is not able to replace existing multi-item questionnaires assessing belief in climate change to its full extent. However, our single item is an ultra-brief, less costly, and less time-consuming measurement to assess belief in climate change and can be easily included in extensive surveys.

Highlights

- We introduce a one-item measure of belief in climate change.
- We provide tests for convergent, predictive, and discriminant validity.
- We provide validity tests beyond self-reports, using actual pro-environmental behavior.

One of society's most pressing social, cultural, and political challenges is the mitigation of anthropogenic climate change (Creutzig et al., 2022). Although governmental policies play an important role at the systemic level, research is clear about the importance of understanding individual attitudes and behavior in combatting climate change (De Keersmaecker et al., 2022; Nielsen et al., 2021). Individual behavior contributes strongly to climate change (Dietz et al., 2009), including consumption choices, investment choices, civic behavior, or organizational citizenship. This manifests in daily transport decisions, how people heat their homes, global food consumption, as well as decisions about whom and what policies to vote for.

As the most recent report from the *American Psychological Association* highlights, this makes individual pro-environmental behavior a crucial research interest for psychologists (American Psychological Association, 2022). A meta-analysis has revealed that an important variable associated with pro-environmental attitudes, intentions, and behavior is belief in climate change (Hornsey et al., 2016). People vary in the degree to which they believe that climate change is real, detrimental, and human-caused. In consequence, this belief manifests in downstream variables such as pro-environmental behavior and policy support (Berger & Wyss, 2021b; Leiserowitz et al., 2021; Poortinga et al., 2019; van der Linden et al., 2019; van Valkengoed et al., 2021).

In the present research, we examine whether belief in climate change as a source of individual differences can be measured with a novel single item. Psychometrically, multiple indicators are typically more reliable as they provide greater coverage of the conceptual domain and increased measurement precision (Gardner et al., 1998; van der Linden & Rosenthal, 2016). Furthermore, the “signal” to “noise” ratio typically increases with more indicators of a latent construct (Nunnally, 1978). Nevertheless, the traditional view that the reliability of single-item measures is often inferior to that of multi-item measures has been repeatedly challenged (Bergkvist, 2015; Bowling, 2005; Wanous & Reichers, 1996). Single-item measures have successfully been implemented across a variety of contexts, among them self-esteem (Robins et al., 2001), happiness (Abdel-Khalek, 2006), narcissism (van der Linden & Rosenthal, 2016), risk attitudes (Dohmen et al., 2011), social identification (Postmes et al., 2013), and subjective well-being (Diener et al., 1985).

Despite the putative downsides, there are also significant benefits to a single-item measure of belief in climate change. Generally speaking, single-item measures are less costly, less time-consuming, and they reduce item redundancy and cognitive fatigue among participants (Allen et al., 2022; Bergkvist, 2015; Bowling, 2005; Postmes et al., 2013). In the domain of social scientific research about climate change—a highly interdisciplinary research field often relying on global assessments of public opinion and attitudes—these benefits are arguably of even greater relevance. There are many different research fields investigating a large variety of pro-environmental behaviors, including food choices (Camilleri et al., 2019), travel choices (Whitmarsh et al., 2020), or the abstract willingness to trade-off personal benefits against environmental consequences (Berger & Wyss, 2021a; Lange & Dewitte, 2022). This research frequently tries to capture whether or not a research participant accepts anthropogenic climate change to be real. As this research routinely requires validated and brief measurement instruments—for example when belief in climate change is not the primary research interest—we sought to develop an additional single-item measurement for use both within and outside psychological research. Our research thereby complements existing single-item measures (van Valkengoed et al., 2021), such as the single-item measure of the Six Americas measure (Swim & Geiger, 2017), or shorter measures such as the Six America Short Survey (SASSY) scale (Chryst et al., 2018). As a critical complement, the present research provides

either a shorter measurement (i.e., in comparison to the SASSY scale), or a non-nominal scale (i.e., in comparison to the single-item Six Americas measure, where participants self-categorize in one of six categories). We test our single item in two separate studies.

Study 1

Study 1 examined to what extent a single-item measure can be used to capture people's individual differences in belief in climate change. We designed a highly powered and pre-registered study, recruiting a geographically diverse sample of adults. The single item addresses three dimensions of climate change that are typically examined with separate items (e.g., Poortinga et al., 2019). First, people are asked if they believe that climate change occurs. This dimension taps into the physical science basis. Second, people are asked about the consequences of climate change being largely negative for human societies. This dimension taps into the impact assessment of climate change. Third, people are asked about climate change being anthropogenic, meaning caused by human activities rather than other natural processes. We provide a test into the degree to which these three dimensions can be reduced to a single-item measure of belief in anthropogenic climate change (abbreviated SIBCC hereafter).

To do so, we assess its correlation with an established measure of belief in climate change (Poortinga et al., 2019) and with related constructs tapping into pro-environmental concern, intentions, and behaviors. More specifically, we measure the revised *New-Environmental Paradigm* (NEP-R) (Dunlap et al., 2000), environmental values via the *Environmental Schwartz Value Survey* (E-SVS) (Bouman et al., 2018), and pro-environmental intentions (Fujii, 2006; Lange & Dewitte, 2022; Mancha & Yoder, 2015), the *Carbon Emission Task* (Berger & Wyss, 2021a), and a version of the *General Ecological Behavior Scale* (GEB) (Kaiser & Wilson, 2004). As indicators of convergent, predictive, and discriminant validity, we expect that our single-item measure positively correlates with a multiple-item measure of belief in climate changes, and with the measures of attitude, intentions, and behavior. The study was pre-registered on the Open Science Framework¹ and received approval from the local ethics committee at the University of Bern (Approval Number 142021).

Participants and Sample Size

As per our pre-registration, we attempted to recruit a total of 1,000 participants, equally divided between Amazon Mechanical Turk (mTurk) and Prolific. The large sample was decided based on budgetary constraints while exceeding the sample size at which correlations typically stabilize (i.e., $n = 250$; Schönbrodt & Perugini, 2013). They strongly

1) See pre-registration at Lange et al. (2021).

exceeded the required sample sizes used in similar studies that were based on a-priori power analyses (e.g., Lange & Dewitte, 2022). Participants were invited to complete a decision-making study and were paid a flat compensation (mTurk: USD 1.15; Prolific: GBP 1.15), plus a potential behavior-dependent bonus of USD 1 (GPD 1) resulting from the behavioral task. As some participants responded to the questionnaire without logging their final completion code, more than 1,000 participants completed the study. Overall, we collected 1,169 responses. Following the pre-registered data inclusion protocol, we removed participants who did not finish the study within 60 minutes of starting it or failed crucial attention or comprehension checks. In addition, and in line with the pre-registration, we excluded all participants who completed less than 70% of the decisions in the *Carbon Emission Task*. The final sample consisted of 913 valid responses (mTurk: $n = 444$; Prolific: $n = 469$). Table 1 displays demographic statistics of both sub-samples (see Supplementary Material A.1, Hauser, 2023, for detailed sample characteristics).

Table 1

Study 1: Sample Characteristics of Prolific and Amazon Mechanical Turk (mTurk) Sample

Samples	Prolific ($n = 469$)	mTurk ($n = 444$)	<i>p</i> -value*	Full sample ($N = 913$)
Age	27.10 ($SD = 8.95$)	35.51 ($SD = 10.13$)	.000	31.21 ($SD = 10.43$)
Gender (% female)	39	38	.711	38
Political ideology (% liberal)	58	51	.026	55
Education (% university degree)	53	88	.000	70
Low income (% less than \$50'000)	78	45	.000	61
Racial identification (% White or Caucasian)	81	60	.000	70

Note. In terms of political ideology, all participants who indicated to be “very liberal” to “somewhat liberal” are merged and labeled “liberal”.

**p*-values are calculated based on a Mann-Whitney-U Test.

Procedure and Measures

All study materials were administered in English, and participants were recruited conditional on being fluent in English. Participation was enabled on either a tablet or personal computer. After providing informed consent, participants first completed the *Carbon Emission Task* as a behavioral measure of pro-environmental behavior, followed by various self-assessments. These variables were assessed to allow for tests of convergent, predictive, and discriminant validity. All tests for convergent and predictive validity were pre-registered. Tests for discriminant validity (i.e., correlation with demographic variables) are exploratory.

Single-Item Measure of Belief in Climate Change (SIBCC)

To measure belief in climate change with a single item, we combined the typical three dimensions of belief in climate change (i.e., its existence, detrimental nature, and anthro-

pogenic origin) into one single item. It is formulated as follows: “*To what extent do you agree with this statement: The occurrence of climate change is caused by human activities and will bring largely negative consequences*”. Participants indicated their answer on a 11-point Likert-scale ranging from -5 (*Strongly disagree*) to +5 (*Strongly agree*). We opted for an 11-point scale for various reasons. First, research suggests that there is no major difference in internal structure in terms of means, standard deviations, item–item correlations, item–total correlations, Cronbach’s alpha, or factor loadings depending on the number scale points (Leung, 2011). Second, findings indicate that having more scale points seems to reduce skewness (Leung, 2011). Third, large household surveys include many items that rely on 11-point scales, among them the Swiss Household Panel, the German Socio-Economic Panel, or the World Value Survey (Scherpenzeel, 2002). Finally, a well-known existing climate attitudes scale also relies on 11 points, measuring belief in climate change ranging from -5 to 5 (Poortinga et al., 2019). The average agreement that climate change is caused by humans is skewed towards positive values ($M = 3.45$, $SD = 1.85$, see Supplementary Material A.2, Hauser, 2023, for the entire distribution).

Belief in Climate Change

To provide a multi-item assessment of climate change belief, we adopted the measure from Poortinga et al. (2019). First, we measured *Trend Skepticism* by asking participants the following question: “*You may have heard the idea that the world’s climate is changing due to increases in temperature over the past 100 years. What is your personal opinion on this? Do you think the world’s climate is changing?*” Answer options ranged on a 4-point Likert-scale ranging from 1 (*Definitely not changing*) to 4 (*Definitely changing*). Following Poortinga et al. (2019), we dichotomized data to climate change believers ($n = 839$, 91.89%) coded as 1 (*Probably/Definitely changing*) and climate change deniers ($n = 74$; 8.11%) as 0 (*Probably/Definitely not changing*). Second, we assessed *Attribution Skepticism* with the following item: “*Do you think that climate change is caused by natural processes, human activity, or both?*”. Likewise, we dichotomized answer options to 0 (*Entirely by natural processes, Mainly by natural processes*, $n = 139$, 15.22%) or 1 (*Entirely by human activity, Mainly by human activity, about equally by natural processes and human activity*, $n = 771$, 84.45%). We followed Poortinga et al. (2019) and coded participants ($n = 3$, 0.33%) who did not think that climate change is happening as missing values to avoid overlapping with *Trend Skepticism*. Third, participants were asked to assess the impact of climate change on people across the world, using a scale ranging from -5 (*Extremely bad*) to +5 (*Extremely good*) ($M = -1.72$, $SD = 3.20$).

Environmental Concern

To measure participants’ views about the relationship between humans and nature, we assessed the NEP-R scale by Dunlap et al. (2000). The NEP-R scale consists of 15 items and is an established construct in the environmental social sciences and frequently used

in studies about pro-environmental behavior (e.g., Berger & Wyss, 2021b; Hawcroft & Milfont, 2010; Lange & Dewitte, 2022; van Valkengoed et al., 2021). Agreement with the items is measured from 1 (*Strongly disagree*) to 5 (*Strongly agree*) ($\alpha = .80$; $M = 3.54$, $SD = 0.60$). For our analysis, we followed Cruz and Manata (2020) and calculated a three-factor solution with the factors *Limits to growth* ($\alpha = .59$; $M = 3.69$, $SD = 0.93$), *Anti-anthropocentrism* ($\alpha = .83$; $M = 3.21$, $SD = 0.99$), and *Concern about ecological damage* ($\alpha = .69$; $M = 4.13$, $SD = 0.66$).

Biospheric Values (E-SVS)

For the assessment of participants' value orientation, we included the Social Value Scale (Steg et al., 2014), an established self-report measure frequently used in pro-environmental behavior research (e.g., Lange & Dewitte, 2022). Participants responded on a 9-point Likert-scale between ranging from -1 (*Opposed to my guiding principles*) to 7 (*Supreme importance*) regarding biospheric (four items, $\alpha = .90$, $M = 5.30$, $SD = 1.34$), altruistic (four items, $\alpha = .78$, $M = 5.43$, $SD = 1.22$), and egoistic values (five items, $\alpha = .79$, $M = 3.72$, $SD = 1.56$).

Pro-Environmental Behavioral Intention

Participants' intention to behave pro-environmentally was elicited with three items adopted from Mancha and Yoder (2015) ($\alpha = .87$). Participants responded on a 7-point Likert-scale from 1 (*Extremely unlikely*) to 7 (*Extremely likely*). The items tap into participants' behavioral intention with respect to the reduction of one's carbon footprint ($M = 5.03$, $SD = 1.47$), general environmentally friendly behavior ($M = 5.22$, $SD = 1.46$) and the wasting of natural resources ($M = 5.21$, $SD = 1.46$). Moving beyond the pre-registered measures, we also assessed behavioral intentions using four items adopted from Fujii (2006) to increase the number of intention measures. These data are available on the *Open Science Framework* project page for interested researchers. The items ($\alpha = .79$) tap into behavioral intentions concerning electricity use reduction ($M = 5.77$, $SD = 1.37$), gas use reduction ($M = 5.02$, $SD = 1.67$), garbage reduction ($M = 5.10$, $SD = 1.56$), and car use reduction ($M = 4.95$, $SD = 1.76$).

Behavioral Assessment of Pro-Environmental Behavior

To measure actual pro-environmental behavior, we relied on a validated experimental protocol coined the *Carbon Emission Task* (Berger & Wyss, 2021a). Participants face repeated dichotomous trade-offs between two options. *Option A* is financially rewarding, but paired with a real carbon emission. *Option B* is financially non-rewarding, but carbon-neutral. Trade-offs vary in both the financial consequence (i.e., 0.2, 0.4, 0.6, 0.8, or 1 GBP/USD) and the associated carbon emissions (i.e., 0, 0.23, 1.02, 4.46, 19.85 lbs. CO₂) and are fully crossed. Carbon emissions are generated through the behavior-dependent purchasing and retirement of emission right certificates from the *EU-Emission Trading*

Scheme. Attaching actual consequences to behavioral tasks is an increasingly used experimental protocol to study consequential pro-environmental behavior under laboratory-like conditions (see Lange, 2023, for a review). In the *Carbon Emission Task*, all decisions made by participants have real consequences for the environment, as certificates are truly bought, and the environmental consequence is realized depending on participants' decisions. For the purpose of the present study, the pre-registered variable of interest is the proportion of pro-environmental choices made across the 25 trials ($M = 0.50$, $SD = 0.29$).

Self-Assessment of Pro-Environmental Behavior

To assess people's self-reported pro-environmental behavior, we administered a 31-item version of the General Ecological Behavior Scale (Arnold et al., 2018). Participants indicated on a 5-point Likert-scale from 1 to 5 (*Never* to *Always*) how frequently they engage in pro-environmental behaviors (e.g., "I bring empty bottles to a recycling bin."). In case participants were unable to answer, they were asked to tick *Not applicable*. Following established GEB practices, we dichotomized the 31-items to 0 (*Never*, *Sometimes*, *Occasionally*) and 1 (*Very often*, *Often*). Similar to Lange and Dewitte (2022), we calculate a Rasch Model (eRm package by Mair et al., 2020) in R 4.0.2 (R Core Team, 2020) and estimated person parameters ($M = 0.44$, $SD = 0.16$) with reasonable separation reliability (rel. = .71).² This person parameter can be viewed as a person's overall environmental attitude (Kaiser et al., 1999).

Results

In order to present the results of the newly established one-item measure, we tested convergent, predictive, and discriminant validity.³ First, *convergent validity* was assessed by correlating the one-item measure with the related constructs. These were trend skepticism: $r = .28$, 95% CI [0.22, 0.34], $p < .001$; attribution skepticism: $r = .28$, 95% CI [0.24, 0.36], $p < .001$; perceived impact of climate change: $r = -.23$, 95% CI [-0.29, -0.17], $p < .001$; the three factors of the New-Environmental Paradigm, limits to growth: $r = .33$, 95% CI [0.27, 0.39], $p < .001$; anti-anthropocentrism: $r = .32$, 95% CI [0.27, 0.38], $p < .001$; and concern about ecological damage: $r = .50$, 95% CI [0.45, 0.55], $p < .001$; as well as egoistic: $r = -.03$, 95% CI [-0.09, 0.03], $p < .001$; altruistic: $r = .38$, 95% CI [0.32, 0.43], $p < .001$; and biospheric: $r = .38$, 95% CI [0.32, 0.43], $p < .001$; values. Table 2 displays all correlational results.⁴ The correlations were all significant and in the expected direction. To conclude,

2) The Rasch separation reliability can be interpreted in a similar manner as Cronbach's alpha in traditional self-report scales.

3) All materials, data, and code to replicate the statistical analyses are available on the Open Science Framework at Hauser (2023).

4) See Supplementary Material Table A.3, Hauser (2023), for Spearman correlations.

the more people evaluated climate change as real, human caused, and having negative consequence, as well as the more they endorsed the three factors of the NEP-R, the higher they report agreement with the single item measure. We therefore conclude that the convergent validity of the scale was good.

Second, *predictive validity* was assessed through the assessment of correlations with downstream variables—intentions to behave pro-environmentally (Mancha & Yoder, 2015), actual behavior in consequential experimental paradigms (Berger & Wyss, 2021a), as well as self-reported pro-environmental behaviors (Arnold et al., 2018). These correlations all showed significant results in the predicted direction. Endorsement of the one-item measure correlated with intentions to behavior pro-environmentally: $r = .31$, 95% CI [0.25, 0.37], $p < .001$; with average pro-environmental behavior in the 25 trials of the *Carbon Emission Task*: $r = .21$, 95% CI [0.15, 0.27], $p < .001$; as well as with self-reported pro-environmental behaviors: $r = .29$, 95% CI [0.23, 0.35], $p < .001$.⁵

In addition, we tested if the SIBCC measure continues to predict the outcome variables (i.e., intentions and behaviors) after controlling for demographic variables (see Table 3). With respect to all three variables (i.e., abstract behavior, intentions, self-reported behaviors), SIBCC correlates with the dependent variables with or without controls.⁶ To conclude, endorsement of the one-item measure correlated with all assessed downstream variables, resulting in good predictive validity of the novel measure.

Third, to examine *discriminate validity*, we test whether our single-item measure differs across groups for which differences are theoretically expected (Hattie & Cooksey, 1984). Precisely, we follow van Valkengoed et al. (2021), who also show that women believe more in the occurrence and anthropogenic causes of climate change than men (McCright, 2010) and that conservative voters perceive the occurrence and detrimental impact of climate change as less strongly than liberal voters (McCright & Dunlap, 2011).

5) See Supplementary Materials A.4, Hauser (2023) for linear regression of SIBCC and other measures of belief in climate change on actual pro-environmental behavior (Carbon Emission Task)

6) See Supplementary Material A.5, Hauser (2023), for additional analyses of predictive validity including environmental concern and values.

Table 2
Descriptive Statistics and Pearson Correlations for Study Variables (N = 913)

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	M	SD
1. SiBCC	—													3.45	1.85
Convergent Validity															
2. Trend Skepticism	.28***	—												0.92	0.27
3. Attribution Skepticism	.28***	.33***	—											0.85	0.36
4. Perceived Impact of CC	-.23***	-.32***	-.50***	—										-1.72	3.20
5. Limits to Growth	.33***	.10**	.03	.00	—									3.69	0.93
6. Anti-anthropocentrism	.32***	.26***	.41***	-.66***	.12***	—								3.21	0.99
7. Ecological Damage	.50***	.24**	.21**	-.32***	.45***	.37***	—							4.13	0.66
8. Egoistic Values	-.03	-.09***	-.24***	.46***	.11***	-.58***	-.05	—						3.72	1.56
9. Altruistic Values	.38***	.23***	.18***	-.27***	.24***	.24***	.51***	.12***	—					5.43	1.22
10. Biospheric Values	.38***	.22***	.12***	-.21***	.29***	.21***	.55***	.19***	.72***	—				5.30	1.34
Predictive Validity															
11. Green Behavioral Intentions	.31***	.09**	.01	.01	.28***	.01	.35***	.26***	.41***	.53***	—			5.04	1.47
12. Carbon Emission Task	.21***	.14***	.22***	-.36***	.00	.41***	.17***	-.23***	.25***	.25***	.21***	—		0.50	0.29
13. General Ecological Behavior	.29***	.05	.01	-.03	.22***	.09***	.31***	.10***	.32***	.41***	.48***	.25***	—	0.44	0.16

Notz. SiBCC = Single-Item Belief in Climate Change, CC = Climate Change; Limits to Growth, Anti-anthropocentrism, Ecological Damage are the three factors of the New Environmental Paradigm Scale-Revised.

p* < .10. *p* < .05. ****p* < .01.

Table 3

Linear Regression of SIBCC on CET Behavior (Models 1 and 2), Behavioral Intentions (Models 3 and 4), and General Ecological Behavior (Models 5 and 6)

Variable	(1)	(2)	(3)	(4)	(5)	(6)
(Intercept)	0.50***(0.01)	0.46***(0.01)	5.04***(0.05)	4.87***(0.06)	0.44***(0.01)	0.42***(0.01)
SIBCC	0.06***(0.01)	0.05***(0.01)	0.46***(0.05)	0.46***(0.05)	0.05***(0.01)	0.04***(0.01)
Gender		0.08***(0.02)		0.42***(0.09)		0.06***(0.01)
Age		0.04***(0.01)		-0.02(0.05)		0.01*(0.02)
Political ideology		-0.01(0.01)		-0.02(0.05)		0.00(0.01)
Education		-0.01(0.01)		0.10**(0.05)		0.01(0.01)
Low income		-0.05***(0.01)		0.09*(0.05)		0.00(0.01)
Observations	913	913	913	913	913	913
R-squared	0.05	0.12	0.10	0.13	0.08	0.12

Note. The table presents estimates from ordinary least squares (OLS) regressions. All continuous predictors are mean centered and scaled by 1SD. Robust standard errors are shown in parentheses. Gender is dummy-coded (1 if female) as well as education (1 if at least university degree) and low income (1 if below GBP 50,000 annual income).

*, **, and *** document significance at the 10%, 5%, and 1% levels, respectively.

For the overall sample, we detect a significant difference ($U = 87810$, $p < .005$, Mann-Whitney test) of belief in climate change perceptions between women ($M = 3.61$, $SD = 1.86$, $n = 349$) and men ($M = 3.36$, $SD = 1.84$, $n = 564$).⁷ However, post-hoc analyses showed that this effect may be driven through differences on the Prolific sample ($U = 22996$, $p < .022$, Mann-Whitney test) and to a lesser extent through differences on the mTurk sample ($U = 21047$, $p < .103$). Similar to previous literature (McCright & Dunlap, 2011; van Valkengoed et al., 2021), we found that climate change perceptions significantly differ between liberals and conservatives ($U = 80997$, $p < .001$, Mann-Whitney test), such that liberals more strongly endorse the item that they believe in climate change.⁸ This result emerges less robust in the Prolific sample ($U = 23746$, $p = .001$, Mann-Whitney test) compared to the mTurk sample ($U = 17291$, $p < .001$, Mann-Whitney test), suggesting a greater political divide in terms of endorsement of the item in the United States. To conclude, the single-item measure is weakly (Prolific) or moderately (mTurk) related to differences in gender and political ideology.

7) Five participants defined their gender non-binary, other, or did not disclose their gender. These individuals are excluded from this analysis.

8) We excluded participants who reported that none of the given political views on a 7-point Likert scale describes them.

Discussion

Based on Study 1, the single item demonstrated initial validity. The single item is significantly correlated with established measures tapping into belief in climate change (*trend skepticism, attribution skepticism, impact assessment*), environmental concern, and biospheric as well as altruistic values. Similar to the meta-analysis study provided by Hornsey et al. (2016), correlations are larger for concern about climate change and smaller for intentions and behavior. The three-factor analysis of the NEP-R scale shows that the correlation between our single item and NEP-R is mainly driven by the items assessing ecological damage. Results revealed good predictive validity through correlations with downstream variables and pro-environmental behavior.

Study 2

Study 2 replicated and extended the results of Study 1. First, we replicated the effect between behavior in the *Carbon Emission Task* and the SIBCC item. In addition, Study 2 includes two additional constructs to assess belief in climate change, the Six America Short Survey (SASSY) scale (Chryst et al., 2018) and a single item of the Six Americas scale (Swim & Geiger, 2017). Thus, beyond validation work of the SIBCC, Study 2 is also a novel test into the degree to which the SASSY scale and the single-item Six Americas scale predict actual, consequential behavior in an experimental paradigm. The *Carbon Emission Task* was administered with a novel set of parameters (behavioral costs, carbon emissions). Lastly, we include a broader set of outcome measures, and also assessed political support and political activism. The study was pre-registered on the Open Science Framework⁹ and received approval from the local ethics committee of the University of Bern (Approval Number 182023).

Participants and Sample Size

We based our power analyses on a one-sided Pearson correlation analysis. To detect a correlation coefficient of at least $r = .20$ between SIBCC and pro-environmental behavior (5% alpha level, 95% power), we require a sample size of 266 participants (G*Power 3.1.9.4; Faul et al., 2009). Considering an attrition rate of 15%, we targeted to recruit 306 participants, which we rounded up to 320 participants. A UK sample of 320 respondents were invited via Prolific and 328 completed the survey. Exclusion of participants according to our pre-registered protocol (similar to Study 1) led to a final sample size of $N = 288$. Table 4 provides a description of the sample of Study 2 (see a detailed description of the sample in the Supplementary Material A.6, Hauser, 2023).

9) See pre-registration at Hauser and Berger (2023).

Table 4*Study 2: Sample Characteristics of Prolific Sample*

Sample	Prolific (N = 288)
Age	39.36 (SD = 11.64)
Gender (% female)	50
Political ideology (% liberal)	54
Education (% university degree)	69
Low income (% less than \$50,000)	61

Note. In terms of political ideology, all participants who indicated to be “very liberal” to “somewhat liberal” were merged and labeled “liberal”.

Procedure and Measures

Data was collected online via Prolific. After giving written consent, participants first completed the *Carbon Emission Task* before completing the SIBCC and the other self-report measures. Participants received a flat fee of GBP 1.1, plus any decision-dependent bonus that followed from behavioral responses. It took participants a median of five minutes to complete the survey. We report here on additional scales and changes to the parameters in the *Carbon Emission Task* compared to Study 1.

SASSY Scale

The Six America Short Survey (SASSY) scale is an established four-item measure by Chryst et al. (2018) derived from the original Six Americas model with 36 questions. The four questions consider questions about the importance, personal worry and harm, and harm to future generations by global warming. Participants responded on a 5-point Likert-scale about the importance of global warming which we coded from 1 (*Not at all important*) to 5 (*Extremely important*) ($M = 3.52$, $SD = 0.92$). Individual worry about global warming was captured on a 4-point Likert-scale from 1 (*Not at all worried*) to 4 (*Very worried*) ($M = 3.05$, $SD = 0.78$). The question about personal harm from global warming ($M = 3.60$, $SD = 0.78$) and harm of future generation ($M = 4.54$, $SD = 0.73$) was measured on a 5-point Likert scale from 1 (*A great deal*) to 4 (*Not at all*) including the opt-out answer of 5 (*Don't know*) coded as NA ($n = 2$). In addition to the single items, we built a composite scale ($\alpha = .88$; $M = 3.67$, $SD = 0.70$).

Single-Item of the Six Americas Scale

We included a self-categorizing single item (Swim & Geiger, 2017) that is also derived from the Six Americas model assessing concern on climate change to correlate our item with the different categories of the item. Hence, participants had to self-categorize themselves into one of six statements about climate change. The statements captured categories of being alarmed (38.89%), concerned (38.19%), cautious (13.89%), disengaged (5.21%), doubtful (2.08%) or dismissive (1.74%) about climate change.

Policy Support and Political Activism

To measure participants' policy support and political activism, we relied on two questionnaires by Swim and Geiger (2017). First, participants responded to six different policies to what extent they support the policy on a 4-point Likert scale from 1 (*Strongly oppose*) to 4 (*Strongly support*) ($M = 3.42$, $SD = 0.57$). Second, on a 4-point Likert scale ranging from 1 (*Never*) to 4 (*Often*), participants reported how many times they have engaged in four different political actions in last 12 months ($M = 1.20$, $SD = 0.40$).

Carbon Emission Task

We included a variant of the *Carbon Emission Task* as described in Study 1, but altered the parameters. In Study 2, financial consequences ranged from GBP 0.2, 0.4, 0.6, 0.8 and GBP 1 and the associated retirement of carbon emissions varied from 0.5, 1, 2, 3 and 4.5 kg CO₂ in a fully-crossed design. The proportion of participants choosing the pro-environmental option was similar to Study 1 ($M = 0.52$, $SD = 0.34$).

Results

To re-assess validity, we correlated the single-item with the four questions of the SASSY scale, a continuous interpretation of the single item of the Six America Scale, policy support and political activism, as well as the *Carbon Emission Task*. In terms of *convergent validity*, results in Table 5 reveal statistically significant correlations coefficients in the expected direction. SIBCC correlates with the overall mean of the SASSY scale: $r = .70$, 95% CI [0.64, 0.75], $p < .001$; with importance of global warming: $r = .60$, 95% CI [0.52, 0.67], $p < .001$; with worry about global warming: $r = .64$, 95% CI [0.57, 0.70], $p < .001$; with individual harm by global warming: $r = .49$, 95% CI [0.40, 0.57], $p < .001$; with the harm of global warming to future generations: $r = .70$, 95% CI [0.64, 0.75], $p < .001$; and with the mean of the single item of the Six America Scale: $r = .70$, 95% CI [0.64, 0.75], $p < .001$.¹⁰

Similar to the results presented in Study 1, *predictive validity* was assessed through correlations between the SIBCC and outcome measures, among them policy support, political activism (Swim & Geiger, 2017), and behavior in the *Carbon Emission Task* (Berger & Wyss, 2021a). Results show that the single-item measure correlates positively and statistically significant with policy support: $r = .59$, 95% CI [0.51, 0.66], $p < .001$; political activism: $r = .16$, 95% CI [0.04, 0.27], $p < .001$; and with pro-environmental behavior: $r = .33$, 95% CI [0.22, 0.43], $p < .001$.

¹⁰ See Supplementary Material Table A.7, Hauser (2023), for Spearman correlations.

Table 5
Descriptive Statistics and Pearson Correlations for Study Variables (N = 288)

Variable	1	2	3	4	5	6	7	8	9	10	M	SD
1. SIBCC	—										3.34	2.04
2. SASSY scale	.70***	—									3.67	0.70
3. Importance of GW	.60***	.89***	—								3.52	0.92
4. Worry by GW	.64***	.88***	.76***	—							3.05	0.78
5. Individual harm by GW	.49***	.82***	.60***	.62***	—						3.60	0.78
6. Harm future generations	.70***	.84***	.66***	.67***	.60***	—					4.54	0.73
7. Single Item 6 America	.70***	.81***	.73***	.75***	.57***	.75***	—				5.01	1.10
8. Political support	.59***	.64***	.59***	.58***	.44***	.59***	.65***	—			3.42	0.57
9. Political activism	.16**	.25***	.27***	.23***	.24***	.13*	.24***	.16**	—		1.20	0.40
10. CET	.33***	.54***	.51***	.50***	.42***	.44***	.48***	.34***	.17**	—	0.52	0.34

Note. SIBCC = Single-Item Belief in Climate Change, GW = global warming, CET = Carbon Emission Task. The categories of the Single Item 6 America were merged to a continuous variable ranging from (1) dismissive to (6) alarmed.

* $p < .10$. ** $p < .05$. *** $p < .01$.

Furthermore, we test the degree to which SIBCC predicts outcome measures (CET behavior, policy support, and political activism), both with and without controlling for other demographic factors (see Table 6). Throughout all models, SIBCC relates to the outcome measures, as expected.

Table 6

Linear Regression of SIBCC on CET Behavior (Models 1 and 2), Policy Support (Models 3 and 4), and Political Activism (Models 5 and 6)

Variable	(1)	(2)	(3)	(4)	(5)	(6)
(Intercept)	0.52 ***(0.02)	0.47***(0.05)	3.42***(0.03)	3.62***(0.07)	1.20***(0.02)	1.13***(0.07)
SIBCC	0.11***(0.02)	0.12***(0.02)	0.34***(0.03)	0.32***(0.03)	0.06***(0.02)	0.06**(0.03)
Gender		0.08**(0.04)		-0.08(0.05)		0.00(0.05)
Age		0.03(0.02)		0.04(0.03)		-0.02(0.03)
Political ideology		-0.00(0.02)		-0.10***(0.03)		-0.01(0.03)
Education		-0.00(0.04)		-0.10(0.06)		0.10*(0.06)
Low income		0.01(0.04)		-0.14**(0.06)		-0.00(0.05)
Observations	288	268	288	268	288	268
R-squared	0.11	0.14	0.35	0.43	0.02	0.04

Note. The table presents estimates from ordinary least squares (OLS) regressions. All continuous predictors are mean centered and scaled by 1SD. Robust standard errors are shown in parentheses. Gender is dummy-coded (1 if female) as well as education (1 if at least university degree) and low income (1 if below GBP 50,000 annual income).

*, **, and *** document significance at the 10%, 5%, and 1% levels, respectively.

Finally, we examine *discriminant validity*, as in Study 1. Contrary to the Prolific sample in Study 1, we do not detect a significant difference ($U = 9678$, $p = .312$, Mann-Whitney test) of belief in climate change perceptions between women ($M = 3.47$, $SD = 1.96$, $n = 144$) and men ($M = 3.22$, $SD = 2.11$, $n = 144$) from the Prolific sample in Study 2. Similar to findings in Study 1, we found statistically significant ($U = 6152$, $p < .001$ Mann-Whitney test) greater climate change perceptions of liberals ($M = 3.99$, $SD = 1.42$, $n = 155$) compared to conservatives ($M = 2.59$, $SD = 2.59$, $n = 133$).

Discussion

Study 2 confirms the findings about *convergent* and *predictive validity* obtained in Study 1, supporting the usage of the single item. In addition, we extend findings from Study 1 by showing that SIBCC correlates with an alternative set of measures designed to test belief in climate change, and with novel outcome variables tapping into policy support and activism. In addition to the validation work mainly intended here, we also show that the related measures assessing belief in climate change (SASSY, Six Americas) are correlated with a consequential, but abstract behavioral measure (i.e., the CET).

General Discussion

In the present research, we investigated the validity of a novel and brief measure to assess belief in climate change with a single item. Across two studies, we show that the item is a suitable alternative to longer instruments. Results in Study 1 support the validity of the single item through establishing convergent, predictive, and discriminant validity. Consistent with the results in Study 1, we replicate and extend our findings in Study 2.

One particular strength of our studies is the inclusion of a consequential behavioral measure with actual environmental consequences. In many cases, ostensible validity support may be artificially increased through common-method variance (Podsakoff et al., 2003). Here, we circumvent this issue and thus follow calls that researchers should apply rigorous measurement models and demonstrate that the proposed measure operates as theoretically predicted beyond the world of self-reports (Kaiser & Lange, 2021).

The single-item SIBCC measure complements the single item of the Six America Survey (Swim & Geiger, 2017) and the SASSY scale (Chryst et al., 2018), which are both also correlated with the *Carbon Emission Task*. SIBCC therefore presents a viable alternative to other measures, enabling researchers to choose among various established measures using a single item (e.g., Swim & Geiger, 2017) or a few items (Chryst et al., 2018; Poortinga et al., 2019). Possible use-cases include screening people out for dismissing anthropogenic climate change or to quickly assess belief in climate change when it is not the primary interest of a study.

Despite the disadvantages that one-item measures may bring, recent research calls for more single-item constructs (Allen et al., 2022). Although these often come with a negative reputation, most research published on single-item measures shows that they are often as valid and reliable as their multi-item counterparts (Ahmad et al., 2014; Ang & Eisend, 2018). Climate change beliefs are particularly important to assess in large-scale surveys (e.g., household surveys, panels, international *Many Labs* projects, etc.) and the need for brief, validated measures is increasing. That said, a single-item measure of belief in climate change does not come without limitations. For example, it cannot capture complex multi-dimensional attitudinal structures. However, the measure is not designed to replace existing longer instruments, but rather to be included as an additional instrument to our toolbox of assessing public belief in climate change when survey space is limited. Our hope is that an additional validated ultra-short assessment instrument will increase the evidence-base, as the one-item measure can easily be incorporated in larger studies.

Openness and Transparency Statements

Author Contributions.

SEBASTIAN BERGER: Conceptualization. Funding acquisition. Writing – original draft. Writing – review & editing.

DAVID HAUSER: Conceptualization. Investigation. Formal analysis. Writing – original draft. Writing – review & editing.

ANNA LANGE: Conceptualization. Investigation. Writing – review & editing.

SANDER VAN DER LINDEN: Methodology. Writing – review & editing.

Acknowledgments. The authors have no additional (i.e., non-financial) support to report. This publication was part of the dissertation work submitted by David Hauser to the University of Bern, Switzerland.

Funding. The authors have no funding to report.

Competing Interests. The authors have declared that no competing interests exist.

Supplementary Materials. The following table provides an overview of the accessibility of supplementary materials (if any) for this paper.

Type of supplementary materials	Availability/Access
Data	
Study data.	Hauser (2023)
Code	
R code.	Hauser (2023)
Material	
a. Materials for Studies 1 & 2.	Hauser (2023)
b. Detailed data analyses for Studies 1 & 2.	Hauser (2023)
Study/Analysis preregistration	
a. Preregistration of hypotheses—Study 1.	Lange et al. (2021)
b. Preregistration of hypotheses—Study 2.	Hauser and Berger (2023)

Badges for Good Research Practices.

Open data: YES.

Open code: YES.

Open materials: YES.

Preregistration: YES.

Diversity statement: NO.

Note: YES = the present article meets the criteria for awarding the badge. NO = the present article does not meet the criteria for awarding the badge or the criteria are not applicable.

References

- Abdel-Khalek, A. M. (2006). Measuring happiness with a single-item scale. *Social Behavior and Personality, 34*(2), 139–150. <https://doi.org/10.2224/sbp.2006.34.2.139>
- Ahmad, F., Jhaji, A. K., Stewart, D. E., Burghardt, M., & Bierman, A. S. (2014). Single item measures of self-rated mental health: A scoping review. *BMC Health Services Research, 14*(1), Article 398. <https://doi.org/10.1186/1472-6963-14-398>
- Allen, M. S., Iliescu, D., & Greiff, S. (2022). Single item measures in psychological science. *European Journal of Psychological Assessment, 38*(1), 1–5. <https://doi.org/10.1027/1015-5759/a000699>
- Ang, L., & Eisend, M. (2018). Single versus multiple measurement of attitudes: A meta-analysis of advertising studies validates the single-item measure approach. *Journal of Advertising Research, 58*(2), 218–227. <https://doi.org/10.2501/JAR-2017-001>
- American Psychological Association. (2022). *Addressing the climate crisis: An action plan for psychologists*. APA Task Force on Climate Change. <https://www.apa.org/news/press/releases/2022/02/climate-crisis-action-plan.pdf>
- Arnold, O., Kibbe, A., Hartig, T., & Kaiser, F. G. (2018). Capturing the environmental impact of individual lifestyles: Evidence of the criterion validity of the general ecological behavior scale. *Environment and Behavior, 50*(3), 350–372. <https://doi.org/10.1177/0013916517701796>
- Berger, S., & Wyss, A. M. (2021a). Measuring pro-environmental behavior using the carbon emission task. *Journal of Environmental Psychology, 75*, Article 101613. <https://doi.org/10.1016/j.jenvp.2021.101613>
- Berger, S., & Wyss, A. M. (2021b). Climate change denial is associated with diminished sensitivity in internalizing environmental externalities. *Environmental Research Letters, 16*, Article 7. <https://doi.org/10.1088/1748-9326/ac08c0>
- Bergkvist, L. (2015). Appropriate use of single-item measures is here to stay. *Marketing Letters, 26*, 245–255. <https://doi.org/10.1007/s11002-014-9325-y>
- Bouman, T., Steg, L., & Kiers, H. A. L. (2018). Measuring values in environmental research: A test of an environmental portrait value questionnaire. *Frontiers in Psychology, 9*, Article 564. <https://doi.org/10.3389/fpsyg.2018.00564>
- Bowling, A. (2005). Just one question: If one question works, why ask several? *Journal of Epidemiology and Community Health, 59*(5), 342–345. <https://doi.org/10.1136/jech.2004.021204>
- Camilleri, A. R., Larrick, R. P., Hossain, S., & Patino-Echeverri, D. (2019). Consumers underestimate the emissions associated with food but are aided by labels. *Nature Climate Change, 9*(1), 53–58. <https://doi.org/10.1038/s41558-018-0354-z>
- Chryst, B., Marlon, J., van der Linden, S., Leiserowitz, A., Maibach, E., & Roser-Renouf, C. (2018). Global Warming’s “Six Americas Short Survey”: Audience segmentation of climate change views using a four question instrument. *Environmental Communication, 12*(8), 1109–1122. <https://doi.org/10.1080/17524032.2018.1508047>
- Creutzig, F., Roy, J., Devine-Wright, P., Diaz-José, J., Geels, F., Grubler, A., Maïzi, N., Masanet, E., Mulugetta, Y., Onyige, C. D., Perkins, P. E., Sanches-Pereira, A., Weber, E. U., Composto, J., Dagnachew, A. G., Das, N., Frank, R., Ghosh, B., Heeren, N., . . . Zimm, C. (2022). Demand,

- services and social aspects of mitigation. In *Climate Change 2022: Mitigation of climate change. Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change* (pp. 752–943). Cambridge University Press.
- Cruz, S. M., & Manata, B. (2020). Measurement of environmental concern: A review and analysis. *Frontiers in Psychology, 11*, Article 363. <https://doi.org/10.3389/fpsyg.2020.00363>
- De Keersmaecker, J., Schmid, K., & van der Linden, S. (2022). Emissions cuts take political and social innovation too. *Nature, 602*(7895), 33. <https://doi.org/10.1038/d41586-022-00219-y>
- Diener, E. D., Emmons, R. A., Larsen, R. J., & Griffin, S. (1985). The satisfaction with life scale. *Journal of Personality Assessment, 49*(1), 71–75. https://doi.org/10.1207/s15327752jpa4901_13
- Dietz, T., Gardner, G. T., Gilligan, J., Stern, P. C., & Vandenbergh, M. P. (2009). Household actions can provide a behavioral wedge to rapidly reduce US carbon emissions. *Proceedings of the National Academy of Sciences of the United States of America, 106*(44), 18452–18456. <https://doi.org/10.1073/pnas.0908738106>
- Dohmen, T., Falk, A., Huffman, D., Sunde, U., Schupp, J., & Wagner, G. G. (2011). Individual risk attitudes: Measurement, determinants, and behavioral consequences. *Journal of the European Economic Association, 9*(3), 522–550. <https://doi.org/10.1111/j.1542-4774.2011.01015.x>
- Dunlap, R. E., Van Liere, K. D., Mertig, A. G., & Jones, R. E. (2000). Measuring endorsement of the new ecological paradigm: A revised NEP scale. *Journal of Social Issues, 56*(3), 425–442. <https://doi.org/10.1111/0022-4537.00176>
- Faul, F., Erdfelder, E., Buchner, A., & Lang, A.-G. (2009). Statistical power analyses using G*Power 3.1: Tests for correlation and regression analyses. *Behavior Research Methods, 41*, 1149–1160. <https://doi.org/10.3758/BRM.41.4.1149>
- Fujii, S. (2006). Environmental concern, attitude toward frugality, and ease of behavior as determinants of pro-environmental behavior intentions. *Journal of Environmental Psychology, 26*(4), 262–268. <https://doi.org/10.1016/j.jenvp.2006.09.003>
- Gardner, D. G., Cummings, L. L., Dunham, R. B., & Pierce, J. L. (1998). Single-item versus multiple-item measurement scales: An empirical comparison. *Educational and Psychological Measurement, 58*(6), 898–915. <https://doi.org/10.1177/0013164498058006003>
- Hattie, J., & Cooksey, R. W. (1984). Procedures for assessing the validities of tests using the “known-groups” method. *Applied Psychological Measurement, 8*(3), 295–305. <https://doi.org/10.1177/014662168400800306>
- Hauser, D. (2023). Measuring belief in climate change with [sic] a single-item data [Data, detailed data analyses, R code, instructions and questionnaires for Studies 1 and 2]. OSF. <https://doi.org/10.17605/OSF.IO/J2GRX>
- Hauser, D., & Berger, S. (2023). *Measuring belief in climate change with a single-item (Study 2) [Preregistration of Study 2]*. OSF. <https://doi.org/10.17605/OSF.IO/7TPFU>
- Hawcroft, L. J., & Milfont, T. L. (2010). The use (and abuse) of the new environmental paradigm scale over the last 30 years: A meta-analysis. *Journal of Environmental Psychology, 30*(2), 143–158. <https://doi.org/10.1016/j.jenvp.2009.10.003>

- Hornsey, M. J., Harris, E. A., Bain, P. G., & Fielding, K. S. (2016). Meta-analyses of the determinants and outcomes of belief in climate change. *Nature Climate Change*, *6*(6), 622–626. <https://doi.org/10.1038/nclimate2943>
- Kaiser, F. G., & Lange, F. (2021). Offsetting behavioral costs with personal attitude: Identifying the psychological essence of an environmental attitude measure. *Journal of Environmental Psychology*, *75*, Article 101619. <https://doi.org/10.1016/j.jenvp.2021.101619>
- Kaiser, F. G., & Wilson, M. (2004). Goal-directed conservation behavior: The specific composition of a general performance. *Personality and Individual Differences*, *36*(7), 1531–1544. <https://doi.org/10.1016/j.paid.2003.06.003>
- Kaiser, F. G., Wölfing, S., & Fuhrer, U. (1999). Environmental attitude and ecological behaviour. *Journal of Environmental Psychology*, *19*(1), 1–19. <https://doi.org/10.1006/jevp.1998.0107>
- Lange, F. (2023). Behavioral paradigms for studying pro-environmental behavior: A systematic review. *Behavior Research Methods*, *55*, 600–622. <https://doi.org/10.3758/s13428-022-01825-4>
- Lange, A., Berger, S., Hauser, D., & Wyss, A. (2021). *Validation study: Measuring belief in (anthropogenic) climate change with one item* [Preregistration of Study 1]. OSF. <https://doi.org/10.17605/OSF.IO/D4BES>
- Lange, F., & Dewitte, S. (2022). The Work for Environmental Protection Task: A consequential web-based procedure for studying pro-environmental behavior. *Behavior Research Methods*, *54*(1), 133–145. <https://doi.org/10.3758/s13428-021-01617-2>
- Leiserowitz, A., Roser-Renouf, C., Marlon, J., & Maibach, E. (2021). Global Warming's Six Americas: A review and recommendations for climate change communication. *Current Opinion in Behavioral Sciences*, *42*, 97–103. <https://doi.org/10.1016/j.cobeha.2021.04.007>
- Leung, S. O. (2011). A comparison of psychometric properties and normality in 4-, 5-, 6-, and 11-point Likert scales. *Journal of Social Service Research*, *37*(4), 412–421. <https://doi.org/10.1080/01488376.2011.580697>
- Mair, P., Hatzinger, R., Maier, M., Rasch, T., & Debelak, R. (2020). *Package eRm (extended Rasch modeling): Reference manual* (R package version 0.14-0). R Foundation for Statistical Computing. <http://cran.r-project.org/web/packages/eRm/index.html>
- Mancha, R. M., & Yoder, C. Y. (2015). Cultural antecedents of green behavioral intent: An environmental theory of planned behavior. *Journal of Environmental Psychology*, *43*, 145–154. <https://doi.org/10.1016/j.jenvp.2015.06.005>
- McCright, A. M. (2010). The effects of gender on climate change knowledge and concern in the American public. *Population and Environment*, *32*, 66–87. <https://doi.org/10.1007/s11111-010-0113-1>
- McCright, A. M., & Dunlap, R. E. (2011). The politicization of climate change and polarization in the American public's views of global warming, 2001–2010. *Sociological Quarterly*, *52*(2), 155–194. <https://doi.org/10.1111/j.1533-8525.2011.01198.x>
- Nielsen, K. S., Nicholas, K. A., Creutzig, F., Dietz, T., & Stern, P. C. (2021). The role of high-socioeconomic-status people in locking in or rapidly reducing energy-driven greenhouse gas emissions. *Nature Energy*, *6*(11), 1011–1016. <https://doi.org/10.1038/s41560-021-00900-y>

- Nunnally, J. (1978). *Psychometric methods*. McGraw Hill.
- Podsakoff, P. M., MacKenzie, S. B., Lee, J. Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology*, 88(5), 879–903. <https://doi.org/10.1037/0021-9010.88.5.879>
- Poortinga, W., Whitmarsh, L., Steg, L., Böhm, G., & Fisher, S. (2019). Climate change perceptions and their individual-level determinants: A cross-European analysis. *Global Environmental Change*, 55, 25–35. <https://doi.org/10.1016/j.gloenvcha.2019.01.007>
- Postmes, T., Haslam, S. A., & Jans, L. (2013). A single-item measure of social identification: Reliability, validity, and utility. *British Journal of Social Psychology*, 52(4), 597–617. <https://doi.org/10.1111/bjso.12006>
- R Core Team. (2020). *R: A language and environment for statistical computing*. R Foundation for Statistical Computing. <https://www.R-project.org/>
- Robins, R. W., Hendin, H. M., & Trzesniewski, K. H. (2001). Measuring global self-esteem: Construct validation of a single-item measure and the Rosenberg Self-Esteem Scale. *Personality and Social Psychology Bulletin*, 27(2), 151–161. <https://doi.org/10.1177/0146167201272002>
- Scherpenzeel, A. (2002). Why use 11-point scales. *Swiss Household Panel*, 9, Article 2008.
- Schönbrodt, F. D., & Perugini, M. (2013). At what sample size do correlations stabilize? *Journal of Research in Personality*, 47(5), 609–612. <https://doi.org/10.1016/j.jrp.2013.05.009>
- Steg, L., Perlaviciute, G., Van der Werff, E., & Lurvink, J. (2014). The significance of hedonic values for environmentally relevant attitudes, preferences, and actions. *Environment and Behavior*, 46(2), 163–192. <https://doi.org/10.1177/0013916512454730>
- Swim, J. K., & Geiger, N. (2017). From alarmed to dismissive of climate change: A single item assessment of individual differences in concern and issue involvement. *Environmental Communication*, 11(4), 568–586. <https://doi.org/10.1080/17524032.2017.1308409>
- van der Linden, S., Leiserowitz, A., & Maibach, E. (2019). The gateway belief model: A large-scale replication. *Journal of Environmental Psychology*, 62, 49–58. <https://doi.org/10.1016/j.jenvp.2019.01.009>
- van der Linden, S., & Rosenthal, S. A. (2016). Measuring narcissism with a single question? A replication and extension of the Single-Item Narcissism Scale (SINS). *Personality and Individual Differences*, 90, 238–241. <https://doi.org/10.1016/j.paid.2015.10.050>
- van Valkengoed, A. M., Steg, L., & Perlaviciute, G. (2021). Development and validation of a climate change perceptions scale. *Journal of Environmental Psychology*, 76, Article 101652. <https://doi.org/10.1016/j.jenvp.2021.101652>
- Wanous, J. P., & Reichers, A. E. (1996). Estimating the reliability of a single-item measure. *Psychological Reports*, 78(2), 631–634. <https://doi.org/10.2466/pr0.1996.78.2.631>
- Whitmarsh, L., Capstick, S., Moore, I., Köhler, J., & Le Quéré, C. (2020). Use of aviation by climate change researchers: Structural influences, personal attitudes, and information provision. *Global Environmental Change*, 65, Article 102184. <https://doi.org/10.1016/j.gloenvcha.2020.102184>