Check for updates

Article

Journal of Cross-Cultural Psychology
1–24
© The Author(s) 2022
Article reuse guidelines:
sagepub.com/journals-permissions
DOI: 10.1177/00220221221110465
journals.sagepub.com/home/jcc
SAGE

Culturally Relevant Frames Increase Individuals' Motivation to Contribute to Carbon Emissions Offsets

Ee Hwee Lau[1], Aneeta Rattan[1], Rainer Romero-Canyas[2], and Krishna Savani[3,4]

Abstract

We theorized that culturally-relevant frames—language that invokes valued cultural concepts without changing the communicated information—canincrease people's willingness to engage in environmental action. Across eight experiments ($N = 10{,}294$) in two national contexts, we adjusted the language of a carbon offset request that people received as part of a simulated flight purchase. We investigated the role of five constructs that are valued across cultures but vary in their importance: choice, economic growth, social change, moral responsibility, and sanctity. We found that the social change, moral responsibility, and sanctity frames did not differ from the control condition in either culture. Invoking the concept of *economic development* increased Indians' willingness to contribute to a carbon offset compared to the control frame, whereas invoking the concept of *choice* increased US Americans' willingness. If these simulated decisions translate into actual actions, the findings suggest that framing environmental requests using culturally-relevant frames have the potential to promote sustainable behavior. More generally, the findings highlight the importance of paying attention to culture to motivate environmental action.

Keywords

carbon offsets, framing, culture, choice, economic development

There is an urgent global mandate to reduce carbon emissions (UN Climate Change Conference, 2021; UN Environment Programme, 2020). Nations must progress toward this goal through policy and technological changes (Organization for Economic Co-operation and Development, 2015), but individual consumers can also play a role. Individuals' behavioral choices, such as the decision to travel by transportation methods with higher carbon footprints, can increase carbon emissions significantly. Yet, individuals also have the potential to mitigate the negative

[1]London Business School, UK
[2]Environmental Defense Fund, New York, NY, USA
[3]The Hong Kong Polytechnic University, Kowloon, Hong Kong
[4]Nanyang Business School, Singapore, Singapore

Corresponding Author:
Krishna Savani, The Hong Kong Polytechnic University, Li Ka Shing Tower M857, Hung Hom, Kowloon, Hong Kong.
Email: krishna.savani@polyu.edu.hk

environmental impacts of their choices. For example, when purchasing goods or services with high carbon footprints, individuals can purchase carbon offsets, which are contributions to fund projects that reduce equivalent amounts of carbon emissions elsewhere (Hahn & Richards, 2013). While individual behavior is not sufficient to reverse global warming, efforts to motivate and socialize pro-environmental behavior as normative are important both in developing solutions to climate change and to communicating consumer priorities to industry.

Policymakers and businesses are thus faced with the challenge of motivating people to adopt practices that benefit the environment at a financial cost to themselves (Hardisty et al., 2017). Bridging the psychological science of decision framing and theories of sociocultural psychology, we theorize that *culturally-relevant frames* can motivate individuals to offset their carbon emissions. Given the global nature of the challenge of carbon emissions, we test our hypothesis that culturally-relevant frames can benefit carbon offset choices in two nations—the US and India. While much past work has established framing effects, the novel contribution of our work is to propose that frames informed by the cultural values of a national context may be effective in motivating people within that cultural context to engage in socially responsible behavior. We set our investigation in the context of airlines offering carbon offset purchases to consumers during a flight purchase. The aviation sector is a major carbon producer—if aviation emissions were tallied against those of nations, aviation would be one of the top 10 carbon emitters (Campos, 2016). Projections prior to the COVID-19 pandemic suggested that without policy changes, emission levels from aviation in 2040 were likely to be four times higher than in 2010 (International Civil Aviation Organization, 2016). As the global economy recovers from the COVID-19 pandemic, many policies (e.g., limits and standards on emissions in aviation) risk being postponed (Petsonk, 2020). Therefore, consumers' decisions to offset emissions will be particularly important to address the rapidly escalating climate crisis and direct industry attention to consumers' environmental concern.

We apply the psychological science of decision framing (Tversky & Kahneman, 1981), which offers different representations of the same options to test whether seemingly minor, but psychologically meaningful, changes in wording can significantly impact people's decisions (Tversky & Kahneman, 2000). Although framing effects are well-established in environmental messaging (e.g., Goldstein et al., 2008; Schultz et al., 2005; Schultz & Zelezny, 2003), past work has not yet considered the potential role of culture in shaping people's responses to decision frames. This is a critical oversight, both because psychological science has shown that culture shapes motivation (Markus & Kitayama, 2003) and because of the global nature of environmental issues like greenhouse gas emissions.

While some components of motivation seem universal (e.g., need to belong; Baumeister & Leary, 1995), others vary in how highly prioritized they are culturally (e.g., need for independence; Markus & Kitayama, 1991). Sociocultural contexts shape people's attitudes, values, beliefs, and behaviors (Bain et al., 2013; Rodriguez et al., 2013), and, we propose, may be an overlooked source of leverage in motivating pro-environmental decision-making (Eom et al., 2019). For example, people's environmental concern predicted their environmental action more in individualist cultures (Eom et al., 2016) and among people from higher socioeconomic status (Eom et al., 2018). The present research goes beyondthis past work by investigating a culturally-informed intervention to motivate environmental action.

Based on research in cultural psychology (Savani et al., 2015; Yates & de Oliveira, 2016), our a priori hypothesis was that decision frames invoking concepts valued within a given culture would motivate people to offset carbon emissions. We test this hypothesis in two national contexts, the United States and India, both major sources of global carbon emissions. We crafted appeals offering consumers a fixed-price carbon offset during a simulated flight purchase. As our baseline, we used a carbon offset appeal similar to messages used by major airlines at the time of the research. Thus, the control frame did not invoke any particular cultural value. Against the

control frame, we predicted that culturally-relevant frames would boost motivation to carbon offset. But which cultural ideals?

This research presents a first step to investigate whether culturally-relevant frames can motivate environmental action. We initiated this research in response to a request for assistance from an airline seeking to encourage its customers to purchase carbon offsets when they purchase their flight tickets. Thus, there was applied value in testing multiple theoretically sound frames. As this research was partially exploratory, we balanced a desire to test a variety of culturally-relevant frames against our funding limitations. For these reasons, we selected cultural ideals which *could be* effective based on the past research and tested them within both cultures. If any culturally-relevant frames were found to be effective within a given culture, we determined a priori that this would offer evidence for the core theoretical proposition of the current research, that decision frames informed by culture offer value for motivating environmental action. Below, we share the rationale behind our decisions about which culturally-relevant frames to test. To reiterate, we selected frames based on past work which suggested they might be effective, but we had no a priori hypothesis about the relative performance of different frames relative to each other, nor did we have an overarching theoretical framework linking the different frames tested.

Environmental appeals typically invoke benefits to society or humanity as a whole (Banerjee et al., 1995), and invoking society's future can shape prosociality (Bain et al., 2013). From our cultural approach, we theorized that frames invoking different types of benefits to the collective might motivate carbon offset purchases in different cultures. Specifically, we studied two frames: economic growth and social change. The economic growth frame focuses people on something that all nations want, and that benefits individuals' well-being (de Neve et al., 2018). We thought the economic growth (vs. control) frame could be particularly meaningful in India where development is a prioritized cultural ideal. Because India is considered an economically developing nation, the issue of economic growth might be closely tied to people's national identity. Additionally, as developing nations grow and industrialize, their citizens tend to report higher concern for the environment and see a link between economic growth and environmental degradation (Summers & VanHeuvelen, 2017). By comparison, the social change frame, also focuses on collective advancement, but in terms of culture rather than economy. Given that the US is generally conceived of as an economically developed country, we thought social change (vs. control) might be a higher cultural priority in the US. Research has found that messages that invoke social change (the idea that society is undergoing an ideological shift) can motivate individuals in the face of large-scale social challenges (e.g., technological shifts, increased immigration, and police brutality; Shnabel et al., 2009; Shnabel & Nadler, 2008; see also Rattan & Ambady, 2014).

We also considered three other concepts, choice, moral responsibility, and sanctity, which have been identified as culturally prioritized ideals in past research. Extensive research on North Americans has found that they are more motivated to work on a task when they can make choices as part of the task than when they do not have choices (Cordova & Lepper, 1996; Lepper & Malone, 1987; Ryan & Deci, 2000). Past research on the motivational effects of choice has nearly exclusively focused on more vs. fewer options (Patall et al., 2008). We extend this work to predict that framing the same objective option using the language of choice (e.g., "*choose* to contribute to a carbon offset") would motivate Americans to contribute to carbon offsets more than the neural frame.

The moral responsibility and purity frames were designed to tap into moral concerns. Morality matters everywhere but is conceptualized differently across cultures. US Americans prioritize personal responsibility (Greenfield, 2011; Hanson & Hanson, 2006; Morren & Grinstein, 2021; Quinn & Crocker, 1999), so we implemented a frame focused on taking moral responsibility for one's actions, which we predicted would motivate Americans to offset carbon emissions relative to the control frame. The idea of purity and contamination is particularly salient in Indian contexts; indeed, Indian children are more sensitive to contamination than American children (Hejmadi et al., 2004; see also Haidt et al., 2009). Similarly, the idea of sacredness is a distinctive

feature of Hindu Indian cultural contexts (Shweder et al., 1997). We thus tested a frame that activated concerns about moral purity and sanctity, that is, the idea that the carbon offset would help preserve the sanctity and purity of the environment.

As a first test of the hypothesis that culturally-relevant frames can motivate environmental action compared to a control frame, we conducted a series of studies testing culturally-relevant frames tied to the values described above. In line with the goals of open and reliable science, we (1) report all studies conducted for this project—there is no file drawer, (2) focus on the overall effects across all studies (rather than effect sizes from individual studies, though these are available in tables; Cumming, 2014), and (3) emphasize that this research is exploratory in that tested a single hypothesis, that culturally-relevant frames matter, using five theoretically-informed frames. Our key focus is on within-culture differences across conditions, that is, whether any of the culturally relevant frames increased people's willingness to contribute to carbon offsets above and beyond the control frame. We also assess whether the effects of various frames are similar or different across cultures, and whether the effects vary across various demographic factors, including participants' gender, age, social class, and political orientation.

Methods

When multiple experiments were run with the data source (i.e., Amazon Mechanical Turk), participants who completed previous experiments were excluded from subsequent experiments. We sought to block multiple responses from the same IP address based on our data collection platform's settings. If we still obtained multiple responses from the same IP address, we excluded them from the analyses because they could represent multiple responses from the same individuals. In addition, given that carbon offset contribution was our key dependent variable, participants who did not respond to the dependent variable automatically dropped out. There were no other exclusions.

We report all participants, experimental conditions, and carbon offset contribution measures. Sample size was determined before any data analysis. Data collection was not continued after data analysis. In each study, participants were randomly assigned to all the experimental conditions included in that study. Table 1 presents the demographics for each study. Participants with duplicate IP addresses and those who did not answer the dependent variable are not reported in this table.

As we analyzed the data using hierarchical regressions with participants nested within studies, we were unable to conduct either a power analysis or a sensitivity analysis. Our total sample size of 10,294 participants yields 858 participants per cell, on average. Although we were ideally aiming for 1,000 participants per cell, the research budget that we could reasonably allocate to this project was exhausted by the time we obtained a total of 10,294 participants. We believe that given the large overall sample, and the substantial sample size per cell, this research can be considered appropriately powered.

The data and analysis code are available at https://osf.io/gqtvf/.

Experiment 1: Givingincentive-Compatible Choices to Active Flyers in India[1]

In Experiment 1, we used an incentive-compatible design. We recruited active flyers in India by offering a chance to win one of six flight vouchers worth Rs. 10,000 (approximately $150 at the time of the study). We targeted people who wanted to fly between Mumbai and New Delhi, took them through the experience of buying a ticket, and offered the carbon offset worth Rs. 499 (approximately $7.50). Participants read that the cost of the offset would be deducted from their flight voucher earnings if they won the prize, which was stated in order to heighten the realism of the choice (winners received the full voucher).

Participants were recruited through Facebook ads. The advertisements targeted residents of New Delhi and Mumbai, India's two largest cities, aged 18 to 64, whose interests included

Table 1. Demographics by Culture and Experiment.

					US			
Experiment	1	2	3	4	5	6	7	8
Control					✓	✓	✓	✓
Economic growth					✓	✓	✓	✓
Social change							✓	✓
Choice							✓	✓
Moral responsibility							✓	✓
Sanctity							✓	✓
Number from duplicate IP addresses	–	–	–	–	29	4	94	20
Valid sample size	–	–	–	–	668	198	3,193	1,494
Number of flights last year (median)	–	–	–	–	2.00	2.00	2.00	2.00
Number of flights in lifetime (median)	–	–	–	–	20.00	20.00	20.00	20.00
Gender (% women)	–	–	–	–	55.35	66.50	60.51	60.12
Age (mean)	–	–	–	–	34.87	36.97	36.30	37.14
Education (% with a Bachelor's degree)	–	–	–	–	57.38	68.53	67.89	67.47
Political orientation[a] (mean)	–	–	–	–	4.56	4.32	4.44	4.42
Social class (mean)[b]	–	–	–	–	2.62	2.49	2.56	2.50
India								
Experiment	1	2	3	4	5	6	7	8
Control	✓	✓	✓	✓	✓	✓		✓
Economic growth	✓	✓	✓	✓	✓	✓		✓
Social change	✓	✓	✓	✓				✓
Choice	✓	✓	✓	✓				✓
Moral responsibility	✓	✓	✓	✓				✓
Sanctity	✓	✓	✓	✓				✓
Number from duplicate IP addresses	106	111	44	116	89	17	–	189
Valid sample size	426	459	281	1,708	631	186	–	1,050
Number of flights last year (median)	4.00	3.00	3.00	4.00	3.00	4.00	–	3.00
Number of flights in lifetime (median)	30.00	10.00	10.00	20.00	12.00	12.00	–	8.00
Gender (% women)	36.08	35.01	31.65	34.63	22.29	29.03	–	30.51
Age (mean)	32.42	31.25	31.20	35.56	30.00	31.13	–	30.85
Education (% with a Bachelor's degree)	86.90	96.27	95.38	97.10	95.08	95.16	–	95.60
Political orientation[a] (mean)	4.80	4.90	4.98	–[c]	4.75	4.96	–	–[c]
Social class (mean)[b]	3.43	3.36	3.30	3.64	3.31	3.24	–	3.07

[a] 1 = strongly conservative, 7 = strongly liberal.
[b] 1 = working class/lower class, 5 = upper class.
[c] Political orientation was not measured in this study.

"Airline" and "Air travel," and whose behaviors indicated that they were "frequent travelers" (based on Facebook's analysis). The ad contained images of airplane seats and stated, "Rs 10,000 Flight Voucher Study," and "Take a short survey about your travel preferences and WIN a flight voucher worth Rs 10,000!"

Upon clicking on the ad, participants were taken to a prescreen survey that contained a series of multiple-choice questions, including questions about participants' age, citizenship, and city of residence. Only Indian citizens aged 18 to 64 residing in New Delhi or Mumbai were eligible to continue. Participants were also asked about their comfort level with reading and writing English (one of India's national languages). Those who indicated that they were "not very comfortable" or "moderately comfortable" with English were ineligible, whereas those who indicated that they were "perfectly fluent" or "not perfectly fluent but very comfortable" were eligible. A total of 426 eligible Indians completed the study.

Thereafter, participants indicated whether they wanted to fly New Delhi-Mumbai-New Delhi or Mumbai-New Delhi-Mumbai, and whether their flight was for business or leisure. Participants then selected their round-trip dates and were informed, "If you are 1 of the 6 lucky winners, you will get a Rs. 10,000 travel gift voucher toward the cost of this itinerary." Participants received a list of real flight timings for their chosen route (pulled from an airline website) and chose their preferred flight. At the time of the study, all round-trip flight costs were under Rs. 10,000.

After their selection, participants were randomly assigned to one of the six decision frame conditions and presented with the carbon offset request. In the *control condition*, the text was similar to that used by a major airline in India at the time of the study: "Help clear the air! This airline is committed to offsetting the pollution caused by air travel. This airline believes everyone can reduce their carbon footprint and promote a healthy and sustainable future." Table 2 details the wording of the conditions.

Wording of Frames Used

After the headline and first paragraph for the relevant condition, all conditions continued to state:

> "In partnership with the Fair Climate Network, this airline has already setup 5000 biogas units in villages in India. (Electricity generated from biogas reduces carbon pollution by 95% compared to normal electricity generated from coal or natural gas.)
>
> Will you contribute Rs. 499 (from your Rs. 10,000 voucher) to fund low-carbon initiatives like these in villages around India?
>
> - Yes. I will make this contribution and I confirm that I am an Indian national. (This contribution is allowed only for Indian nationals as per Government of India rules.)
> - No. Thank you."

This served as our key dependent variable.

We collected additional exploratory measures across all experiments[2] (see Supplemental Material). The results for these exploratory measures are available in the Results.docx file on the online data repository.

Experiment 2: Giving Hypothetical Vignette Choices to Recent Flyers in India

In Experiment 2, we sought to replicate the findings of Study 1 but without the voucher,as people do not pay for carbon offset purchases using vouchers in the course of real-life flight purchases. We recruited residents of India on Amazon Mechanical Turk for this study. Participants

Table 2. Wording of the Frames Used Across the Experiments, With Description of Variations by Study.

Frame	Experiment 1 wording	Variations
Control	Help clear the air! This airline is committed to offsetting the pollution caused by air travel. This airline believes everyone can reduce their carbon footprint and promote a healthy and sustainable future.	Experiments 2, 3, 4: "This airline" replaced with "FlyIndia." Experiments 5, 6 and 8: "This airline" replaced with "FlyIndia" for the Indian sample and with "FlyAmerica" for the American sample. Experiment 7: "This airline" replaced with "FlyAmerica." For US samples, the frames did not mention India, but "America."
Economic growth	*Promote India's economic development*: Help clear the air! This airline is committed to promoting India's economic development by offsetting the pollution caused by air travel. This airline believes everyone can contribute to India's successful growth and development by reducing their carbon footprint and promoting a healthy and sustainable future.	
Social change	*Be part of social change*: Help clear the air! This airline is committed to creating social change by offsetting the pollution caused by air travel. This airline believes everyone can be part of this social change by reducing their carbon footprint and promoting a healthy and sustainable future.	
Choice	*It's your choice*: Help clear the air! This airline chooses to offset the pollution caused by air travel. This airline believes everyone can choose to reduce their carbon footprint and promote a healthy and sustainable future.	
Moral responsibility	*It is your moral responsibility*: Help clear the air! This airline believes that it is our moral responsibility to offset the pollution caused by air travel. This airline believes we all should fulfill our moral responsibility to reduce our carbon footprint and promote a healthy and sustainable future.	
Sanctity	*Preserve India's sanctity and purity*: Help clear the air! This airline is committed to maintaining the sanctity and purity of India's air, water, and land, by offsetting the pollution caused by air travel. This airline believes everyone can help preserve the purity of India's environment by reducing their carbon footprint and promoting a healthy and sustainable future.	

Note. After the frame, participants read the offer to partially offset their flight. The wording for these asks differed by experiment and are described in the Methods section.

completed a prescreen survey that contained a series of multiple-choice questions. Only those who were physically in India, had flown a domestic ticket in the past year, and had purchased a flight ticket online were eligible. A total of 459 eligible Indian flyers participated in the study.

Participants read: "Imagine that you need to take a flight within India and have searched for the best fare. You find that FlyIndia, a new airline, is offering a good fare and convenient times for the flight that you want to take. Therefore, you decide to take the FlyIndia flight for your upcoming trip. Once you have selected your preferred flight and entered your payment information, you see the following message."

Thereafter, participants were randomly assigned to one of the six conditions and presented with the carbon offset request. The requests were identical to those used in Experiment 1 except that we removed the flight voucher incentive, "This airline" was replaced with "FlyIndia," and "Rs. 499" was replaced with "Rs. 99" (approximately $1.50). The offset price was changed to be equivalent to the offset offered by an Indian airline at the time.

Further, we altered the framing of the other response option to match the experimental condition: "Yes. I will make this contribution" (control condition); "Yes. I will support India's sustainable growth and economic development and make this contribution" (economic growth condition); "Yes. I will be a part of this social change and make this contribution" (social change condition); "Yes. I choose to make this contribution" (choice condition); "Yes. I will fulfill my moral responsibility and make this contribution" (moral responsibility condition); and "Yes. I want to preserve the sanctity and purity of India and make this contribution" (sanctity condition). Each of the above stems was completed by ". . . and I confirm that I am an Indian national. (This contribution is allowed only for Indian nationals as per Government of India rules.)". The second response option to not contribute ("No. Thank you.") was identical across conditions.

Experiment 3

In Experiment 3, we realized that Indians' high reported rates of contribution in the previous experiments could be due to the small offset amount asked. So, we decided to increase the offset amount from Rs. 99 to Rs. 499.The methods of this study were identical to Experiment 2. A total of 281 eligible Indian flyers completed the study.

Experiment 4: Presenting a Realistic Fictional Airline Website to Indians

To increase ecological validity, Experiment 4 was designed to be a realistic replication in which participants actually selected flights between airports that they wanted to fly. We recruited Indian flyers using Survey Sampling International, a survey panel company. Participants completed a prescreen survey. Only those who lived in India, had taken a commercial flight, had purchased a flight on an airline website, and were either fluent or comfortable with English were eligible. A total of 1,708 eligible Indian flyers participated in the study.

Participants were taken through a realistic experience of buying a ticket on the website of the fictional airline FlyIndia. For the experiment, we programed the entire domestic flight schedule of a major Indian airline in the online survey. Participants were first asked to select 1 of 33 origin airports, which included all the airports that this airline flew to at the time of the study. Based on their choice, participants were then given a list of possible destination airports, which included all potential domestic destinations for this airline. Thereafter, participants were shown all available flight times between the given origin-destination pair and were asked to choose one. For ease of programing, we included a flight even if it did not fly daily between the given pair of cities.

After participants chose a flight, they were randomly assigned to one of the six conditions and presented with the carbon offset request. The language of the request was similar to that used in Experiment 3. The Rs. 499 contribution was replaced with a Rs. 199 contribution (approximately

$3). Further, we changed the second paragraph in the appeal to state that the carbon offset would be used for setting up cooking gas units rather than for generating electricity from biogas: "In partnership with the Fair Climate Network, FlyIndia has already setup 5000 cooking gas units in villages in India. (Using cooking gas instead of wood or coal reduces carbon pollution by 95%.)"

Experiment 5: Investigating Economic Growth Frame in Two Countries

In Experiment 5, the goal was to obtain a US sample, and we focused on the frame that we thought was most effective in India. We recruited residents of India and the US on Amazon Mechanical Turk for this study. Upon clicking on the study link, participants were taken to a prescreen survey that contained a series of multiple-choice questions. Only those who were living in either India or the US, had taken a commercial flight, and were either fluent or comfortable with English were eligible. A total of 631 eligible Indian flyers and 668 eligible US American flyers participated in the study.

Participants were asked to imagine that they wanted to purchase a flight ticket and checked the website of a new airline, FlyIndia/FlyAmerica (respectively). To simulate the flight search experience, participants were asked to type out the name of the airport that they would like to fly from, the airport that they would like to fly to, the date they would like to fly, and the date that they would like to return. To highlight the cost of the flight, participants were asked to estimate the cost of the flight as per their entered itinerary.

Participants were next randomly assigned to either the control condition or the economic growth condition. The language of the request was very similar to that used in Experiment 4. In the US, "villages in India" was replaced with "rural communities in the US." The contribution amount was Rs. 199 (approximately $3 at the time of the study) in India and $4.99 in the US. In the response option to contribute, we removed the following text which was included in previous studies: ". . . and I confirm that I am an Indian national. (This contribution is allowed only for Indian nationals as per Government of India rules.)"

Experiment 6

In Experiment 6, in addition to recruiting US samples, we also wanted to equate the carbon offset amounts between India and the US. We recruited residents of India and the US on Amazon Mechanical Turk for this study. A total of 186 eligible Indian flyers and 198 eligible US American flyers participated in the study. The procedure was identical to that in Experiment 5, except the contribution amount was changed to Rs. 335 (approximately $5 at the time of the study) in India and $5 in the US.

Experiment 7: Investigating All Frames in the US

In Experiments 7 and 8, the goal was to balance out the sample sizes across conditions. We recruited US residents on Amazon Mechanical Turk. A total of 3,193 eligible US-American flyers participated. The procedure was identical to Experiment 5 except that participants were randomly assigned to one of the six conditions included in Experiments 1 to 4. The contribution amount was changed to $4.99 in the US. We changed the second paragraph in the appeal to state that the carbon offset would be used to "set up 5000 biogas units in rural communities in the US" (similar to the language used in Experiments 1–3).

Experiment 8: Investigating All Frames in Two Countries

We recruited residents of India and the US on Amazon Mechanical Turk. A total of 1,050 eligible Indian flyers and 1,494 eligible US flyers participated. The procedure was identical to Experiment

7 except for two changes in the India survey: we used a contribution amount of Rs. 99 (approximately $1.50 at the time of the study), and changed the second paragraph in the appeal to state that the carbon offset would be used to "set up 5,000 biogas units in villages in India."

Demographic Variables

We measured participants' political orientation in all experiments and in both cultures (except Experiments 4 and 8 in India) by asking participants to indicate their political orientation on a scale of "1 = Strongly conservative" to "7 = Strongly liberal." We also included two additional items in Experiments 7 and 8 that were conducted in the US,"1 = Strongly right" to "7 = Strongly left" and "1 = Strongly republican" to "7 = Strongly democrat." We averaged participants' responses across the three questions in Experiments 7 and 8. We measured participants' social classin all experiments and in both cultures by asking participants to describe their social class on a scale of "1 = Working class/Lower class" to "5 = Upper class." We also asked participants to indicate their gender (coded such that 1 = "female" and 2 = "male"), and asked them to write their age.

Results

We pooled the data across all experiments a sit allowed us to provide a more accurate and unbiased test of our hypotheses(Braver et al., 2014; Cumming, 2014; Maner, 2014; Schimmack, 2012; Stanley & Spence, 2014; Tuk et al., 2015). In each experiment, participants were randomly assigned to conditions, and the conditions only varied in the text of the carbon offset frame. Thus, condition was treated as a participant-level variable with six categories (similar to that in virtually all experiments in psychology). However, our experiments systematically differed from each other in design features, participant pool, and dates of data collection. As such, the responses of participants within an experiment are likely correlated, so we treated participants as nested within experiments. Although it is common practice to use logistic regressions when analyzing binary dependent variables, recent research has suggested that in experiments with binary dependent variables, linear probability models are superior to logistic regressions (Gomila, 2021). We thus analyzed the data with a hierarchical linear model (see Raudenbush & Bryk, 2002, Chapter 7) using the *mixed* command in STATA©. This model allows us to analyze the data from all experiments in a single analysis rather than having separate estimates for each experiment and then pooling those estimates. As we are seeking to compare the effects of five experimental conditions compared to one control condition within a given culture, we used Bonferroni correction to adjust our p-value cut-off from $<.05$ to $<.01$.

Our dependent variable was binary—whether or not participants chose to contribute to the carbon offset. The independent variables were dummy variables indicating the condition that participants were assigned to (with the control condition treated as the dropped baseline), participants' culture (India = 0, US = 1), and interactions between culture and each condition. We controlled for the offset cost, which varied across experiments, as people might be less likely to contribute as the contribution amount increased. We converted this variable from Indian Rupees to US dollars using the rate 1 USD = 74 INR. We allowed the slopes of culture and condition to vary across experiments. However, we set the slopes of the culture × condition interactions as fixed across experiments because the model could not converge if we treated these slopes as random. We used a model with robust standard errors because our dependent variable was not linear.[3] Table 3 presents the descriptive statistics. The following equation depicts our model (i indicates participant number, j indicates experiment number):

$$\beta_{0j} = G_{00} + G_{01}ContributionScaled + U_{0j},$$

$$\beta_{1j} = G_{10} + U_{1j},$$

$$\beta_{2j} = G_{20} + U_{2j},$$

$$\beta_{3j} = G_{30} + U_{3j},$$

$$\beta_{4j} = G_{40} + U_{4j},$$

$$\beta_{5j} = G_{50} + U_{5j},$$

$$\beta_{6j} = G_{60} + U_{6j},$$

$$\beta_{7j} = G_{70},$$

$$\beta_{8j} = G_{80},$$

$$\beta_{9j} = G_{90},$$

$$\beta_{10j} = G_{100},$$

$$\beta_{11j} = G_{110}.$$

Our key goal was to examine whether any of the culturally-relevant frames motivate carbon offset more than the control condition within each culture. To do so, we ran separate hierarchical linear models within each culture using the same specifications as in our full model but without culture and the corresponding interaction terms. Table 4 presents the results from this analysis. We found that in India, the economic growth condition increased carbon offset contributions significantly compared to the control condition, $p < .001$. In terms of practical significance, the economic growth frame increased Indians' likelihood of contributing a carbon offset by 3.9% (95% CI [1.9, 5.9]). None of the other conditions were significantly different from the control condition ($p > .01$). The effect of the sanctity condition was about one-fourth as large ($B = .010$) as that of the economic growth condition ($B = .039$), with a wide confidence interval, and thus virtually indistinguishable from zero. The other three frames—choice, moral responsibility, and social change—had non-significant but negative effects, indicating that they are highly unlikely to increase Indians' likelihood of contributing to carbon offsets. We interpret these results as evidence for the absence of any effect for these four remaining conditions in India.

In the US, we found that compared to the control condition, the choice condition increased carbon offset contributions significantly, $p < .001$. In terms of practical significance, the choice frame increased Americans' likelihood of contributing a carbon offset by 4.5% (95% CI [2.5, 6.6). Americans' willingness to make the carbon offset contribution in the remaining conditions did not significantly differ from that in the control condition ($p > .01$). An examination of the Beta coefficients indicated that the moral responsibility condition had a larger effect ($B = .073$), and the social change condition had nearly as large an effect ($B = .038$) as the choice condition ($B = .045$). However, these two conditions also had much wider confidence intervals, which resulted in non-significant effects. For this reason, we consider the effects for both the moral responsibility and social change conditions inconclusive. However, we note that with a larger sample, or a different version of the manipulation, these effects may also emerge. The effect of the economic growth condition was about half as large ($B = .019$) as that of the choice condition,

Table 3. Proportion of Participants Contributing to the Carbon Offset, by Culture, Experiment, and Condition.

US								
Experiment	1	2	3	4	5	6	7	8
Control condition	–	–	–	–	0.39 (326)	0.46 (97)	0.45 (521)	0.58 (77)
Choice condition	–	–	–	–	–	–	0.48 (535)	0.58 (343)
Economic growth	–	–	–	–	0.43 (342)	0.49 (101)	0.45 (532)	0.63 (48)
Moral responsibility	–	–	–	–	–	–	0.47 (541)	0.65 (344)
Sanctity	–	–	–	–	–	–	0.45 (533)	0.52 (339)
Social change	–	–	–	–	–	–	0.50 (531)	0.54 (343)
India								
Control condition	0.72 (78)	0.93 (73)	0.76 (49)	0.74 (291)	0.68 (319)	0.71 (98)	–	0.83 (66)
Choice condition	0.72 (69)	0.85 (81)	0.80 (46)	0.72 (272)	–	–	–	0.79 (217)
Economic growth	0.73 (67)	0.90 (78)	0.83 (48)	0.79 (290)	0.71 (312)	0.78 (88)	–	0.86 (92)
Moral responsibility	0.73 (71)	0.92 (74)	0.78 (41)	0.71 (285)	–	–	–	0.80 (218)
Sanctity	0.64 (74)	0.94 (72)	0.81 (48)	0.75 (282)	–	–	–	0.82 (226)
Social change	0.69 (67)	0.91 (81)	0.80 (49)	0.74 (288)	–	–	–	0.74 (231)

Note. Results are reported in the format: Mean (*N*). We randomly assigned participants to conditions using Qualtrics™ "randomize block" function. The goal of Study 8 was to make approximately equal the distribution of participants in each condition across all studies. This was done by intentionally limiting the number of participants in the control and economic growth conditions, which were already over-sampled in Studies 5 and 6. Thus, in Study 8, all participants had higher probabilities of being assigned to any previously under-sampled conditions, but were still randomly assigned across all conditions.

Table 4. Results of the Separate Hierarchical Linear Models, Examining Effects Within Cultures.

	US					India				
Predictor	*N*	*B* (robust *SE*)	95% CI	*z*-value	Variance	*N*	*B* (robust *SE*)	95% CI	*z*-value	Variance
Control	1,021	–	–	–	–	974	–	–	–	–
Choice	878	.045 (0.01)	[0.025, 0.066]	4.29***	1.90e–14[a]	685	–.011 (0.01)	[–0.029, 0.007]	–1.18	1.00e–15[a]
Economic growth	1,023	.019 (0.01)	[–0.001, 0.040]	1.86	3.71e–15[a]	975	.039 (0.01)	[0.019, 0.059]	3.91***	9.37e–17[a]
Moral responsibility	885	.073 (0.04)	[–0.0009, 0.146]	1.94	0.002[a]	689	–.006 (0.01)	[–0.027, 0.015]	–0.55	2.19e–15[a]
Sanctity	872	.007 (0.01)	[–0.018, 0.031]	0.53	2.23e–15[a]	702	.010 (0.01)	[–0.014, 0.034]	0.81	9.69e–10[a]
Social change	874	.038 (0.02)	[–0.003, 0.080]	1.81	2.14e–12[a]	716	–.019 (0.02)	[–0.057, 0.019]	–0.98	1.77e–08[a]
Contribution amount (scaled)		.042 (0.27)	[–0.49, 0.58]	0.15	–		–.0002 (0.0002)	[–0.0005, 0.0001]	–1.16	–
Constant		–2.47 (19.08)	[–39.87, 34.93]	–0.13	0.002[b]		.81 (0.06)	[0.69, 0.93]	13.72***	.004[b]
Residual		–	–	–	0.247		–	–	–	.177[c]

[a]Variance in the random slope of culture/condition across experiments.
[b]Variance in the random intercept across experiments.
[c]Residual error variance at the level of participants.
*$p < .05$. **$p < .01$. ***$p < .001$ (all two-tailed).

but with a much narrower confidence interval than that of the moral responsibility and social change conditions. The sanctity condition's coefficient was the smallest of all ($B = .007$) and virtually indistinguishable from zero. Overall, it appears that the social change and sanctity frames suggest an absence of any effect.

Next, we examined whether there are significant cultural differences in the effectiveness of the various culturally-relevant frames. To do so, we ran the full hierarchical linear model. Table 5 presents the results from this analysis. We found a simple effect of culture ($B = -.27$, $p < .001$), which indicated that American participants were less likely to indicate that they would contribute to the carbon offset than Indian participants. We also found a simple effect of the *economic growth* condition on participants' decisions to contribute ($B = .039$, $p < .001$). Given the coding of culture (India = 0, US = 1), this finding indicates that the *economic growth* frame increased Indian participants' willingness to contribute to the carbon offset. However, the culture × economic growth interaction was non-significant ($p > .01$). We found significant culture × condition interactions for *choice* ($B = .055$), *moral responsibility* ($B = .080$), and *social change* ($B = .054$); the positive sign of these coefficients indicates that these conditions increased Americans' willingness to contribute more than Indians'. An examination of the variance components in Table 5 indicates that there was very little variance in the effect of culture or condition across experiments.

Additional Exploratory Analyses

We examined whether the effectiveness of the five frames varied across various demographic factors, including participants' political orientation, social class (SES), gender, and age. We did so because past research has found that different frames are effective for people varying on political orientation (e.g., Campbell & Kay, 2014; Day et al., 2014; Feinberg & Willer, 2013; Wolsko et al., 2016) and social class (Graham et al., 2009; Snibbe & Markus, 2005), and it is likely that there are similar variations across other demographic characteristics. We re-ran four models, each for one of the four demographic variables within each culture (except for political orientation, which we ran in the US only because the liberal-conservative political orientation is not relevant in India). In addition to the existing predictors, we added the mean-centered demographic variable and its interactions with the condition dummy variables. Table 6 presents the results from these analyses (Table 7).

We found that the effectiveness of the five frames did not vary by participants' political orientation in the US and by participants' age in both cultures. However, in the US, we found significant interactions between participants' social class and the social change frame ($B = .057$) and the economic growth frame ($B = .036$). Simple slopes analyses revealed that for participants from a higher SES background (those 1 *SD* above the mean on the social class measure), the social change ($B = .081$), and economic growth frames ($B = .039$) were better than control in leading to higher carbon offset donations; however, these two frames were not effective for participants from a lower SES background (those 1 *SD* below the mean on the social class measure; $B = .007$ and 0.010, respectively). In India, we also found an interaction between the social change frame and SES. However, this time round, the social change frame was non-significantly more effective than control for lower SES participants ($B = .027$) but not for higher SES participants ($B = -.025$).

In the US, the effectiveness of the five frames did not vary by participants' gender. In India, we found significant interactions between gender and the choice frame ($B = .032$) and the economic growth frame ($B = -.058$). Simple slopes analyses revealed that the choice frame led to higher carbon offset donations than the control frame among women ($B = .038$) but lower donations among men ($B = -.030$). The economic growth frameled to higher carbon offset donations than the control frame among men ($B = .051$) but not among women ($B = .010$). These findings

Table 5. Results of the Full Hierarchical Linear Model, Examining Effects Between Cultures.

Predictor	*B* (robust *SE*)	95% CI of *B*	z-value	Variance
Culture (India = 0, US = 1)	–.2732 (0.02)	[–0.304, –0.243]	–17.49***	1.13e–13[a]
Choice	–.015 (0.01)	[–0.036, 0.006]	–1.44	1.73e–15[a]
Economic growth	.039 (0.01)	[0.019, 0.059]	3.87***	9.70e–15[a]
Moral responsibility	–.014 (0.01)	[–0.031, 0.003]	–1.65	.0006[a]
Sanctity	.005 (0.01)	[–0.020, 0.031]	0.41	5.83e–13[a]
Social change	–.020 (0.02)	[–0.058, 0.019]	–1.00	.0003[a]
Contribution amount (scaled)	–.00005 (0.0001)	[–0.0002, 0.0001]	–0.51	–
Choice × culture	.055 (0.01)	[0.029, 0.081]	4.12***	–
Economic growth × culture	–.019 (0.02)	[–0.049, 0.011]	–1.26	–
Moral responsibility × culture	.080 (0.03)	[0.020, 0.14]	2.63**	–
Sanctity × culture	–.004 (0.02)	[–0.039, 0.030]	–0.24	–
Social change × culture	.054 (0.01)	[0.028, 0.081]	4.04***	–
Constant	.77 (0.04)	[0.68, 0.86]	17.41***	.004[b]
Residual	–	–	–	.214[c]

[a]Variance in the random slope of culture/ condition across experiments.
[b]Variance in the random intercept across experiments.
[c]Residual error variance at the level of participants.
*$p < .05$. **$p < .01$. ***$p < .001$ (all two-tailed).

suggest that organizations can target different frames to different demographic groups to maximize carbon offset donations.

Discussion

Across eight experiments with 10,294 participants, this exploratory research provides evidence in two nations that are major emitters of carbon emissions (the US and India) that culturally-relevant frames can motivate environmental action. In a simulated flight purchase decision, Indians selected a carbon offset more often when it was framed as furthering the nation's economic development, with an effect size of 3.9%, whereas Americans selected a carbon offset more often when it was framed as a choice, with an effect size of 4.5%. If these effect sizes generalize to the real world, they would then represent monetarily large consequences of virtually costless changes to the language used to elicit carbon offsets. Specifically, in 2019, people took 926 million flights in the US, and 167 million flights in India (World Bank, 2021). Assuming that the effect realized in the real world is at the lower bound of the confidence interval of the effect of the choice frame in the US (2.5%), the net effect would be 115.8 million dollars of additional carbon offset contributions per year. Assuming the average effect size of 4.5% in the US, the net effect would be 208.4 million dollars additional carbon offset contributions per year. Assuming the higher bound of the confidence interval of 6.6% in the US, the net effect would be 305.6 million dollars additional carbon offset contributions per year. The same estimation approach using the lower bound, 1.9%, estimated effect size, 3.9%, and higher bound, 5.9%, in India would result in net effects ranging from 4.8 million to 9.8 million to 14.8 milliondollars. Although no individual action will make up for the lack of efforts by governments and industry to reduce carbon emissions, these individual-level actions could collectively have the potential to have a meaningful impact.

It is important to note that even though all participants had a clear choice about whether or not to contribute to the carbon offset, an effect of the language of choice still emerged in the US. Our research is the first to show that merely invoking the term "choice" can significantly increase

Table 6. Results of the Separate Hierarchical Linear Models, Examining Effectiveness of the Five Frames Varied by Participants' Political Orientation, Social Class (SES), Gender, and Age.

Political orientation								
	US				India			
Predictor	*B* (robust *SE*)	95% CI	*z*-value	Variance	*B* (robust *SE*)	95% CI	*z*-value	Variance
Control	–	–	–	–	–	–	–	–
Choice	.042 (0.01)	[0.020, 0.063]	3.85***	9.41e–15[a]	–	–	–	–
Economic growth	.021 (0.01)	[0.00003, 0.043]	1.96	5.84e–15[a]	–	–	–	–
Moral responsibility	.076 (0.04)	[0.006, 0.145]	2.12*	0.002[a]	–	–	–	–
Sanctity	.016 (0.01)	[–0.011, 0.043]	1.16	3.74e–14[a]	–	–	–	–
Social change	.046 (0.02)	[0.0004, 0.091]	1.98*	2.84e–13[a]	–	–	–	–
Contribution amount (scaled)	.110 (0.29)	[–0.45, 0.67]	0.38	–	–	–	–	–
Political	.065 (0.003)	[0.059, 0.071]	20.92***	–				
Choice × political	.007 (0.007)	[–0.007, 0.022]	1.03	–	–	–	–	–
Economic growth × political	–.011 (0.01)	[–0.038, 0.017]	–0.74	–	–	–	–	–
Moral responsibility × political	–.008 (0.005)	[–0.017, 0.002]	–1.62	–	–	–	–	–
Sanctity × political	.011 (0.02)	[–0.031, 0.053]	0.51	–	–	–	–	–
Social change × political	.007 (0.02)	[–0.038, 0.052]	0.30	–	–	–	–	–
Constant	–7.20 (20.14)	[–46.67, 32.26]	–0.36	0.002[b]	–	–	–	–
Residual	–	–	–	0.235[c]	–	–	–	–
Social class								
Control	–	–	–	–	–	–	–	–
Choice	.049 (0.02)	[0.014, 0.084]	2.76**	3.58e–14[a]	.00008 (0.008)	[–0.016, 0.016]	0.01	1.18e–13[a]
Economic growth	.032 (0.007)	[0.018, 0.045]	4.54***	4.93e–15[a]	.048 (0.02)	[0.010, 0.086]	2.48*	4.19e–17[a]
Moral responsibility	.082 (0.05)	[–0.018, 0.181]	1.61	0.002[a]	.007 (0.01)	[–0.016, 0.030]	0.57	1.13e–14[a]
Sanctity	.006 (0.01)	[–0.018, 0.029]	0.50	7.32e–15[a]	.021 (0.01)	[–0.003, 0.046]	1.74	1.03e–09[a]
Social change	.060 (0.02)	[0.020, 0.100]	2.92**	3.11e–12[a]	.009 (0.02)	[–0.031, 0.049]	0.43	.0005[a]
Contribution amount (scaled)	.020 (0.27)	[–0.50, 0.54]	0.08	–	–.0001 (0.0001)	[–0.0004, 0.0001]	–1.00	–
SES	–.053 (0.02)	[–0.084, –0.023]	–3.46**	–	.059 (0.01)	[0.030, 0.087]	4.05***	
Choice × SES	.017 (0.03)	[–0.043, 0.076]	0.54	–	–.023 (0.02)	[–0.055, 0.008]	–1.44	–
Economic growth × SES	.036 (0.01)	[0.011, 0.062]	2.77**	–	–.021 (0.02)	[–0.065, 0.023]	–0.93	–
Moral responsibility × SES	.021 (0.03)	[–0.046, 0.089]	0.62	–	–.024 (0.01)	[–0.053, 0.005]	–1.61	–
Sanctity × SES	.004 (0.02)	[–0.029, 0.037]	0.22	–	–.010 (0.01)	[–0.039, 0.020]	–0.65	–
Social change × SES	.057 (0.01)	[0.029, 0.085]	4.03***	–	–.050 (0.02)	[–0.089, –0.011]	–2.52*	–
Constant	–.97 (18.73)	[–37.68, 35.73]	–0.05	0.002[b]	.78 (0.06)	[0.67, 0.89]	13.76***	.004[b]
Residual	–	–	–	0.246[c]	–	–	–	.174[c]
Gender								
Control	–	–	–	–	–	–	–	–

(continued)

Table 6. (continued)

Political orientation								
	US				India			
Predictor	*B* (robust *SE*)	95% CI	*z*-value	Variance	*B* (robust *SE*)	95% CI	*z*-value	Variance
Choice	.043 (0.009)	[0.025, 0.062]	4.58***	7.15e–14[a]	−.002 (0.008)	[−0.019, 0.014]	−0.25	2.24e–11[a]
Economic growth	.022 (0.01)	[0.003, 0.040]	2.26*	9.65e–15[a]	.027 (0.01)	[0.006, 0.048]	2.54*	6.30e–15[a]
Moral responsibility	.069 (0.04)	[–0.003, 0.142]	1.88	0.002[a]	–.011 (0.01)	[–0.037, 0.015]	–0.85	7.18e–14[a]
Sanctity	.011 (0.02)	[–0.020, 0.041]	0.70	1.46e–13[a]	.008 (0.008)	[–0.008, 0.025]	1.03	1.07e–09[a]
Social change	.033 (0.02)	[–0.006, 0.071]	1.65	1.15e–11[a]	–.020 (0.02)	[–0.054, 0.014]	–1.17	.00005[a]
Contribution amount (scaled)	.045 (0.27)	[–0.48, 0.57]	0.17	–	–.0001 (0.0001)	[–0.0004, 0.0002]	–0.90	–
Gender	–.027 (0.03)	[–0.081, 0.028]	–0.96	–	–.036 (0.03)	[–0.088, 0.017]	–1.34	–
Choice × gender	.045 (0.03)	[–0.012, 0.102]	1.54	–	.032 (0.02)	[0.002, 0.062]	2.07*	–
Economic growth × gender	–.004 (0.02)	[–0.036, 0.028]	–0.23	–	–.058 (0.02)	[–0.107, –0.010]	–2.37*	–
Moral responsibility × gender	.055 (0.03)	[–0.002, 0.111]	1.89	–	–.051 (0.03)	[–0.101, 0.00005]	–1.96	–
Sanctity × gender	–.040 (0.04)	[–0.112, 0.031]	–1.10	–	–.036 (0.03)	[–0.090, 0.019]	–1.29	–
Social change × gender	.058 (0.03)	[–0.0003, 0.116]	1.95	–	–.042 (0.04)	[–0.122, 0.037]	–1.04	–
Constant	–2.67 (18.64)	[–39.20, 33.86]	–0.14	0.002[b]	.86 (0.08)	[0.71, 1.01]	11.10***	.004[b]
Residual	–	–	–	0.246[c]	–	–	–	.174[c]
Age								
Control	–	–	–	–	–	–	–	–
Choice	.045 (0.007)	[0.031, 0.059]	6.24***	1.15e–14[a]	–.007 (0.01)	[–0.034, 0.019]	–0.56	2.20e–14[a]
Economic growth	.017 (0.008)	[0.001, 0.032]	2.14*	2.39e–15[a]	.043 (0.007)	[0.030, 0.057]	6.30***	9.64e–17[a]
Moral responsibility	.073 (0.04)	[0.002, 0.144]	2.02*	0.002[a]	.0002 (0.01)	[–0.029, 0.029]	0.01	3.88e–15[a]
Sanctity	.004 (0.01)	[–0.022, 0.029]	0.27	5.98e–15[a]	.020 (0.008)	[0.005, 0.036]	2.56*	7.58e–10[a]
Social change	.035 (0.02)	[–0.008, 0.078]	1.57	9.06e–13[a]	–.013 (0.02)	[–0.060, 0.035]	–0.51	.0001[a]
Contribution amount (scaled)	.046 (0.28)	[–0.49, 0.59]	0.17	–	–.0001 (0.0001)	[–0.0004, 0.0001]	–0.92	–
Age	–.001 (0.002)	[–0.005, 0.003]	–0.55	–	–.0002 (0.001)	[–0.002, 0.002]	–0.16	–
Choice × age	–.0002 (0.002)	[–0.004, 0.004]	–0.07	–	–.002 (0.003)	[–0.008, 0.005]	–0.47	–
Economic growth × age	.0002 (0.002)	[–0.004, 0.004]	0.10	–	.001 (0.002)	[–0.002, 0.005]	0.68	–
Moral responsibility × age	–.001(0.002)	[–0.005, 0.003]	–0.59	–	–.0007 (0.001)	[–0.003, 0.002]	–0.47	–
Sanctity × age	.0009 (0.002)	[–0.004, 0.006]	0.36	–	–.0006 (0.001)	[–0.003, 0.002]	–0.48	–
Social change × age	.002 (0.002)	[–0.002, 0.006]	0.82	–	–.002 (0.002)	[–0.007, 0.003]	–0.88	–
Constant	–2.79 (19.31)	[–40.62, 35.05]	–0.14	0.002[b]	.80 (0.06)	[0.68, 0.91]	13.52***	.004[b]
Residual	–	–	–	0.247[c]	–	–	–	.174[c]

[a]Variance in the random slope of culture/ condition across experiments.
[b]Variance in the random intercept across experiments.
[c]Residual error variance at the level of participants.
*$p < .05$. **$p < .01$. ***$p < .001$ (all two-tailed).

Table 7. Simple Slopes Analyses Modeling the Effect of Conditions on Participants' Carbon Offset Donations at Differing Levels of Social Class (SES) and of Different Gender.

Social class (US)						
	Higher SES			Lower SES		
Predictor	*B* (robust *SE*)	95% CI	z-value	*B* (robust *SE*)	95% CI	z-value
Choice	–	–	–	–	–	–
Economic growth	.039 (0.01)	[0.013, 0.066]	2.92**	.010 (0.02)	[−0.026, 0.046]	0.57
Moral responsibility	–	–	–	–	–	–
Sanctity	–	–	–	–	–	–
Social change	.081 (0.04)	[0.0006, 0.161]	1.98*	.007 (0.02)	[–0.035, 0.048]	0.32
Social class (IN)						
	Higher SES			Lower SES		
Predictor	*B* (robust *SE*)	95% CI	z-value	*B* (robust *SE*)	95% CI	z-value
Choice	–	–	–	–	–	–
Economic growth	–	–	–	–	–	–
Moral responsibility	–	–	–	–	–	–
Sanctity	–	–	–	–	–	–
Social change	−.025 (0.03)	[−0.079, 0.029]	−0.91	.027 (0.02)	[−0.010, 0.065]	1.44
Gender (IN)						
	Men			Women		
Predictor	*B* (robust *SE*)	95% CI	z-value	B (robust *SE*)	95% CI	z-value
Choice	−.030 (0.009)	[−0.047, −0.012]	−3.36**	.038 (0.02)	[0.008, 0.068]	2.50*
Economic growth	.051 (0.01)	[0.021, 0.080]	3.39**	.010 (0.01)	[−0.017, 0.038]	0.73
Moral responsibility	–	–	–	–	–	–
Sanctity	–	–	–	–	–	–
Social change	–	–	–	–	–	–

Note. The *B* coefficients indicate the difference between the control condition and each experimental condition for lower vs. higher SES background, and men vs. women.
*$p < .05$. **$p < .01$. ***$p < .001$ (all two-tailed).

Americans' likelihood of choosing to contribute to the carbon offset. This finding is consistent with research in cross-cultural psychology demonstrating that choice, although universally valued, does not motivate Indians as it motivates US Americans (Tripathi et al., 2018). However, we did not find significant differences between the US and India in the effectiveness of the economic growth frame. This finding suggests that the economic growth frame did not motivate Indians differently than US Americans, although the economic growth frame was significantly more effective than the control condition only in India, not in the US.

Our exploratory study also shows that not all culturally-relevant frames are equally motivating in this context of a decision about an individual pro-environmental action. Although all the frames presented reasonable starting points based on past research, the sanctity, moral responsibility, and social change frames did not differ from the control condition in either the US or India; however, the social change frame had a stronger effect in the US than in India. Exploratory analyses found that the effectiveness of the five frames varied based on targets' social class and gender within each culture, but not their political orientation and age. In the US, the social change and economic growth frameswere more effective for people from higher SES backgrounds. In India, the social change frame was more effective for people from lower SES backgrounds, the choice frame was more effective for women, and the economic growth frame was more effective for men. These findings suggest that future research, or organizational efforts, can consider targeting different frames to individuals depending upon their socioeconomic class and gender, if these characteristics are known.

The goal of the current research was not to discriminate between the culturally-relevant frames, so we cannot currently offer insights into why the two frames that yielded results (economic growth and choice) did so while the others (sanctity, moral responsibility, and social change) did not. Further, the goal of the current research was also not to identify frames that would fit into an elegant theoretical framework, so our exploratory approach used the funding available to us to conduct a highly powered test of frames that we thought could be effective in India and the US given past research. Our results support two conclusions within a simulated flight purchase context: culturally-relevant frames matter, and that not all cultural values made effective frames across the studies. In this way, our research highlights the value of exploratory approaches because these results can stimulate future research exploring precisely why some values, though universally valued, come to be more motivating than others in the context of carbon offset contributions. Research that explores how other information or affect could be combined with the frames, for example, could clarify when these cultural values could shape decisions. For example, a sanctity frame may be very effective after imagery that evokes disgust has been presented to respondents.

Assuming that findings from our hypothetical decisions generalize to actual decisions, our findings can be extended to donation requests in the sphere of environmental action in the US and India; carbon offset requests are just one type of donation requests for environmental action. Whether the current results would generalize outside of the environmental domain, such as seeking people's financial contribution to address other societal problems, is less certain and will require future research to answer. It is also possible that our findings about the effect of the choice frame in the US would generalize to other Western countries that value independence and free choice (Markus & Kitayama, 2003). Similarly, our findings about the effect of the economic growth frame in India may generalize to other economically developing countries that are aspiring to improve their economy. Future research can test these questions.

As we examined the effect of culturally-relevant frames on people's willingness to contribute to a carbon offset in hypothetical flight purchase scenarios, it is possible that our findings do not translate into actual behaviors that cost real money, especially if these hypothetical behaviors were driven by social desirability (Grimm, 2010; Marlow & Crowne, 1961). For example, if people want to be seen as socially desirable (i.e., caring of the environment), they may be more

likely to contribute in a hypothetical scenario; yet, these individuals may not readily do so when their actual money is involved, as monetary self-interest could theoretically outweigh social desirability. However, we see no reason why any effect of social desirability would differ systematically across conditions, and thus concerns about social desirability do not undermine our findings. Even though the average actualized donation rate may be lower than in our experiments, it is unlikely that social desirability can explain our between-condition differences. We submit that to the extent enough people contribute to a carbon offset, using a culturally relevant frame found to be effective in our research is likely to elicit more donations than a control frame. We hope to test these possibilities with actual donations in the future in order to offer empirical answers.

Perhaps the greatest value of this exploratory approach is the many directions for future research it generates. Future, pre-registered investigations should test confirmatory hypotheses arising from the current work (i.e., in pre-registered experiments). Most importantly, future research needs to assess whether our findings generalize to actual carbon offset or donation contributions using real money (e.g., using A–B testing in the field). Although we did not find statistically significant effects for a number of frames, it is possible these frames might only be relevant under particular circumstances. Specifically, the choice frame in the US and the economic growth frame in India might tap people's general values or concerns, and thus increased contributions overall, but the sanctity, moral responsibility, and social change frames might only be relevant in specific circumstances (e.g., in which people feel impure). Future research can test these ideas by manipulating situational variables (e.g., moralizing environmental action) and then assessing the effectiveness of the relevant frames. Similarly, it may be important to tie the message of social change to prominent figures or events around taking environmental action to yield a result.

The present research could have implications for organizations that wish to spur the adoption of environmental solutions. Our research highlights that it is essential to take cultural context into consideration. Changing a few words and sentences to convert generic appeals into culturally-relevant frames has nearly zero cost, yet may be effective at motivating environmental action across the airline industry. Of course, follow-up confirmatory work is needed to back these preliminary findings, and research partnerships with organizations in this industry would present the best approach for this future research. Regardless, this present research demonstrates that small changes, informed by psychological science, can have the potential to have meaningful environmental impact.

These results expand the psychological science of decision framing by accounting for sociocultural context. The present research is the first to document that culturally-relevant values can be invoked to motivate hypothetical societally beneficial behavior, specifically, individual environmental action. Finally, the present research provides preliminary evidence that it is possible to engage individual consumers in offsetting the environmental consequences of their behaviors. If these hypothetical behavioral differences translate into actual purchasing behavior, it is possible that culturally-relevant frames have the potential to contribute to the reduction of carbon emissions worldwide.

Acknowledgments

We thank Sylvia Chin, Dayana Bulchand, Yu Ding, Kunalan Manokara, and Li Shi Tan for invaluable research assistance.

Contributions

All authors designed research; EH, KS, and AR performed research. EH and KS analyzed data. All authors wrote the paper.

Data Accessibility Statement

All data and analysis code are available at https://osf.io/gqtvf/.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This research was supported by a Nanyang Assistant Professorship grant awarded by Nanyang Technological University to KS, an Aditya Birla India Center, London Business School, grant awarded to AR, and the Environmental Defense Fund.

ORCID iDs

Ee Hwee Lau https://orcid.org/0000-0002-1297-3892

Aneeta Rattan https://orcid.org/0000-0001-9007-5599

Rainer Romero-Canyas https://orcid.org/0000-0002-8995-3654

Krishna Savani https://orcid.org/0000-0002-6934-1917

Supplemental Material

Supplemental material for this article is available online.

Notes

1. These additional measures were included in Experiment 1: decision to opt-in to mailing list, current feelings, cost of flight, feelings about contribution (if decided to contribute), attitudes toward airline, and attention check.
2. These included questions about whether participants wanted to join the mailing list ("1 = Yes", "0 = No"), participants' emotions (i.e., "How much do you feel happy/excited/calm/sad/nervous/angry right now?" ["1 = Not at all" to "6 = A lot"]), the estimated cost of the flight (open-ended), participants' attitude toward the airline (i.e., "How do you feel about this airline?" ["1 = Very negative" to "7 = Very positive"], "How favorable is your impression of this airline?", "To what extent do you think this airline represents a good company?", "How much do you think this airline is truly committed to improving the environment?" ["1 = Not at all" to "7 = Extremely"]), and how they think about greenhouse gas emissions (e.g., "What do you think about a cap on greenhouse gas emissions that harm people or climate?", "What do you think about a price (fee/tax) on greenhouse gas emissions that harm people or climate?" ["1 = Completely oppose it" to "6 = Completely accept it."]).
3. Results with non-robust standard errors in the Results.docx file available on https://osf.io/gqtvf/. To calculate these values, we took 926 million flights in the US multiplied by 2.5% (i.e., the lower bound of the confidence interval of the choice condition in the US, see Table 4, row 4, converted into a percentage), 4.5% (i.e., the point estimate of the coefficient), and 6.6% (i.e., the upper bound of the confidence interval). We then multiplied this number by $5, the carbon offset amount in our experiment, to derive the total carbon offset contributions. We used the same procedure for India but multiplied by Rs. 99 (approximately $1.50), the smallest possible carbon offset contribution in our experiment.

References

Bain, P. G., Hornsey, M. J., Bongiorno, R., Kashima, Y., & Crimston, C. R. (2013). Collective futures: How projections about the future of society are related to actions and attitudes supporting social change. *Personality and Social Psychology Bulletin*, *39*(4), 523–539.

Banerjee, S., Gulas, C. S., & Iyer, E. (1995). Shades of green: A multidimensional analysis of environmental advertising. *Journal of Advertising*, *24*(2), 21–31. https://doi.org/10.1080/00913367.1995.10673473

Baumeister, R. F., & Leary, M. R. (1995). The need to belong: Desire for interpersonal attachments as a fundamental human motivation. *Psychological Bulletin*, *117*(3), 497–529. https://doi.org/10.1037/0033-2909.117.3.497

Braver, S. L., Thoemmes, F. J., & Rosenthal, R. (2014). Continuously cumulating meta-analysis and replicability. *Perspectives on Psychological Science*, *9*(3), 333–342. https://doi.org/10.1177/1745691614529796

Campbell, T. H., & Kay, A. C. (2014). Solution aversion: On the relation between ideology and motivated disbelief. *Journal of Personality and Social Psychology*, *107*(5), 809–824.

Campos, P. (2016). A market based measure for international aviation: Need, design, and legal Form. *Carbon & Climate Law Review*, *10*(2), 93–96.

Cordova, D. I., & Lepper, M. R. (1996). Intrinsic motivation and the process of learning: Beneficial effects of contextualization, personalization, and choice. *Journal of Educational Psychology*, *88*(4), 715–730. https://doi.org/10.1037//0022-0663.88.4.715

Cumming, G. (2014). The new statistics: Why and how. *Psychological Science*, *25*(1), 7–29.

Day, M., Fiske, S., Downing, E. L., & Trail, T. E. (2014). Shifting liberal and conservative attitudes using moral foundations theory. *Personality and Social Psychology Bulletin*, *40*(12), 1559–1573.

de Neve, J. E., Ward, G., de Keulenaer, F., van Landeghem, B., Kavetsos, G., & Norton, M. I. (2018). The asymmetric experience of positive and negative economic growth: Global evidence using subjective well-being data. *Review of Economics and Statistics*, *100*(2), 362–375. https://doi.org/10.1162/rest_a_00697

Eom, K., Kim, H. S., & Sherman, D. K. (2018). Social class, control, and action: Socioeconomic status differences in antecedents of support for pro-environmental action. *Journal of Experimental Social Psychology*, *77*, 60–75. https://doi.org/10.1016/j.jesp.2018.03.009

Eom, K., Kim, H. S., Sherman, D. K., & Ishii, K. (2016). Cultural variability in the link between environmental concern and support for environmental action. *Psychological Science*, *27*(10), 1331–1339. https://doi.org/10.1177/0956797616660078

Eom, K., Papadakis, V., Sherman, D. K., & Kim, H. S. (2019). The psychology of proenvironmental support: In search of global solutions for a global problem. *Current Directions in Psychological Science*, *28*(5), 490–495. https://doi.org/10.1177/0963721419854099

Feinberg, M., & Willer, R. (2013). The moral roots of environmental attitudes. *Psychological Science*, *24*(1), 56–62.

Goldstein, N. J., Cialdini, R. B., & Griskevicius, V. (2008). A Room with a viewpoint: Using social norms to motivate environmental conservation in hotels. *Journal of Consumer Research*, *35*(3), 472–482. https://doi.org/10.1086/586910

Gomila, R. (2021). Logistic or linear? Estimating causal effects of experimental treatments on binary outcomes using regression analysis. *Journal of Experimental Psychology: General*, *150*(4), 700–709. https://doi.org/10.1037/xge0000920

Graham, J., Haidt, J., & Nosek, B. A. (2009). Liberals and conservatives rely on different sets of moral foundations. *Journal of Personality and Social Psychology*, *96*(5), 1029–1046.

Greenfield, K. (2011). *The myth of choice: Personal responsibility in a world of limits*. Yale University Press. https://doi.org/10.5860/choice.49-4138

Grimm, P. (2010). Social desirability bias. In J. N. Sheth & N. K. Malhotra (Eds.), *Wiley International Encyclopedia of Marketing* (p. 258). Wiley-Blackwell. https://doi.org/10.1002/9781444316568.wiem02057

Hahn, R., & Richards, K. (2013). Understanding the effectiveness of environmental offset policies. *Journal of Regulatory Economics*, *44*, 103–119.

Haidt, J., Graham, J., & Joseph, C. (2009). Above and below left-right: Ideological narratives and moral foundations. *Psychological Inquiry*, *20*(2–3), 110–119.

Hanson, J., & Hanson, K. (2006). The blame frame: Justifying (racial) injustice in America. *Harvard Civil Rights-Civil Liberties Law Review*, *41*(2), 413–480.

Hardisty, D., Beal, A., Lubowski, R., Petsonk, A., & Romero-Canyas, R. (2017). A carbon price by another name may seem sweeter: Consumers prefer upstream offsets to equivalent downstream taxes. *Association for Consumer Research*, *45*, 654. http://www.acrwebsite.org/volumes/v45/acr_vol45_1025013.pdf

Hejmadi, A., Rozin, P., & Siegal, M. (2004). Once in contact always in contact: Contagious essence and conceptions of purification in American and Hindu Indian children. *Developmental Psychology*, *40*, 467–476.

International Civil Aviation Organization. (2016). *ICAO environmental report 2016 (2016 environment report)*. Author. https://www.icao.int/environmental-protection/pages/env2016.aspx

Lepper, M. R., & Malone, T. W. (1987). Intrinsic motivation and instructional effectiveness in computer-based education. In R. E. Snow & M. J. Farr (Eds.) *Aptitude, learning and instruction* (Vol. *3*, pp. 255–286). Taylor & Francis Group.

Maner, J. K. (2014). Let's put our money where our mouth is: If authors are to change their ways reviewers (and editors) must change with them. *Perspectives on Psychological Science*, *9*(3), 343–351.

Markus, H. R., & Kitayama, S. (1991). Culture and the self: Implications for cognition, emotion and motivation. *Psychological Review*, *98*(2), 224–253.

Markus, H. R., & Kitayama, S. (2003). Culture, self and the reality of the social. *Psychological Inquiry*, *14*(3–4), 277–283.

Marlow, D., & Crowne, D. P. (1961). Social desirability and response to perceived situational demands. *Journal of Consulting Psychology*, *25*(2), 109–115.

Morren, M., & Grinstein, A. (2021). The cross-cultural challenges of integrating personal norms into the theory of planned behavior: A meta-analytic structural equation modeling (MASEM) approach. *Journal of Environmental Psychology*, *75*, 101593.

Organization for Economic Co-operation and Development. (2015). *Climate change mitigation: Policies and progress* [October 2015 report]. Author. https://dx.doi.org/10.1787/9789264238787-en

Patall, E. A., Cooper, H., & Robinson, J. C. (2008). The effects of choice on intrinsic motivation and related outcomes: A meta-analysis of research findings. *Psychological Bulletin*, *134*(2), 270–300.

Petsonk, A. (2020, June 9). *CORSIA: 5 reasons why the ICAO Council shouldn't move now to rewrite the rules of its aviation climate program*. Environmental Defense Fund. http://blogs.edf.org/climate411/2020/06/09/corsia-5-reasons-why-the-icao-council-shouldnt-move-now-to-rewrite-the-rules-of-its-aviation-climate-program/

Quinn, D. M., & Crocker, J. (1999). When ideology hurts: Effects of belief in the protestant ethic and feeling overweight on the psychological well-being of women. *Journal of Personality and Social Psychology*, *77*(2), 402–414.

Rattan, A., & Ambady, N. (2014). How "it gets better" effectively communicating support to targets of prejudice. *Personality and Social Psychology Bulletin*, *40*(5), 555–566.

Raudenbush, S. W., & Bryk, A. S. (2002). *Hierarchical linear models: Applications and data analysis methods*. SAGE.

Rodriguez, S., Romero-Canyas, R., Downey, G., Mangels, J. A., & Higgins, E. T. (2013). When school fits me: How fit between self-beliefs and task benefits boosts math motivation and performance. *Basic and Applied Social Psychology*, *35*(5), 445–466.

Ryan, R. M., & Deci, E. L. (2000). Intrinsic and extrinsic motivations: Classic definitions and new directions. *Contemporary Educational Psychology*, *25*(1), 54–67.

Savani, K., Cho, J., Baik, S., & Morris, M. W. (2015). *Culture and judgment and decision making*. In G. Keren & G. Wu (Eds.), *The Wiley Blackwell handbook of judgment and decision-making* (pp. 456–477). John Wiley.

Schimmack, U. (2012). The ironic effect of significant results on the credibility of multiple-study articles. *Psychological Methods*, *17*(4), 551–566.

Schultz, P. W., Gouveia, V. V., Cameron, L. D., Tankha, G., Schmuck, P., & Frank, M. (2005). Values and their relationship to environmental concern and conservation behavior. *Journal of Cross-Cultural Psychology*, *36*(4), 457–475.

Schultz, P. W., & Zelezny, L. (2003). Reframing environmental messages to be congruent with American values. *Human Ecology Review*, *10*(2), 126–136.

Shnabel, N., & Nadler, A. (2008). A needs-based model of reconciliation: Satisfying the differential emotional needs of victim and perpetrator as a key to promoting reconciliation. *Journal of Personality and Social Psychology*, *94*(1), 116–132.

Shnabel, N., Nadler, A., Ullrich, J., Dovidio, J. F., & Carmi, D. (2009). Promoting reconciliation through the satisfaction of the emotional needs of victimized and perpetrating group members: The needs-based model of reconciliation. *Personality and Social Psychology Bulletin*, *35*(8), 1021–1030.

Shweder, R., Much, N., Mahapatra, M., & Park, L. (1997). The "big three" of morality (autonomy, community, and divinity), and the "big three" explanations of suffering. In A. Brandt & P. Rozin (Eds.), *Morality and Health* (pp. 119–169). Routledge.

Snibbe, A. C., & Markus, H. R. (2005). You can't always get what you want: Educational attainment, agency, and choice. *Journal of Personality and Social Psychology*, *88*(4), 703–720.

Stanley, D. J., & Spence, J. R. (2014). Expectations for replications: Are yours realistic? *Perspectives on Psychological Science*, *9*(3), 305–318.

Summers, N., & VanHeuvelen, T. (2017). Heterogeneity in the relationship between country-level affluence and environmental concern. *Social Forces*, *96*(1), 329–360.

Tripathi, R., Cervone, D., & Savani, K. (2018). Are the motivational effects of autonomy-supportive conditions universal? Contrasting results among Indians and Americans. *Personality and Social Psychology Bulletin*, *44*(9), 1287–1301.

Tuk, M. A., Zhang, K., & Sweldens, S. (2015). The propagation of self-control: Self-control in one domain simultaneously improves self-control in other domains. *Journal of Experimental Psychology: General*, *144*(3), 639–654.

Tversky, A., & Kahneman, D. (1981). The framing of decisions and the psychology of choice. *Science*, *211*(4481), 453–458.

Tversky A., & Kahneman D. (Eds.). (2000). *Choices, values, and frames*. Cambridge University Press.

UN Climate Change Conference. (2021, October 31). *COP26 goals*. Author. https://ukcop26.org/cop26-goals/

UN Environment Programme. (2020, December 9). *Emissions gap report 2020*. Author. https://www.unep.org/emissions-gap-report-2020

Wolsko, C., Ariceaga, H., & Seiden, J. (2016). Red, white, and blue enough to be green: Effects of moral framing on climate change attitudes and conservation behaviors. *Journal of Experimental Social Psychology*, *65*, 7–19.

World Bank. (2021). *Air transport, passengers carried* [Data file]. World Development Indicators. https://data.worldbank.org/indicator/IS.AIR.PSGR

Yates, J. F., & de Oliveira, S. (2016). Culture and decision making. *Organizational Behavior and Human Decision Processes*, *136*, 106–118.