Putting the "I" in environmentalist: Explicit (but not implicit) identity predicts pro-environmental action

Cameron Brick[1*] & Calvin K. Lai[2]

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[1] Department of Psychology, University of Cambridge, Cambridgeshire, United Kingdom

[2] Department of Psychological & Brain Sciences, Washington University in St. Louis, Missouri, United States

* Corresponding author: brickc@gmail.com, DPMMS, Wilberforce Rd, Cambridge, CB3 0WA, United Kingdom

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Abstract

Awareness of environmental problems increased dramatically over recent decades, but individual action to address environmental problems has not increase commensurately. This stagnation may be the result of shifts in how people identify with social groups. Identification with environmentalists declined from 78% in 1991 to 42% in 2016 in the United States. In four pre-registered studies (total $N = 2033$), we explored the potential consequences of this decline by examining the correlates of *environmentalist identity*. We also tested the possibility that aspects of environmentalist identity may be less deliberate or conscious by using a novel implicit measure of environmentalist identity. We tested the predictive validity of explicit and implicit environmentalist identity on a wide range of self-reported environmental behaviors and policy preferences. Meta-analytic estimates reveal that explicit environmentalist identity is moderately associated with implicit identity ($r = .24$) and explicit identity strongly and uniquely predicts pro-environmental behaviors and policy preferences (partial rs = .58, .62). In contrast, implicit identity is not a unique predictor of behaviors and policy preferences (partial rs = .05, .05). Our findings highlight the importance of environmentalist identity for conservation efforts and reveal novel dispositional and situational predictors of environmentalist identity.

1. Introduction

Raising awareness about environmental problems and solutions is a popular approach for trying to increase pro-environmental action. Over the past decade, print messaging has exploded about the evidence for human-caused climate change (Google Ngram Viewer, 2017), and concern about climate change and environmental damage increased globally (Gallup, 2016; National Geographic, 2014). The U.S. National Science Foundation budgeted $20m in 2010-11 alone for education programs about climate change. Unfortunately, raising awareness about environmental issues has not been sufficient in changing conservation behaviors and political actions. Greenhouse gas emissions are rising, new environmental regulations are rare, and individual conservation behaviors remain stagnant (Gardner & Stern, 2008). This may be because beliefs are only loosely related to behaviors (Fishbein & Ajzen, 2011). Support for environmental action is only weakly predicted by beliefs about the environment across 47 countries (Eom, Kim, Sherman, & Ishii, 2016).

Evidence from other fields also demonstrates that awareness of problems is insufficient for behavior change. Among diabetes patients, knowledge about diabetes is not predictive of diabetes-related health outcomes (Sánchez et al., 2005). The National Youth Anti-Drug Media Campaign, a billion-dollar media campaign designed to increase awareness about the dangers of drug use, failed to reduce drug use and may have unwittingly increased it (Hornik, Jacobsohn, Orwin, Piesse, & Kalton, 2008). Even showing calorie counts of food items on restaurant menus fails to reduce calorie consumption (Sinclair, Cooper, & Mansfield, 2014).

Similarly, knowledge of climate change does not preclude a large carbon footprint. As awareness of environmental issues is only weakly linked to behavior (for discussion, see Gifford, 2014), it would be valuable to study the individual differences that most strongly predict pro-

environmental behavior such as biospheric values (Steg, Bolderdijk, Keizer, & Perlaviciute, 2014) and openness to new experiences (Brick & Lewis, 2016). However, it has proven difficult to craft interventions targeting values or personality traits, in part because it is difficult to modify these factors (Manfredo et al., 2017). A more promising basis for experimental research and future interventions might be found in how people identify with environmentally relevant groups.

1.1 Environmentalism. Party identity and political orientation predict pro-environmental behavior and policy support (e.g., Gromet, Kunreuther, & Larrick, 2013), perhaps due to increasing political polarization in the U.S. Previous identity research mostly examined identification with the environment as opposed to with a social group. Groups linked with pro-environmental behavior include the Green Party, vegetarians, and Whites (Pearson & Schuldt, 2014). Groups associated with anti-environmental behavior include coal miners or capitalists. However, the social group that is most conceptually consistent with pro-environmental behavior is *environmentalists*, whose defining feature is a desire for healthy ecosystems.

Identification with environmentalists has changed dramatically in the last three decades. In 1991, a strong majority of U.S. residents (78%) identified as environmentalists. By 2016, it fell to 42%. This decline accompanied the emergence of a partisan divide in environmentalist identity. Democrats and Republicans were equally likely to consider themselves as environmentalists in 1991, but by 2016 Democrats were twice as likely as Republicans to consider themselves environmentalists (56% vs. 27%; Gallup, 2016). One possible account for these declines is a change in what 'environmentalist' means (Pearson & Schuldt, 2018). For example, public information campaigns and the deliberate politicization of environmental topics for political and financial gain (Dunlap & McCright, 2010) may have binded environmentalist

identity with left-wing politics. Recent studies suggest environmentalists in the U.S. are now seen as radical political activists (e.g., "militant", "unclean"; Bashir, Lockwood, Chasteen, Nadolny, & Noyes, 2013) and even a threat to society (Hoffarth & Hodson, 2016). To the extent that environmentalism now signifies negative qualities such radicalism or as valuing animals over humans, individuals are likely to distance themselves from environmentalists.

The decline of environmentalist identity may pose a problem for the conservation movement. Individuals who think positively of environmentalists (Ratliff, Howell, & Redford, 2017) or who think of themselves as "environmentally-friendly consumers" (Kashima, Paladino, & Margetts, 2014; Whitmarsh & O'Neill, 2010) report engaging in more pro-environmental behavior. However, the core component of how identities drive pro-environmental behavior have not yet been studied. Past studies used less pure measures that also included liking or disliking of environmentalists and identification with environmental issues and behaviors (Whitmarsh & O'Neill, 2010). These concepts are distinct from how much an individual feels part of the social group environmental*ists*, and because of the power of social influence it would be valuable to test how social identification predicts pro-environmental concern and behaviors. Early evidence suggests that a group-focused measure of environmentalist identity is a stronger predictor of self-reported pro-environmental behaviors than even U.S. political orientation (Brick, Sherman, & Kim, 2017). The current studies replicate and extend that finding with pre-registered studies that include multiple operationalizations of identity, behavior, and political preferences.

1.2 Social identity. Social identities drive behavior across diverse contexts (Brewer, 2003, pp. 480-491; Dunning, 1999; Ellemers, Spears, & Doosje, 2002), including pro-environmental behaviors (Fielding & Hornsey, 2016). Fortunately, social desirability does not

appear to affect self-reported pro-environmental behavior ratings (Milfont, 2008). Identifying with a group could lead to pro-environmental behavior through at least four routes:

1. Social identities provide guidance on how to act when individuals lack information or are ambivalent (informational social influence; Brewer, 2003).
2. Social identities motivate behavior through the desire to act consistently with group goals (normative social influence; Cialdini, 2003); cf. identity-based motivation framework, (Oyserman, Fryberg, & Yoder, 2007). Acting consistently with group goals may provide social benefits such as compliments or inclusion, whereas acting at odds with group goals may provide social costs such as criticism or censure. Social identity can also be primed in certain situations to promote desirable behaviors. For example, priming environmental values only leads to more pro-environmental behavior when those values are seen as central to the self (Verplanken & Holland, 2002). Which identity is currently influencing behavior depends on both fit and accessibility (Fielding & Hornsey, 2016; Oakes, Turner, & Haslam, 1991).
3. Environmental issues such as conservation are well-characterized as commons dilemmas (Van Lange, Joireman, Parks, & Van Dijk, 2013), and interventions that lead to cooperation over limited resources are therefore well-suited to environmental issues. Notably, social identity interventions lead to greater cooperation over limited resources (van Vugt, 2009).
4. Identities can promote consistency and interdependence between pro-environmental behaviors (behavioral spillover; Kashima et al., 2014; Truelove, Carrico, Weber, Raimi, & Vandenbergh, 2014; Walker & Thomas, 2014). For example, an environmentalist who agrees to install solar panels might then feel motivated to also

buy a more efficient toilet. Behavioral spillover is important for conservation because most individuals are ignorant about which behaviors are most important (e.g., on climate change, Gardner & Stern, 2008; on water use, Attari, 2014), and because changes in a network of behaviors are necessary for sufficient conservation to address massive problems like climate change.

These four routes for identity-based behavior change led to a burst of research connecting social identities with pro-environmental outcomes (e.g., Brick et al., 2017; Fielding & Hornsey, 2016; Kashima et al., 2014; Whitmarsh & O'Neill, 2010). However, previous research has not investigated the limitations of self-reported identity to see whether individuals are sometimes unable or unwilling to report their level of identification.

1.3 Explicit and implicit measures of environmentalist identity. Explicit self-reported measures of identity capture peoples' conscious theories of what groups they belong to. These personal theories may be at odds with their identity as revealed by other means. As identification with environmentalists is now a strong signal of other political affiliations (e.g., being a Democrat or Republican), people may be *unwilling* or *unable* to report the full extent of their identification with environmentalists (Milfont, 2008). For example, people on a college campus may claim to be environmentalists to signal that they are liberal, even when it contradicts their private commitments (i.e., externally motivated environmentalists). Similarly, people in a town with a large oil industry may publicly disavow environmentalists even when this contradicts their private identities (i.e., hidden environmentalists, cf. Gal, 2015).

To assess aspects of people's thoughts that they do not report, we used measures of implicit identity that can be used to tap into mental associations that lay outside of conscious awareness or control. The implicit measure in the current studies is the Single-Target Implicit

Association Test (ST-IAT), which measures the speed at which people sort words into categories to assess the degree to which concepts are associated together in memory (Bluemke & Friese, 2008). Implicit measures have been fruitful for predicting a wide range of behavior (Cameron, Brown-Iannuzzi, & Payne, 2012; Greenwald, Poehlman, Uhlmann, & Banaji, 2009). For example, implicit identification with math predicts whether people choose to major in math-intensive majors (Nosek, Banaji, & Greenwald, 2002), implicit shyness predicts spontaneous shy behavior (Asendorpf, Banse, & Mücke, 2002), and implicit Democrat/Republican identity predicts support for partisan welfare policies among self-described political independents (Hawkins & Nosek, 2012). Implicit measures of liking and disliking have also been used to understand environmental topics such as implicit attitudes toward nature (Schultz, Shriver, Tabanico, & Khazian, 2004), implicit biospheric values (Walker & Thomas, 2014), and implicit attitudes toward environmentally friendly groceries (De Houwer & De Bruycker, 2007; Panzone, Hilton, Sale, & Cohen, 2016).

1.4 Study overview. We argue that how much individuals behave pro-environmentally depends on social influence. Four pre-registered online studies investigated explicit and implicit environmentalist identity and their relation to self-reported pro-environmental behavior and policy preferences. The identity measures were consistent across the studies, and the outcome measures were deliberately varied to test for direct and conceptual replication. These studies reveal what aspects of social identity are associated with pro-environmental behaviors and political support.

2. Methods

We pre-registered each of the four studies and report all samples, conditions, measures, data exclusions, and how we determined sample sizes. The data, cleaning and analysis code, and

text of all measures are freely available (https://osf.io/84g5v/?view_only=8676cca974834239b6bc0043ab08ac20). Analytic decisions are flagged below when they are extensions of pre-registration or not pre-registered. The similarities and differences between the four studies are described below.

2.1. Participants and design. Participants in all four studies were volunteers at the research website Project Implicit (https://implicit.harvard.edu) and all were U.S. citizens or residents 18 or older ($N = 2033$). In each study, participants completed four key measures: explicit and implicit measures of environmentalist identity, and pro-environmental behaviors and policy preferences. Participants who completed all four measures were $n = 1675$, slightly liberal on average, M (SD) = 4.97 (1.71) from 1 (*conservative*) to 7 (*liberal*), 65.1% female, and median age = 33 years (39 excluding Study 3a). The participants in Study 3a were exclusively 18 years old, which provided the opportunity for a high-powered replication among a demographic more similar to a typical undergraduate student sample. Study 3a's results did not substantively differ from the other three studies, so we do not discuss this difference further.

2.2. Key measures. ***Explicit environmentalist identity (all studies).*** To measure whether individuals saw themselves as environmentalists, we used a four-item identity scale across all studies: "I see myself as pro-environmentalist"; "I am pleased to be pro-environmentalist"; "I feel strong ties with pro-environmentalist people"; and "I identify with pro-environmentalist people" (Brick et al., 2017; Smith, Seger, & Mackie, 2007), rated from 1 (*disagree strongly*) to 7 (*agree strongly*). The four items were combined into a composite, and Cronbach's alphas were .91-.93 for all studies. Two other single-item explicit identity measures, inclusion of environmentalists in self and inclusion of nature in self, were assessed in Study 2 (Schultz, 2002). In our main

analyses, we present the four-item measure because it was more reliable, explained more variance in preferences and behaviors, and was measured in all four studies.[1]

Implicit environmentalist identity. For a measure of identity that bypasses self-report, we used the Single-Target Implicit Association Test (ST-IAT; Bluemke & Friese, 2008), which measures associations between a single concept and its attributes (e.g., identification with environmentalists). In the current studies, the ST-IAT measured associations between the concepts 'Environmentalist' with 'Self' and 'Other'.

This ST-IAT consisted of five blocks (20 trials in the first block, 48 trials in other blocks). Participants in the first block sorted words belonging to one of two categories (Self and Other) by pressing either "E" (for Other) or "I" for (for Self). In the second and third blocks, participants sorted words belonging to one of three categories (Self, Other, and Environmentalist) by pressing either "E" (for Other) or "I" for (for Self or Environmentalist). In the fourth and fifth blocks, participants did the same except Environmentalist words were also categorized with Other-related words instead of Self-related words. The stimuli presented in the first block were divided equally between the two categories, whereas the other blocks were presented with 14 trials each for the paired stimuli and 20 trials the stimuli that were not paired with another category.[2]

The ST-IAT was scored using the *D2* algorithm (Greenwald, Nosek, & Banaji, 2003), which indexed how quickly participants categorized words when 'Environmentalist' was paired

[1] Complementary analyses using the single-item measures found consistent yet smaller effects than the four-item measure, likely in part because of higher measurement error.

[2] To test for order effects, in Studies 1 & 2 participants were randomly assigned to the ST-IAT as above or in a flipped order where Other/Environmentalist vs. Self were Blocks 2 and 3 and Other vs. Self/Environmentalist were Blocks 4 and 5 (Greenwald, McGhee, & Schwartz, 1998). Self-Environmentalist block first yielded higher implicit identity, $F(1,945) = 76.5$, $p < .0001$. However, entering order with explicit and implicit identity into two regressions predicting behavior and then policy preferences, with or without the 2- and 3-way interactions, yielded no main nor interaction effects of order, all ps $\geq .29$, so order does not account for the main findings.

with 'Self' compared to when 'Environmentalist' was paired with 'Other'. The stimuli for 'Self' were: Mine, Myself, I, My. The stimuli for 'Other' were They, Their, Them, Theirs, Other. A pilot test of 130 Amazon MTurk participants helped generate synonyms for the word 'Environmentalist' and also rated the overlap between environmentalists and terms chosen by the researchers in advance. The resulting stimuli were chosen because of high agreement between raters for representing Environmentalists while not implying other demographics, e.g., gender: Environmentalist, Conservationist, Preservationist, Tree-Hugger.

We tested slight variations on the procedure in each study. In Study 1, the ST-IAT alternated between congruent and incongruent blocks instead of going in sequential order (i.e., congruent blocks first, then incongruent blocks second or vice versa). In Study 2, the critical blocks were in sequential order but were doubled in length to 96 trials. Finally, Studies 3a and 3b used the standard ST-IAT described above. These changes were not pre-registered yet did not affect the pattern of results. Cronbach's alphas were ≥ .96 for all studies.

Pro-environmental behavior. To test a behavioral outcome of environmentalist identity, participants completed multiple scales reporting the frequency of pro-environmental behaviors. Different scales were used to test for convergent validity of the relationships with explicit and implicit identity. In Study 1, participants reported six behaviors from the Recurring Environmental Behavior Scale including water conservation, reusable bag use, and discussing environmental topics (Brick et al., 2017), Cronbach's alpha = .84. In Study 2, participants reported five difficult civic and pro-environmental behaviors from the Environmental Action Scale (Alisat & Riemer, 2015), including volunteering for an environmental organization and participating in a community event focused on environmental awareness, Cronbach's alpha = .86. In Studies 3a and 3b, participants completed all 21 items of the Recurring Environmental

Behavior Scale (Brick et al., 2017), spanning individual conservation actions and also educating oneself and talking with others about environmental topics, Cronbach's alphas 3a = .79, 3b = .84. These scales were measured from 1 (*never*), 3 (*sometimes*), to 5 (*always*), and assessed the frequency of different kinds of pro-environmental behaviors (cf. Stern, 2000). See Supplement for item text.

Environmental policy opinion. To test how environmentalist identity relates to policy opinions, participants reported their policy preferences about environmental issues from 1 (*disagree strongly*) to 7 (*agree strongly*) in all studies. Study 1 had two items assessing opinions about specific issues: "The United States should implement cap-and-trade or a carbon tax to reduce greenhouse gas emissions" and "The United States should approve the Keystone XL pipeline that would carry crude oil from the Alberta tar sands" [reverse-scored]. These items were combined into a composite, $r(538) = -.42$, $p < .0001$ (see Supplement for analyses with these items as separate predictors that show the same result).

Study 2 contained three policy items assessing broader preferences: "The United States should create more laws to reduce global warming", "The United States should create a carbon pollution tax in order to reduce global warming," and "The United States should support international efforts to reduce global warming." These items were combined into a composite, Cronbach's alpha = .90.

Study 2's policy measure yielded restricted range at the high end, so in Studies 3a & 3b we introduced a trade-off between environmental and economic concerns in the policy opinion measure: "The United States should create more laws to reduce global warming, even if those laws cost American jobs," "The United States should create a carbon pollution tax in order to reduce global warming, even if the tax reduces the ability of American businesses to compete

globally," and "The United States should support international efforts to reduce global warming, even if other countries like China don't participate."

In Studies 3a and 3b, we also measured opinions about a novel environmental issue to allow for more reactionary responses less informed by explicit memories of personal commitments, e.g., stances on familiar issues like climate change. A mock article was created to appear to be from the Los Angeles Times titled "Controversy over commercial development in East Rock". The 260-word article described a legal challenge to a commercial development in the desert based on an inadequate environmental review (see Supplement for text). Participants responded to two items from 1 (*not at all*) to 7 (*extremely*): "How much do you support stopping construction for the next three weeks for the independent environmental review?" and "How much do you support allowing construction on the East Rock business development to continue without further review?" [reverse-scored]. To achieve the greatest construct coverage, all five policy items were combined into a composite, Cronbach's alphas 3a = .83, 3b = .88 (see Supplement for exploratory analyses that separate out the novel policy items and find parallel results).

2.3 Predictors of environmentalist identity. We also investigated predictors of environmentalist identity. Mapping these predictors could establish convergent and divergent validity for the identity measures, provide insight into their origins and causes, and inform interventions for increasing environmentalist identity (Clayton & Opotow, 2003). In particular, childhood exposure to nature may foster pro-environmental values and environmentalist identity (Brügger, Kaiser, & Roczen, 2011; Hinds & Sparks, 2008; Matsuba & Pratt, 2013). We measured childhood museum and camp experiences (Study 2), contact with household pets during childhood (Study 2), and current rural location (Studies 2, 3a, & 3b). We further assessed

individual differences in personality and motivation that could relate differently to explicit and implicit identity: dispositional awe (Shiota, Keltner, & John, 2006; Studies 3a and 3b), internal and external motivation to appear pro-environmental (adapted from Plant & Devine, 1998); Studies 3a & 3b), the perceived social status of environmentalists (adapted from Operario, Adler, & Williams, 2004; Studies 3a and 3b), and pro-environmental concern (Stern, Dietz, Abel, Guagnano, & Kalof, 1999; Study 1). Zero-order correlations of these variables with key measures are provided below. See the pre-registered analytic plans for secondary hypotheses and the Supplement for a full description of secondary measures and results.

3. Results

Each study's main pre-registered analyses were the same: testing for the unique contribution of explicit and implicit identity. Given the variance in results across studies, the logical extension of the pre-registration was to pool the effect sizes to reduce error. Therefore, we present the main findings with meta-analysis, and provide separate analyses when a measure was not assessed in all studies. Aggregating across the four studies, participants reported slightly positive mean identification with environmentalists. Implicitly, they were about as fast to respond to pairings of "Self" with "Environmentalist" as they were to respond to pairings of "Other" and "Environmentalist". Most individuals reported engaging in most pro-environmental behaviors "sometimes" as shown by the median of behavior. Support for pro-environmental policy was moderately positive. Descriptives of key variables by study are given in Table 1.

Table 1. *Descriptive statistics of key variables by study.*

Study 1	Range	*n*	*M*	*SD*
Implicit identity	n/a	558	-0.04	0.26
Explicit identity	1-7	545	5.03	1.34
Behavior	1-5	544	2.80	0.77
Policy preferences	1-7	545	5.07	1.41
Study 2				
Implicit identity	n/a	394	-0.08	0.25
Explicit identity	1-7	376	5.03	1.35
Behavior	1-5	374	1.99	1.01
Policy preferences	1-7	375	5.84	1.36
Study 3a				
Implicit identity	n/a	393	-0.09	0.24
Explicit identity	1-7	325	4.54	1.27
Behavior	1-5	321	2.80	0.48
Policy preferences	1-7	303	4.93	1.16
Study 3b				
Implicit identity	n/a	539	-0.04	0.27
Explicit identity	1-7	479	5.25	1.33
Behavior	1-5	473	3.07	0.52
Policy preferences	1-7	455	5.58	1.29

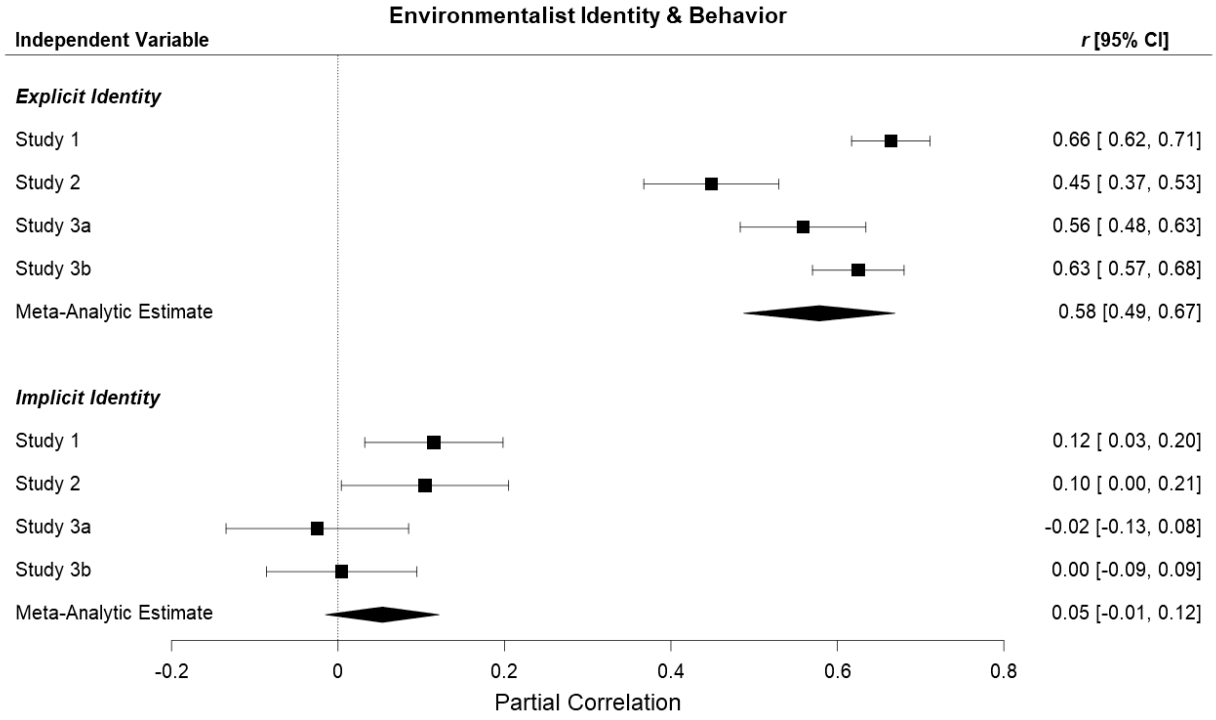
Note: The behavior and policy measures differed between studies: see Methods. Higher scores indicate stronger environmentalist identity, more frequent pro-environmental behavior, and more support for pro-environmental policies.

3.1. Meta-analysis. To test whether implicit and explicit environmentalist identity uniquely predict pro-environmental behavior and policy preferences, we conducted a random-effects meta-analysis of partial correlations using the R package `metafor` (Viechtbauer, 2010). First, pro-environmental behavior was predicted from implicit and explicit identity. Then, policy preferences were predicted from implicit and explicit identity. The partial correlations were Fisher's *z*-transformed for analyses and converted back to Pearson's *r* for interpretation. Partial correlations drop any variance that is shared between predictors of the outcome, and remaining

effects can be interpreted as unique contributions of that predictor similar to a regression coefficient. We also examined the correlation between implicit and explicit identity (see Figure 1 & Table 2).

Figure 1. *Explicit identity is a strong and unique predictor of pro-environmental behavior (1a) and policy preferences (1b), and implicit identity is not a unique predictor, shown with meta-analysis forest plots using random effects.*

1a)



1b)

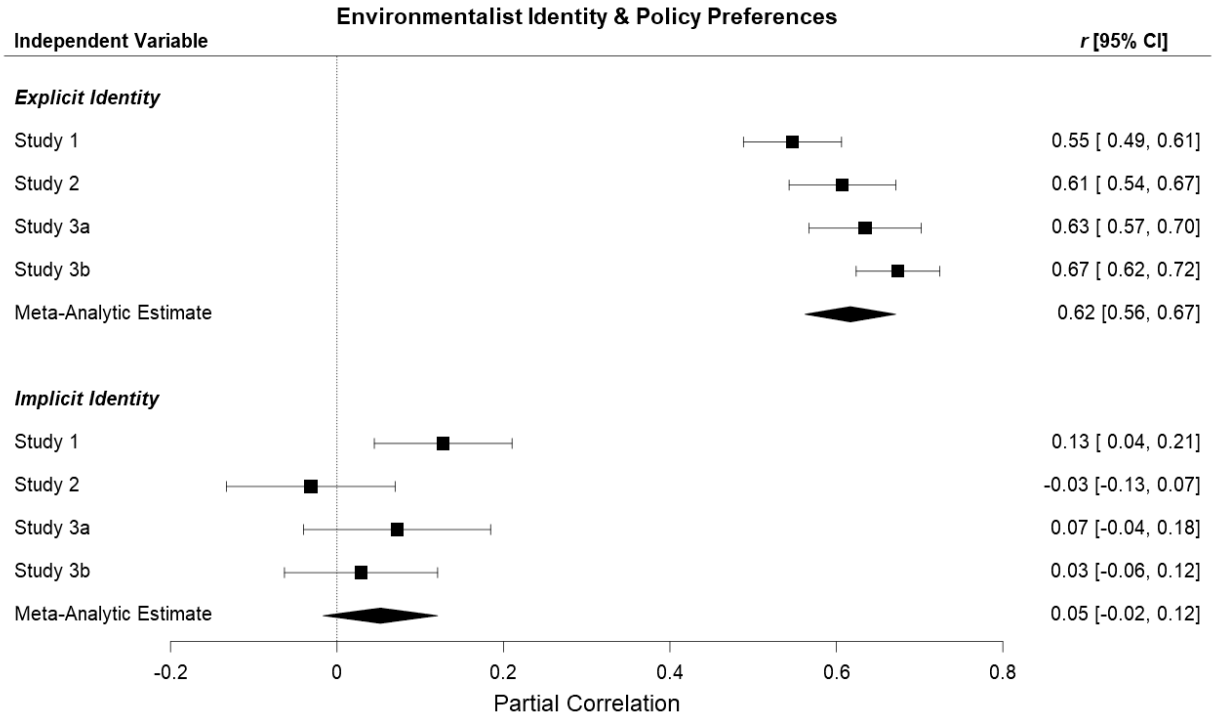


Table 2. *Pooled effect sizes of partial correlations from random effects meta-analysis.*

	n	*r* [95% CI]	*Z*	*p*
Implicit on behavior	1712	.05 [-.02, .12]	1.48	.13
Implicit on policy	1678	.05 [-.02, .12]	1.48	.14
Explicit on behavior	1712	.58 [.49, .67]	12.46	< .00001
Explicit on policy	1678	.62 [.56, .57]	22.17	< .00001
Implicit and explicit	1725	.24 [.20, .29]	10.77	< .00001

Note. Implicit = implicit environmentalist identity, Explicit = explicit environmentalist identity, and partial *r* includes the other identity measure, except for the Pearson's correlation between the two.

Explicit environmentalist identity was highly predictive of self-reported pro-environmental behavior and policy preferences, partial *r*s = .59, .62, *p*s < .00001, suggesting that social identity may be critical for pro-environmental action. In contrast, implicit environmentalist identity did not uniquely predict pro-environmental behavior and policy preferences, partial *r*s =

.05, .05, *p*s = .13, .14. To investigate whether the predictions were improved by accounting for externally motivated environmentalists (high explicit/low implicit) or hidden environmentalists (low explicit/high implicit), we also examined whether implicit and explicit identity interacted to predict behavior and policy preferences (the interaction tests are exploratory; not pre-registered). Behavior and policy preferences were separately regressed onto standardized implicit and explicit identity and their interaction term, again using the R package `metafor` to combine the four studies meta-analytically. There was no evidence for an interaction between implicit and explicit identity, partial *r*s for the interaction predicting behavior, $r = .07$, $p = .33$; predicting policy, $r = .06$, $p = .57$.

We also examined the heterogeneity of the effect sizes across studies (an extension of pre-registration). Three of the effect sizes showed greater variation across the studies than might be expected by chance: explicit on behavior, $Q = 22.3$, $p < .0001$, explicit on policy, $Q = 10.6$, $p = .01$, interaction on behavior, $Q = 30.9$, $p < .0001$, and interaction on policy, $Q = 79.8$, $p < .0001$. Other effects were non-significant, $ps \geq .10$. The differences between estimates may be due to changes between studies in the policy items, behavior items, sample populations, or statistical noise.

3.1.1. Robustness check with structural equation model. Due to measurement unreliability, partial correlations are vulnerable to high false-positive rates when used to establish incremental validity (Westfall & Yarkoni, 2016). To address this issue, we also conducted the incremental validity analyses as structural equation models (SEM) that take into account the measurement variance using the R package `lavaan` (Rosseel, 2012) (logical extension of pre-registration). Individual-level data were aggregated across all four studies for these analyses. The indicators for the explicit identity latent variable were the four explicit identity items used in all

analyses and the indicators for the implicit identity latent variable were *D* scores calculated separately for the first ST-IAT critical blocks and the second ST-IAT critical blocks. The model predicting behavior was a good fit (Schreiber, Nora, Stage, Barlow, & King, 2006) on 1 of 3 fit indexes, SRMR = .027, and a less-than-good fit on the other two indices, CFI = .938, RMSEA = .143. Removing error variance with SEM slightly weakened prediction for explicit identity, β = .49, $p < .001$, and slightly improved behavior prediction for the ST-IAT, β = .10, p = .005. The model predicting policy preferences was also a good fit on 1 of 3 fit indexes, SRMR = .027, and a less-than-good fit on the other two indices, CFI = .940, RMSEA = .143. Removing error variance with SEM did not affect prediction for either explicit identity, β = .62, $p < .001$, or implicit identity, β = .04, p = .14. We also conducted similar SEM models where ST-IAT had three indicators (dividing the trials by thirds instead of halves). The measurement model with three indicators is just-identified, and therefore model misfit can only result from the structural relations between constructs. The pattern of results did not change. Note that the main meta-analysis results use partial correlations, which are similar but not interchangeable with the above βs. Overall, this SEM-based approach strengthens the interpretation suggested by the partial correlation approach: explicit (but not implicit) identity is a strong predictor of pro-environmental behavior and policy preferences.

3.2 Predictors of environmentalist identity (Study 2). Revealing what causes environmental identity might illuminate pathways responsible for its decline and could also inform interventions to increase helpful behaviors. We hypothesized in pre-registration that implicit identity would be positively related to the childhood exposure to nature items: frequency of childhood visiting of museums, attendance of summer camp, lived with a pet, and took care of a pet. However, these experiences were unrelated to implicit identity, all zero-order $|r\text{s}| \leq .09$, ps

> .08. Implicit identity was then regressed onto these four variables simultaneously. None predicted implicit identity, all *p*s ≥ .12, all eta-squared ≤ .01, suggesting that implicit identity is not related to childhood exposure to nature. Exploratory analyses revealed that implicit identity was unrelated to currently living in a rural area, $r(1135) = -.06$, $p = .06$.

Table 3. *Descriptive statistics and and zero-order correlations between explicit and implicit identity with possible predictors (Studies 1-3b,* N*s ≤ 1706 differ by cell; see Table 1).*

	Explicit	Implicit	Pol	Edu	Concern	Camp	Pet	Awe	Status	IMS	EMS
Studies	1-3b	1-3b	1-3b	1-3b	1	2	2	3a-b	3a-b	3a-b	3a-b
M	5.00	-0.06	4.96	7.16	5.66	2.90	12.0	5.40	5.90	5.07	2.94
SD	-1.35	0.26	-1.70	-2.53	-1.13	-2.31	-6.32	0.96	-1.96	-1.22	-1.21
Implicit	.25[c]										
Pol	.49[c]	.19[c]									
Edu	.19[c]	.06[b]	.16[c]								
Concern	.58[c]	.28[c]	.54[c]	-.03							
Camp	.15[b]	.08	.13[c]	.20[c]	n/a						
Pet	.19[c]	.01	.01	.01	n/a	.20[c]					
Awe	.35[c]	.06	.06	.11[b]	n/a	n/a	n/a				
Status	.31[c]	.09[a]	.15[c]	.14[c]	n/a	n/a	n/a	.12[b]			
IMS	.71[c]	.21[c]	.42[c]	.23[c]	n/a	n/a	n/a	.34[c]	.32[c]		
EMS	-.21[c]	-.07[a]	-.08[a]	-.18[c]	n/a	n/a	n/a	-.10[b]	-.06	-.21[c]	

Note: [a] $p \leq .05$, [b] $p \leq .01$, [c] $p \leq .001$

Note. Explicit = explicit environmentalist identity; Implicit = implicit environmentalist identity; Pol = political orientation from conservative to liberal; Edu = highest education level; Concern = pro-environmental concern; Camp = frequency of attending summer camp during childhood; Pet = childhood years lived with a pet; Awe = trait awe; Status = social status of environmentalists; IMS = internal motivation to appear pro-environmental; EMS = external motivation to appear pro-environmental.

Implicit identity was also hypothesized in pre-registration to be positively related to dispositional awe, internal motivation to be pro-environmental, and social status of environmentalists (Studies 3a & 3b; see Table 3). Implicit environmentalism was related to internal motivation, $r(797) = .21$, $p < .001$, and social status of environmentalists, $r(755) = .09$, $p = .019$. Regressions were run in Studies 3a & 3b predicting implicit identity from these three

predictors. All betas are standardized. Higher internal motivation was positively related to higher implicit identity in both samples, Study 3a $\beta = .06$, $t(293) = 3.67$, $p < .001$, Study 3b $\beta = .04$, $t(454) = 2.79$, $p = .006$. No other effects were significant, ps $\geq .25$. Overall, there was partial support for these factors predicting implicit identity.

In contrast, explicit identity was associated with nearly every factor, including these novel zero-order correlations: living in a rural area, $r(1135) = -.15$, $p < .0001$, childhood summer camp attendance, $r(373) = .15$, $p = .003$, childhood living with a pet, $r(367) = .19$, $p = .0003$, and education, $r(1710) = .19$, $p < .0001$ (see Table 3). To explore the more novel predictors, exploratory analyses were run predicting explicit identity from dispositional awe, internal motivation to be pro-environmental, and social status of environmentalists. Across Studies 3a & 3b, all three factors uniquely predicted explicit identity, ps $\leq .003$, and the strongest was internal motivation, $\beta = .94$, $t(751) = 25.1$ $p < .0001$. However, this effect should be interpreted cautiously because of high collinearity between internal motivation and explicit identity, 3a Pearson's $r(321) = .66$, $p < .0001$, 3b $r(473) = .71$, $p < .0001$.

Our pre-registered analytic plans specified that further tests between the factors in Table 3 would be exploratory. Overall, the pattern of zero-order correlations suggests many factors might contribute to explicit identity, particularly environmental concern, $r(542) = .58$, $p < .0001$, and internal motivation to appear pro-environmental $r(794) = .71$, $p < .001$ (see Table 3). It could be valuable to study the variables associated with explicit identity longitudinally and/or experimentally to discover their potential consequences.

4. Discussion

Four high-powered pre-registered studies examined the relationships between environmentalist identity and pro-environmental behavior, policy opinions, childhood

experiences, and dispositions. Meta-analysis revealed that explicit identity is a strong and reliable predictor of pro-environmental behavior and policy preferences, consistent with recent work highlighting environmentalist identity (Brick et al., 2017; Fielding & Hornsey, 2016). Social identity appears a valuable tool to understand and influence pro-environmental actions including voting. Identifying with environmentalists may lead to associating pro-environmental behaviors with self-worth (Baumeister & Leary, 1995), which could in turn cause both public and private conservation actions. We also show for the first time that implicit environmentalist identity is a reliable construct that is moderately and positively related to explicit identity. Although implicit identity is positively associated with pro-environmental behavior and policy preferences, it does not uniquely predict those outcomes when controlling for explicit identity. Also, we did not find evidence that externally motivated environmentalists (high explicit/low implicit) or hidden environmentalists (low explicit/high implicit) affect the outcomes. These findings suggest that self-reports of environmentalist identity are sufficient for predicting environmental behavior and policy preferences.

A recent theory of implicit associations, the Bias of Crowds model (Payne, Vuletich, & Lundberg, 2017), suggests that implicit associations are better understood as properties of groups rather than of individuals. Weak individual-level correlations in these studies are consistent with this perspective. Stronger correlations would be expected when aggregate levels of implicit identity are correlated with group-level behavior. Future research could examine whether region-level implicit environmentalist identity predicts aggregated outcomes such as regional pro-environmental laws or county-level recycling.

4.1. Limitations and future research. Two benefits of self-reported behavior are construct comprehensiveness (by including a wide range of pro-environmental behaviors) and

data collection feasibility. However, self-reported behavior may differ from actual behavior. A recent meta-analysis finds that the relationship between self-reported and objective pro-environmental behavior is only moderate (r = .46; Kormos & Gifford, 2014), suggesting differences in the social and psychological processes that underlie objective and self-reported behavior. The MODE model (Motivation and Opportunity as DEterminants of the Attitude-Behavior Relation (Fazio & Towles-Schwen, 1999; Olson & Fazio, 2008) positions questionnaire self-reports as a distinct type of behavior where people can have the motivation and opportunity to deliberate and impede the influence of automatic mental processes. In the current studies, self-reported behavior could be driven by deliberative processes that artificially reduce the relationship with implicit identity and increase the relationship with explicit identity (e.g., via the motivation to appear pro-environmental, which was tightly linked to explicit identity in the current studies: see Table 3). The MODE model also predicts that implicit associations will influence behavior more when people lack the motivation or opportunity to impede the influence of automatic mental processes. Future research may find stronger relationships between implicit identity and pro-environmental behavior in situations where people do not have the opportunity or motivation to impede the influence of automatic processes. We suggest researchers consider spontaneous pro-environmental behavior (e.g., recycling while distracted) or behavior where self-presentation motives are weak or absent (e.g., private home energy use).

This paper also investigated the potential origins of environmentalist identity by measuring childhood exposure to nature, animals, and museums. We found only weak connections between childhood experiences and explicit identity, and none with implicit identity. These results suggest that childhood experiences with nature are unlikely to be the primary

determinants of adult environmentalist identity. Instead, future research might look to social influence. Individuals develop social identities through interaction with other people. One possible source of environmentalist identity are the local communities in which people live. Future work on antecedents could examine community-level variables such as community political climate, other valued social identities, socioeconomic status, and educational attainment. Future research on education may be particularly illuminating, as country-level educational attainment is the single strongest predictor of climate change awareness across 119 countries (Lee, Markowitz, Howe, Ko, & Leiserowitz, 2015).

4.2. Conclusion. Environmental concern is growing in recent decades, but individual pro-environmental behavior remains stagnant. This disconnect creates the need for other predictors to understand and influence behavior. Social identity drives myriad behaviors (Ellemers et al., 2002) and holds particular promise for conservation because it can lead to mental associations between diverse environmental behaviors (Truelove et al., 2014). Across four pre-registered studies predicting a wide range of outcomes, we found that explicit environmentalist identity was strongly associated with pro-environmental behaviors and policy preferences. In contrast, implicit environmentalist identity had no unique contribution. These findings suggest that understanding individuals in social contexts can support the study of environmental behavior, and that self-report is sufficient for predicting behavior from environmentalist identity. We welcome other researchers to use the novel implicit measure and analysis code to test for relationships with other identities and outcomes. Future research could isolate the key identities that influence pro-environmental actions, the origins of these identities, and design interventions to boost pro-environmental behavior by selectively highlighting or obscuring links with key social groups.

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Supplement

Behavior measures

All items rated from 1 (*never*), 3 (*sometimes*), to 5 (*always*).

Study 1. Pro-environmental behavior (six items adapted from the Recurring Environmental Behavior Scale; (Brick et al., 2017).

1. When you visit the grocery store, how often do you use reusable bags?"
2. How often do you conserve water when showering, cleaning clothes, washing dishes, watering plants, or during other activities?"
3. How often do you discuss environmental topics, either in person or with online posts (Facebook, Twitter, etc.)?"
4. When you buy clothing, how often is it from environmentally friendly brands?"
5. How often do you engage in political action or activism related to protecting the environment?"
6. How often do you educate yourself about the environment?"

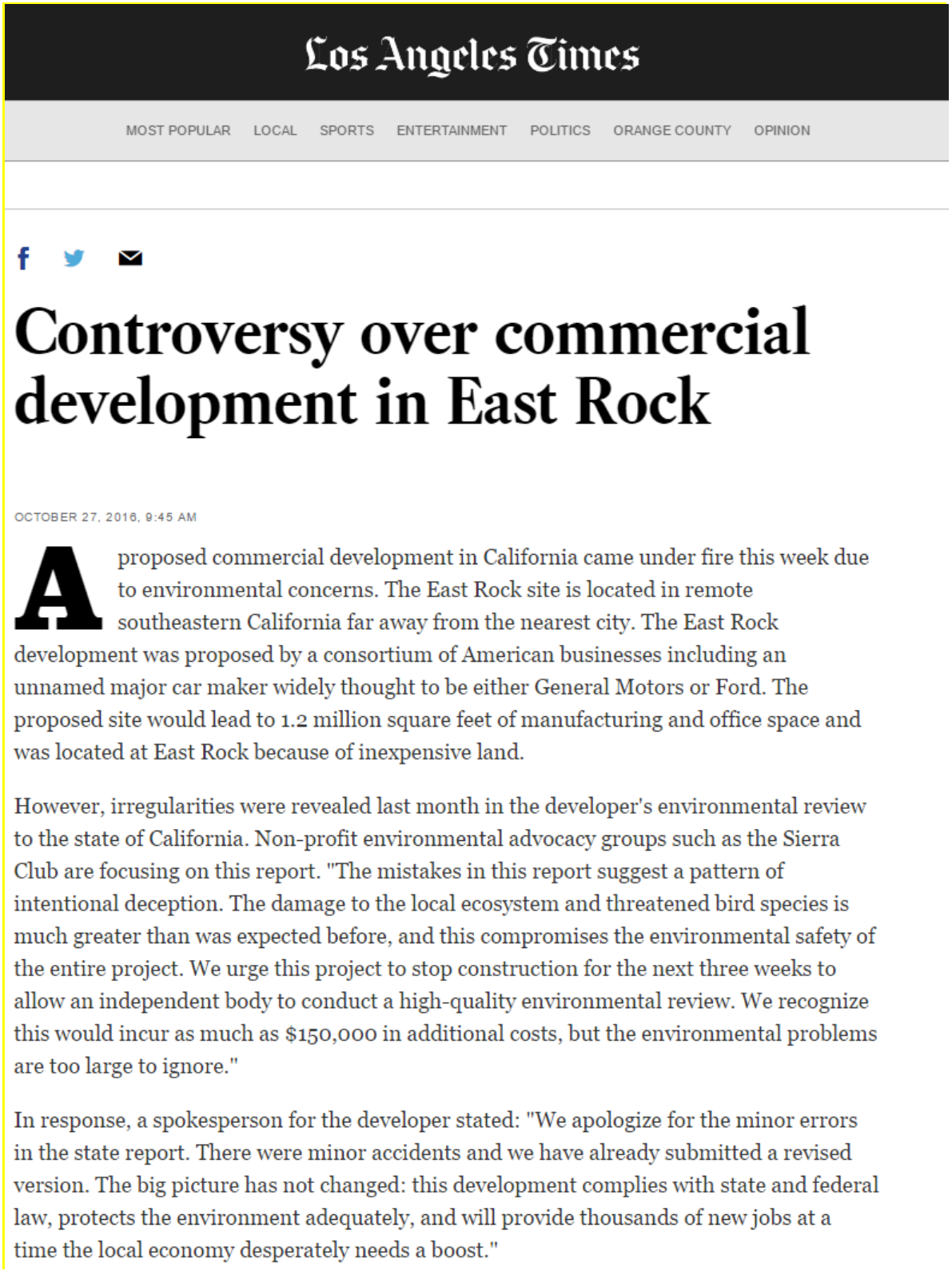
Study 2. Civic pro-environmental behavior (Environmental Action Scale; Alisat & Reimer, 2015).

1. Participated in nature conservation efforts (e.g., planting trees, restoration of waterways).
2. Spent time working with a group/organization that deals with the connection of the environment to other societal issues such as justice or poverty.
3. Became involved with an environmental group or political party (e.g., volunteer, summer job, etc.).
4. Participated in a community event which focused on environmental awareness.

5. Consciously made time to be able to work on environmental issues (e.g., working part time to allow time for environmental pursuits, working in an environmental job, or choosing environmental activities over other leisure activities).

   ***Studies 3a & 3b*:** Recurring Environmental Behavior Scale, 21 items (Brick et al., 2017).

Novel policy preference measure: Studies 3a & 3b



Los Angeles Times

MOST POPULAR LOCAL SPORTS ENTERTAINMENT POLITICS ORANGE COUNTY OPINION

Controversy over commercial development in East Rock

OCTOBER 27, 2016, 9:45 AM

A proposed commercial development in California came under fire this week due to environmental concerns. The East Rock site is located in remote southeastern California far away from the nearest city. The East Rock development was proposed by a consortium of American businesses including an unnamed major car maker widely thought to be either General Motors or Ford. The proposed site would lead to 1.2 million square feet of manufacturing and office space and was located at East Rock because of inexpensive land.

However, irregularities were revealed last month in the developer's environmental review to the state of California. Non-profit environmental advocacy groups such as the Sierra Club are focusing on this report. "The mistakes in this report suggest a pattern of intentional deception. The damage to the local ecosystem and threatened bird species is much greater than was expected before, and this compromises the environmental safety of the entire project. We urge this project to stop construction for the next three weeks to allow an independent body to conduct a high-quality environmental review. We recognize this would incur as much as $150,000 in additional costs, but the environmental problems are too large to ignore."

In response, a spokesperson for the developer stated: "We apologize for the minor errors in the state report. There were minor accidents and we have already submitted a revised version. The big picture has not changed: this development complies with state and federal law, protects the environment adequately, and will provide thousands of new jobs at a time the local economy desperately needs a boost."

Additional measures

To test secondary hypotheses across the studies, we also assessed several additional measures. In Study 1 we included environmental concern to test for overlap with the identity measures. In Study 2 we assessed inclusion of self in nature (IOS; Schultz, 2002), inclusion of self in environmentalists as exploratory measures to assess shared method variance with the IOS scale, amount of nature experiences, contact with environmentalists, and whether the participants lived in a rural/urban area. In Study 3, we assessed dispositional awe (Shiota et al., 2006)**,** perceived social status of environmentalists (adapted from (Operario et al., 2004), and internal/external motivation to respond pro-environmentally (adapted from (Plant & Devine, 1998). See the pre-registered analytic plans for those hypotheses and both the main paper and Supplement for the results.

Study 1. *Environmental concern*. Five items from the New Ecological Paradigm scale (NEP; Dunlap, Van Liere, Mertig, & Jones, 2000); subset used by (Stern, 1999) were combined into a composite, Cronbach's alpha = .80.

Study 2. *Inclusion of self in nature* (IOS; Schultz, 2001). Pictorial measure of seven images of two progressively overlapping circles labeled "Self" and "Nature". Participants read: "Please choose the picture that best describes your relationship with the natural environment. How interconnected are you with nature? Enter the number below." Adapted from Schultz (2001).

Inclusion of self in environmentalists. As above, another pictorial measure with labels "Self" and "Environmentalists". Participants read: "Please choose the picture that best describes you in relation to environmentalists. Enter the number below."

Nature experiences. Participants reported the frequency of childhood experiences with nature in six items: "Before you turned 18, how many times did you go to [aquariums/zoos/natural history museums]?", rated *0*, *1-2 times*, *3-4 times*, *5-6 times*, *7-8 times*, *9 times or more*; "Before you turned 18, how much time did you spend at a summer camp or other group organization in nature (outside of a city)?", rated *Never*, *1 day-2 weeks*, *Less than 4 weeks*, *Less than 6 weeks*, *Less than 8 weeks*, *Less than 10 weeks*, *10 weeks or more*; and two items entered in whole years: "Of the 18 years of your childhood, how many years did you live in a house with a pet?"; and "Of the 18 years of your childhood, for how many years were you primarily responsible for feeding a pet?"

Rurality. Participants reported the rurality of their current home address using the nine-item USDA Rural-Urban Continuum Codes, e.g., 1 (*County in metropolitan area of 1 million population or more*) to 9 (*Completely rural or less than 2,500 urban population, not adjacent to a metro area*). Study 3 also included this measure.

Contact with environmentalists. Participants responded to three questions: "How many [friends/family/co-workers] can you think of that would identify as environmentalists?" If the answer to any was greater than zero, they further responded to the corresponding follow-up question(s): "How often do you spend time with these [friend(s)/family member(s)/co-worker(s)]?, rated from 1 (*none*) [labeling error] to 7 (*very often*).

Political orientation. Participants responded to two questions: "In general, how liberal or conservative are you on social issues?" and "In general, how liberal or conservative are you on economic issues?" from 1 (*strongly conservative*) to 7 (*strongly liberal*).

Study 3. *Internal and external motivation to respond pro-environmentally*. This 10-item scale was adapted from (Plant & Devine, 1998) to focus on motivation to act pro-

environmentally, for example, "Because of today's politically correct standards, I try to appear pro-environmental" [external] and "I attempt to behave pro-environmentally because it is personally important to me" [internal], rated from 1 (*disagree strongly*) to 7 (*agree strongly*).

Awe. Participants responded to the six-item scale measuring the trait tendency to experience the emotion awe (Shiota et al., 2006), e.g., "I feel wonder almost every day," rated from 1 (*disagree strongly*) to 7 (*agree strongly*).

Social status of environmentalists. The MacArthur Ladder Scale of Subjective Social Status was adapted for environmentalists (Operario et al., 2004). Participants chose the social status of environmentalists by selecting a rung on a ten-rung ladder where the top are those who have the highest standing in their community.

Zip code. As part of the Project Implicit pre-screening, participants entered their five-digit US zip code. This data was not used in the main analyses and was removed from the shared dataset to protect confidentiality.

Supplemental hypotheses and results

The analytic plans for each study included secondary hypotheses. These planned analyses comprised three main goals for exploring the effects of implicit identity: 1) identify potential moderators of implicit effects on behavior or policy preferences, 2) identify childhood predictors of implicit identity in adulthood, and 3) use any childhood predictors to test mediation through implicit identity. In sum, there was no evidence for any of these relationships. This is consistent with the meta-analytic result showing little effect of implicit identity on behavior or policy preferences. All secondary hypotheses and results follow below.

Study 1. *Hypothesis 3.* Implicit identity was hypothesized to uniquely predict policy preferences better when explicit identity with environmentalism was moderate (Hawkins &

Nosek, 2012). A dummy variable was created for moderate identity values following the analytic plan (3.5-4.5 on the 7-point scale). A linear regression predicting policy preferences using implicit identity, moderate vs. non-moderate explicit identity, and their interaction yielded no interaction effect, $p = .09$, eta-squared = .01. This hypothesis was not supported.

Study 2. *Hypothesis 2b.* The effect of explicit identity on policy preferences was hypothesized to be greater for conservatives. A regression predicting policy preferences was run with explicit identity, political orientation, and their interaction as predictors. The interaction was not significant, $p = .98$, eta-squared = .00. This hypothesis was not supported.

Hypothesis 2c. The effect of implicit identity on policy preferences and behavior was hypothesized to be separate from the effect of inclusion of nature in self. Two regressions were run with the predictors explicit identity, implicit identity, and inclusion of nature in self in Study 2. All betas below are standardized except with dummy variables. Policy preferences were not uniquely predicted by implicit identity, $p = .55$, consistent with no effect in the mini-meta-analysis. However, behavior was uniquely predicted by implicit identity, $\beta = .10$, $t(369) = 2.13$, $p = .03$, eta-squared = .01. However, the other predictors showed stronger unique effects: explicit identity $\beta = .32$, $t(369) = 6.13$, $p < .001$, eta-squared = .09; inclusion of nature in self $\beta = .27$, $t(369) = 5.27$, $p < .001$, eta-squared = .07. This hypothesis was partially supported.

Hypothesis 3. Implicit identity was hypothesized to uniquely predict policy preferences better when explicit identity with environmentalism was moderate (Hawkins & Nosek, 2012) (same as Study 1 Hypothesis 3). Dummy explicit identity predicted policy, $\beta = -.94$, $t(371) = -6.19$, $p < .0001$, eta-squared = .09, and implicit identity as well, $\beta = .21$, $t(371) = 2.63$, $p = .009$, eta-squared = .00. Their interaction was significant, $\beta = -.33$, $t(371) = -2.09$, $p = .038$, eta-squared

= .01. This hypothesis was partially supported but the interaction effect was very small and of little practical importance.

Hypothesis 4a. Implicit identity was hypothesized to be positively related to contact with environmentalists (friends, family, and coworkers). Implicit identity regressed onto these three contact variables simultaneously. None predicted implicit identity, all *p*s ≥ .72, all eta-squared = .00, nor was there any significant zero-order relationship with implicit identity, all *r*s ≤ .06, *p*s ≥ .37. This hypothesis was not supported.

Hypothesis 4b. See main results.

Hypothesis 4c. Implicit identity was hypothesized to mediate effects of either childhood contact with environmentalists or contact with nature on policy preferences and/or behavior. Four mediation models were performed with the two predictors from Hypotheses 4a & 4b that had the largest relationships with implicit identity: museum visits and contact with environmentalist friends. There was no evidence for mediation through implicit identity, indirect effect βs = .00, .02, .01, .02, *p*s = .54, .16, .53, .11.

Study 3. *Hypothesis 3a-c.* See main results.

Hypothesis 4. Implicit identity was hypothesized to mediate the effects of dispositional awe, internal motivation to be pro-environmental, and social status of environmentalists on policy preferences and behavior. Combined across both studies, two mediation models were performed with implicit identity as the mediator and the three predictors as separate independent variables. In neither Study 3a and 3b, implicit identity did not mediate the effect of these predictors on policy preferences, indirect effect |*β*s| ≤ .02, *p*s ≥ .18, or on behavior, indirect effect |*β*s| = .00, *p*s ≥ .91. In sum, there was no evidence for mediation through implicit identity.

Robustness checks and analysis plan deviations

Study 1. The pre-registered analysis plan stated that policy opinions would analyzed separately if $r < -.75$, and $r(538) = -.42$, $p < .001$. The policy beliefs were combined to pool effect sizes across studies for the meta-analysis. As a robustness check for the main approach, the policy items were also analyzed separately using partial correlations. Support for a carbon tax was uniquely predicted by explicit identity, $r(541) = .47$, $p < .0001$, and also implicit identity, $r(541) = .10$, $p = .017$. Opposing the Keystone XL pipeline (the pro-environmental stance) was uniquely predicted by explicit identity, $r(538) = .45$, $p < .0001$, and uniquely by implicit identity, $r(538) = .11$, $p = .013$. These results are consistent with the two-item policy composite used in the main analyses.

Study 2. *Length of ST-IAT.* In Study 2, the ST-IAT was doubled in length from 192 critical trials (48 trials / critical blocks) to 384 critical trials (96 trials / critical block). This change may be responsible for differences in predictive validity compared to other studies, as participant fatigue may have increased the relative contribution of non-associative processes in ST-IAT performance (Calanchini & Sherman, 2013). However, we urge caution with interpreting across the studies. Different results could also be due to the different operationalizations of policy preferences and behaviors. The meta-analytic pooled effect sizes are the most reliable estimate of the aggregate relationship between implicit identity with policy support and behavior.

Study 2 had a lower retention rate (37%) relative to the other two studies using general population samples (Studies 1 & 3b: 69%). This lower retention rate could have also induced differential attrition. Relative to Studies 1 and 3b, there were more women in Study 2 (69%; 61% in Study 1, and 61% in Study 3b). However, participants in Study 2 were not different than Studies 1 and 3b on political ideology, education, or age, ps $> .05$.

Studies 3a-b. The pre-registered analysis plan stated that the three policy opinions and the two novel policy reactions would be combined into separate composites. The two composites are analyzed separately here using partial correlations. The three-item policy composite was uniquely predicted from explicit identity, 3a & 3b rs $\geq .61$, ps $< .0001$, but not from implicit identity, $|r\text{s}| \leq .04$, ps $\geq .43$. The two-item novel policy composite was uniquely predicted from explicit identity, rs $\geq .45$, ps $< .0001$, but not from implicit identity, $|r\text{s}| \leq .10$, ps $\geq .06$. These results are consistent with the five-item policy composite in the main analyses.

In sum, secondary analyses and robustness checks suggest that the main meta-analytic results are reliable and robust. Explicit identity is a strong and unique predictor of behavior and policy preferences, whereas implicit identity is a weak predictor of behavior and policy preferences.