UvA-DARE (Digital Academic Repository)

Motivation and climate change: A review

Brick, C.; Bosshard, A.; Whitmarsh, L.

DOI

[10.1016/j.copsyc.2021.04.001](https://doi.org/10.1016/j.copsyc.2021.04.001)

Publication date

2021

Document Version

Final published version

Published in

Current Opinion in Psychology

License

CC BY

[Link to publication](#)

Citation for published version (APA):

Brick, C., Bosshard, A., & Whitmarsh, L. (2021). Motivation and climate change: A review. *Current Opinion in Psychology*, 42, 82-88. <https://doi.org/10.1016/j.copsyc.2021.04.001>

General rights

It is not permitted to download or to forward/distribute the text or part of it without the consent of the author(s) and/or copyright holder(s), other than for strictly personal, individual use, unless the work is under an open content license (like Creative Commons).

Disclaimer/Complaints regulations

If you believe that digital publication of certain material infringes any of your rights or (privacy) interests, please let the Library know, stating your reasons. In case of a legitimate complaint, the Library will make the material inaccessible and/or remove it from the website. Please Ask the Library: <https://uba.uva.nl/en/contact>, or a letter to: Library of the University of Amsterdam, Secretariat, Singel 425, 1012 WP Amsterdam, The Netherlands. You will be contacted as soon as possible.

Review

Motivation and climate change: A review

Cameron Brick¹, Anna Bosshard¹ and Lorraine Whitmarsh²**Abstract**

This paper reviews motivations people experience about climate change and integrates recent findings into the BUCKET model of core social goals. We argue that environmentalism is not the main cause of thoughts or behaviors about climate change. Rather, the evolved social needs for Belongingness, Understanding, Control, self-Enhancement, and Trust are more practical intervention targets than the attempt to create environmentalist beliefs or identities. We used database searches to identify the key research areas on motivation and climate change and synthesized articles into the BUCKET model. This reveals some limiting assumptions of previous approaches and suggests the effectiveness of targeting existing motives rather than fostering new values or worldviews.

Addresses

¹ Department of Psychology, University of Amsterdam, 1012 WX, Amsterdam, Netherlands

² Department of Psychology, University of Bath, Claverton Down, Bath, BA2 7AY, United Kingdom

Corresponding author: Brick, Cameron (c.brick@uva.nl)

Current Opinion in Psychology 2021, **42**:82–88

This reviews comes from a themed issue on **42 Psychology of Climate Change**

Edited by **Mark F. Ferguson & Michael T. Schmitt**

For a complete overview see the [Issue](#) and the [Editorial](#)

Available online 20 April 2021

<https://doi.org/10.1016/j.copsyc.2021.04.001>

2352-250X/© 2021 The Author(s). Published by Elsevier Ltd. This is an open access article under the CC BY license (<http://creativecommons.org/licenses/by/4.0/>).

Keywords

Environmentalism, Proenvironmental behavior, Prosociality, Knowledge deficit model, Attitude-behavior gap, Motivation.

A central paradox in human behavior is that people value their health, relationships, and environments yet choose actions that harm them. One explanation for this value-action gap is that evolution shaped human minds to respond to problems faced by our distant ancestors [9]. Consider the disproportionate fear people experience towards spiders compared to cars, even though road injuries are a major cause of death worldwide. Climate change is an abstract, slow, and distant problem unlike any our ancestors adapted to solve, and therefore humans are poorly equipped for environmentalism [33]. Rather, animals developed biological drives such as

reproduction that are partially served in humans through psychological motivations like maintaining positive interpersonal relationships. For example, people over-consume to boost their social status [31]. This leads to two discomfiting claims: behaviors that impact the environment are rarely explained by a conscious motivation towards nature, and conservation efforts will fail if the damaging behavior is easier, cheaper, or better serves social motives. Even deliberate conservation actions could be explained through core social motives (review; [88]), and meta-analyses suggest that the most effective interventions harness motives such as belongingness [24].

Beyond environmentalism

Contrary to what might be assumed, proenvironmental thoughts and behaviors are only weakly linked (for reviews, see: [50,78]). This suggests that environmentalism is not the main cause of relevant behaviors. Long-term concern about the natural environment is new in evolutionary terms, and its abstraction, distance, and uncertainty can make it hard to understand. Despite this, many interventions are still based on the knowledge deficit model, which holds that damaging behaviors are caused by the ignorance of facts. This claim is hard to substantiate. The strongest predictors of individual environmental damage are demographic like income and country rather than psychological like environmentalist identity or behavioral intentions [63].

Even environmentalists want to behave in ecological ways, but they still tend to focus on actions with small benefits. There is a wide gulf between the environmental behaviors most people think about and adjust (such as recycling or turning off lights) and their behaviors with large impact (such as indirect water use or home size), and these different classes will have different predictors [59]. Even climate scientists fly a great deal [91]. Consistent with this separation, people are surprisingly inaccurate about the environmental impact of common behaviors, for example, of household appliances using water [4] or energy [5].

In sum, environmentalism is not a unitary and internal psychological construct but only a semantic label that groups distinct phenomena by face validity, combining other terms like climate change beliefs and recycling behavior. A recent paper explains that assuming scientific terms are real, discovered, and have an underlying

essence is pervasive across psychological science, including areas like neuroscience and biopsychology [13]. Proenvironmental behavior is not a single thing either (review: [54,75]). Almost nothing is similar between the habitual behavior of recycling and the expensive, one-off purchase of a new furnace. They might each be weakly linked to cognitive variables such as attitudes about conservation, but that does not mean the behaviors form a coherent, separate category. Too quickly assuming labels like environmentalism or proenvironmental behavior have valid and unitary essences assuming the descriptive stage of mapping outcomes across contingencies, contexts, and populations [30,71]. Fortunately, environmental beliefs, preferences, and behaviors can also be explained through well-established social motives.

The current review

This article focuses on core social motivations—needs that arise in social settings. Below, we integrate recent climate change research into the BUCKET motives: **B**elonging, **U**nderstanding, **C**ontrolling, **s**elf-**E**nhancing, and **T**rusting others (Table 1). Key psychological research was identified through author experience and nonsystematic reviews of years 2010–2020 for publications in Web of Science and Google Scholar in September 2020. The first query was (“proenvironment* OR environmentally responsible* OR climate change OR climate change mitigation OR global warming OR sustain* OR green”) AND (“motive* OR behavior* OR attitude* OR norm* OR intent* OR personality”). These articles were examined for relevance, their references and citing articles were also reviewed, and the most relevant and informative were included in the review.

Belonging

Thoughts, feelings, and behaviors are shaped by the desire to build and sustain positive social relationships. Social norms quickly emerged as one of the central predictors of proenvironmental and climate mitigation behaviors (review: [34]). Descriptive norms are beliefs about what others are doing, and injunctive norms are beliefs about what others should be doing. Notably,

people dramatically underestimate how much others influence their behavior [94]. Because affiliation motives are powerful, fundamental, and underappreciated, they are a major potential lever for interventions ranging from message framing to social context and can also explain antienvironmental preferences [39] and behaviors [81].

In a rare transition of social psychology to large-scale application, norm interventions on household energy use [72] inspired a major commercial venture in Opower, a company that introduced normative messages into utility bills. The messages showed how much energy people used compared to their neighbors (descriptive) and included neutral or smiley face emojis (injunctive). These messages reduced household energy use by 2%, which is massive considering that Opower operated in nine countries and 50 million households when it was sold in 2016. Descriptive norms are also a key predictor of public-sphere climate action such as volunteering, at least among those alarmed about climate outcomes [23].

Understanding

People are motivated to feel that they understand what is real and why things happen. Crucially, this feeling does not require that knowledge is accurate nor internally consistent. The chasm between facts and widespread conspiracies can be partially explained through the desire to understand (and other motives like belongingness). This is particularly concerning because conspiratorial thinking predicts climate change denial [57].

Recognizing the motive for understanding allows climate change communicators to move beyond a simple deficit model of ignorance (for example, presenting facts about atmospheric chemistry) towards providing individuals with satisfying opportunities such as aligning their beliefs with what others think. For example, the Gateway Belief Model is the replicated finding that informing people about the high scientific consensus about human-caused climate change leads to increases in relevant, accurate beliefs and willingness to act

Table 1

Core Social Motives and Climate Change (Fiske, 2018)

Name	Motive	Example Research Areas (climate change)
Belonging	Maintain positive, stable relationships	Descriptive and injunctive norms
Understanding	Integrate new information and construct shared meaning	Conspiracies; scientific consensus
Controlling	Feel competitive and effective	Self-efficacy; psychological distance
self-Enhancing	Be seen as socially worthy	Consistency; signaling; personal norms
Trusting	Believe that others are benevolent	Cooperation; prosociality

Also see similar frameworks such as Self-Determination Theory [70] and an updated hierarchy of human needs [47].

towards mitigation and adaptation [84,85]. This intervention might also support belongingness, but the understanding component has a unique contribution because boosting consensus can also reduce group-based ideological biases [35].

Controlling

The motives to effectively control one's environment, achieve mastery, and feel competent are core behavioral drivers [68–70,73]. Self-efficacy—the perceived ability to mobilize resources and take action—is essential for behavior change and persistence [8], including proenvironmental behaviors [53,80]. Self-efficacy also mediates spillover: adopting an initial, easy proenvironmental behavior develops individuals' confidence and skills, which motivates further, more difficult proenvironmental actions [55]. Similarly, perceived behavioral control drives a wide range of behaviors [1], and particularly more difficult and impactful proenvironmental actions such as avoiding driving [7,32]. This literature helps explain the importance of convenience factors [58] and reveals that increasing proenvironmental actions requires making green actions easier than more polluting actions (for example, by reallocating road space from cars to cyclists and pedestrians) [46].

Climate change is global, long-term, and uncertain, which can lead to low perceived control and motivation to engage in mitigation or adaptation: feeling like a drop in the ocean [59]. Further, climate change is psychologically distant in time and space, unavailable to sensory experience, and therefore deprioritized in favor of more proximal problems [16,42,61,77] (review: [62]). Extreme weather events like floods [2,90] can make climate change salient and threatening. Actions like flood-proofing one's home are more likely when perceived as effective and controllable [22,37]. Boosting individual and collective efficacy (review [49]: can thus increase motivation for mitigation and protective action against climate change impacts [28] (systematic review: [51])).

Self-Enhancing

People are motivated to see themselves as consistent and worthy. How people describe themselves (self-identity) is influenced by personal motivations for self-esteem, self-enhancement, and self-understanding, as well as social interactions and roles [25]. People are motivated to act consistently and express their self-identity through actions and purchases [10]. Proenvironmental identity predicts green consumption behaviors [19,36,45,76,86], recycling [60], carbon offsetting [93], avoiding flying [32], and green policy preferences [14]. Identity can support consistency across actions and contexts, thus mediating spillover between proenvironmental behaviors [52,87]. In contrast, external interventions without self-

enhancement motives such as price signals are less likely to spill over because individuals do not attribute the action to their identity [67] (review: [83]). Conspicuous conservation describes when individuals seek status by demonstrating their green credentials, for example, by purchasing hybrid or electric vehicles [64,74]. Environmentalist identity may best predict proenvironmental behaviors that are visible to other people [15].

Self-enhancement includes the motivation for moral integrity: being a good person. Similarly, personal norms are perceived moral obligations and also predict certain proenvironmental behaviors [12,17,26,48] when not in conflict with other motives (reviews: [78,79]). Climate change is a moral issue for many people [41]; addressing it requires considering social inequalities, intergenerational justice, and environmental degradation. Consequently, environmentalist, self-transcendent, and progressive values are the strongest predictors of climate change attitudes [93] (meta-analysis: [40]).

For those with strong environmental values, taking green actions can afford a warm glow and intrinsic satisfaction [82], whereas taking more polluting actions can create guilt [65,11]. Conversely, environmental information that threatens a valued social identity, such as one's political affiliation, is likely to be ignored or denigrated [38,43]. In climate change communication, motivated reasoning can lead to attitude polarization [21]. Likewise, a behavior such as reusing a grocery bag might be shunned to avoid looking like an environmentalist [15]. Reframing environmental action in line with audience values may overcome identity threats and motivate attitude and behavior change [27,92].

Trusting

In addition to the desire to belong, people are motivated to trust others and believe that others are benevolent [29]. Trust will be a crucial aspect of climate change action because the required physical changes are complex, distributed, and require cooperation spanning from small groups to international treaties. This systematic need aligns with trust in scientists and institutions emerging as a key lever for climate communication and behavior change in the USA. [3] and Germany [44], as well as in a recent meta-analysis [18].

The desire to trust others can also reveal novel pathways to policy support for mitigation. In 24 countries, individuals were motivated towards action when they were informed of cobenefits such as development (economic and scientific) and benevolence (a moral and caring community) [6]. These effects were of similar magnitude to the belief that climate change is important, which reinforces the potential for harnessing existing motives. Last, perhaps because environmentalists are perceived as

trustworthy, environmentalists are seen as more cooperative in social dilemma tasks [89] and even preferred as romantic partners [66].

Conclusion

Because of how human minds evolved, actions on climate change are explainable through social motives; even phenomena such as cognitive dissonance or ambiguity avoidance that are commonly attributed to intrapsychic processes may be explained by interpersonal processes, according to a recent review [56]. Social motives may be a uniquely effective target for interventions since they are ubiquitous and afford many roads to action, for example by activating different identities. Other frameworks of fundamental motives could also serve as a basis for interventions. For instance, Self-Determination Theory covers similar core motives: autonomy, competence, and relatedness [20,70]. Another related model of fundamental needs is well-grounded in evolutionary psychology, and it overlaps most with the BUCKET motives for status and esteem [47]. However, these frameworks do not fully explain behaviors. Major topics within environmental psychology such as social norms or identities can plausibly fit several motives, and behaviors are also driven by habits and homeostatic drives.

Our practical advice is for researchers to identify a behavior with environmental consequences, determine how it serves core social motives, and test an intervention targeted at fulfilling those motives. This process may also reveal instances when difficult conservation behaviors conflict with existing motives. In these cases, the most effective interventions might limit individuals' capacity to do harm, for example, through taxes or regulations. Overall, harnessing core motives could help avoid the worst outcomes of climate change. Many drops can fill a bucket.

Financial disclosure/funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Author's contributions

Brick C, Conceptualization, Methodology, Supervision, Writing – original draft, Writing – review & editing; Bosshard A., Methodology, Writing – original draft, Writing – review & editing; Whitmarsh L., Writing – original draft, Writing – review & editing.

Conflict of interest statement

Nothing declared.

Acknowledgements

We thank Nathaniel Geiger for input on the BUCKET model and Gary J. Lewis and Michael Barlev for the conceptual feedback.

References

Papers of particular interest, published within the period of review, have been highlighted as:

- of special interest
 - of outstanding interest
1. Ajzen I: **The theory of planned behavior**. *Organ Behav Hum Decis Process* 1991, **50**:179–211, [https://doi.org/10.1016/0749-5978\(91\)90020-T](https://doi.org/10.1016/0749-5978(91)90020-T).
 2. Akerlof K, Maibach EW, Fitzgerald D, Ceden A, Neuman A: **Do people “personally experience” global warming, and if so how, and does it matter?** *Global Environ Change* 2013, **23**: 81–91, <https://doi.org/10.1016/j.gloenvcha.2012.07.006>. Human and Policy Dimensions.
 3. Arbuckle Jr JG, Morton LW, Hobbs J: **Understanding farmer perspectives on climate change adaptation and mitigation: the roles of trust in sources of climate information, climate change beliefs, and perceived risk**. *Environ Behav* 2015, **47**: 205–234, <https://doi.org/10.1177/0013916513503832>. Farmers' trust in institutions and climate change beliefs predicts risk perception. Farmers support adaptation more than mitigation.
 4. Attari SZ: **Perceptions of water use**. *Proc Natl Acad Sci Unit States Am* 2014, **111**:5129–5134, <https://doi.org/10.1073/pnas.1316402111>.
 5. Attari SZ: **Misperceived energy use and savings**. *Nature Energy* 2018, **3**:1029–1030, <https://doi.org/10.1038/s41560-018-0298-6>. Misperceptions of household energy use were a stronger predictor than actual savings for consumer acceptance of a demand-side response program.
 6. Bain PG, Milfont TL, Kashima Y, Bilewicz M, Doron G, Garðarsdóttir RB, Gouveia VV, Guan Y, Johansson L-O, Pasquali C, Corral-Verdugo V, Aragonés JI, Utsugi A, Demarque C, Otto S, Park J, Soland M, Steg L, González R, ... Saviolidis NM: **Co-benefits of addressing climate change can motivate action around the world**. *Nat Clim Change* 2015, **6**:154, <https://doi.org/10.1038/nclimate2814>. Individuals across 24 countries are motivated to address climate change because of cobenefits like economic development and a more caring community.
 7. Bamberg S: **How does environmental concern influence specific environmentally related behaviors? A new answer to an old question**. *J Environ Psychol* 2003, **23**:21–32, [https://doi.org/10.1016/S0272-4944\(02\)00078-6](https://doi.org/10.1016/S0272-4944(02)00078-6).
 8. Bandura A: *Self-efficacy: the exercise of control*. 1st ed. Worth Publishers; 1997.
 9. Barkow JH, Cosmides L, Tooby J: *The adapted mind: evolutionary psychology and the generation of culture*. USA: Oxford University Press; 1995.
 10. Belk RW: **Possessions and the extended self**. *J Consum Res* 1988, **15**:139–168, <https://doi.org/10.1086/209154>.
 11. Blüch A-M, McGarty C, Thomas EF, Lala G, Berndsen M, Misajon R: **Public division about climate change rooted in conflicting socio-political identities**. *Nat Clim Change* 2015, **5**: 226–229, <https://doi.org/10.1038/nclimate2507>.
 12. Bouman T, Verschoor M, Albers CJ, Böhm G, Fisher SD, Poortinga W, Whitmarsh L, Steg L: **When worry about climate change leads to climate action: how values, worry and personal responsibility relate to various climate actions**. *Global Environ Change* 2020, **62**:102061, <https://doi.org/10.1016/j.gloenvcha.2020.102061>. Human and Policy Dimensions.
 13. Brick C, Hood B, Ekroll V, de-Wit L: **Illusory essences: a bias holding back theorizing in psychological science**. *Perspect Psychol Sci* 2021, <https://doi.org/10.31234/osf.io/eqma4>.
 14. Brick C, Lai CK: **Explicit (but not implicit) environmentalist identity predicts pro-environmental behavior and policy preferences**. *J Environ Psychol* 2018, <https://doi.org/10.1016/j.jenvp.2018.07.003>.
 15. Brick C, Sherman DK, Kim HS: **“Green to be seen” and “brown to keep down”: visibility moderates the effect of identity on**

- pro-environmental behavior.** *J Environ Psychol* 2017, **51**: 226–238, <https://doi.org/10.1016/j.jenvp.2017.04.004>.
16. Brügger A, Dessai S, Devine-Wright P, Morton TA, Pidgeon NF: **Psychological responses to the proximity of climate change.** *Nat Clim Change* 2015, **5**:1031–1037, <https://doi.org/10.1038/nclimate2760>.
 17. Chan L, Bishop B: **A moral basis for recycling: extending the theory of planned behaviour.** *J Environ Psychol* 2013, **36**: 96–102, <https://doi.org/10.1016/j.jenvp.2013.07.010>.
 18. Cologna V, Siegrist M: **The role of trust for climate change mitigation and adaptation behaviour: a meta-analysis.** *J Environ Psychol* 2020, **69**:101428, <https://doi.org/10.1016/j.jenvp.2020.101428>.
 19. Cook AJ, Kerr GN, Moore K: **Attitudes and intentions towards purchasing GM food.** *J Econ Psychol* 2002, **23**:557–572, [https://doi.org/10.1016/S0167-4870\(02\)00117-4](https://doi.org/10.1016/S0167-4870(02)00117-4).
 20. Cooke AN, Fielding KS, Louis WR: **Environmentally active people: the role of autonomy, relatedness, competence and self-determined motivation.** *Environ Educ Res* 2016, **22**: 631–657, <https://doi.org/10.1080/13504622.2015.1054262>.
 21. Corner A, Whitmarsh L, Xenias D: **Uncertainty, scepticism and attitudes towards climate change: biased assimilation and attitude polarisation.** *Climatic Change* 2012, **114**:463–478, <https://doi.org/10.1007/s10584-012-0424-6>.
 22. Demski C, Evensen D, Pidgeon N, Spence A: **Public prioritisation of energy affordability in the UK.** *Energy Pol* 2017, **110**: 404–409, <https://doi.org/10.1016/j.enpol.2017.08.044>.
 23. Doherty KL, Webler TN: **Social norms and efficacy beliefs drive the Alarmed segment's public-sphere climate actions.** *Nat Clim Change* 2016, **6**:879, <https://doi.org/10.1038/nclimate3025>.
In individuals highly concerned about climate, social norms, self-efficacy, and personal and collective response efficacy predict public climate actions like volunteering.
 24. Ehret PJ, Hodges HE, Kuehl C, Brick C, Mueller S, Anderson SE: **Systematic review of household water conservation interventions using the Information–Motivation–Behavioral Skills model.** *Environ Behav* 2020, <https://doi.org/10.1177/0013916519896868>.
 25. Ellemers N, Spears R, Doosje B: **Self and social identity.** *Annu Rev Psychol* 2002, **53**:161–186, <https://doi.org/10.1146/annurev.psych.53.100901.135228>.
 26. Esfandiari K, Dowling R, Pearce J, Goh E: **Personal norms and the adoption of pro-environmental binning behaviour in national parks: an integrated structural model approach.** *J Sustain Tourism* 2020, **28**:10–32, <https://doi.org/10.1080/09669582.2019.1663203>.
 27. Feinberg M, Willer R: **The moral roots of environmental attitudes.** *Psychol Sci* 2013, <https://doi.org/10.1177/0956797612449177>.
 28. Feldman L, Hart PS: **Using political efficacy messages to increase climate activism: the mediating role of emotions.** *Sci Commun* 2016, **38**:99–127, <https://doi.org/10.1177/1075547015617941>.
 29. Fiske ST: *Social beings: core motives in social psychology*. 4th ed. John Wiley & Sons, Inc; 2018.
This book introduces the BUCKET model and has an applied focus.
 30. Flake JK, Pek J, Hehman E: **Construct validation in social and personality research: current practice and recommendations.** *Social Psychological and Personality Science* 2017, **8**:370–378, <https://doi.org/10.1177/1948550617693063>.
 31. Frank RH: *The Darwin economy*. Princeton University Press; 2012. <https://press.princeton.edu/books/paperback/9780691156682/the-darwin-economy>.
This book applies Darwin's theory of evolution to economics, challenging Adam Smith's notion that free-market competition channels self-interest resulting in societal equilibrium.
 32. Gatersleben B, Murtagh N, Abrahamse W: **Values, identity and pro-environmental behaviour.** *Contemporary Soc Sci* 2014, **9**:374–392, <https://doi.org/10.1080/21582041.2012.682086>.
 33. Gifford R: **The dragons of inaction: psychological barriers that limit climate change mitigation and adaptation.** *Am Psychol* 2011, **66**:290–302, <https://doi.org/10.1037/a0023566>.
 34. Gifford R, Nilsson A: **Personal and social factors that influence pro-environmental concern and behaviour: a review.** *Int J Psychol: J Int Psychol* 2014, **49**:141–157, <https://doi.org/10.1002/ijop.12034>.
 35. Goldberg MH, van der Linden S, Leiserowitz A, Maibach E: **Perceived social consensus can reduce ideological biases on climate change.** *Environ Behav* 2020, **52**:495–517, <https://doi.org/10.1177/0013916519853302>.
 36. Grewal R, Mehta R, Kardes FR: **The role of the social-identity function of attitudes in consumer innovativeness and opinion leadership.** *J Econ Psychol* 2000, **21**:233–252, [https://doi.org/10.1016/S0167-4870\(00\)00003-9](https://doi.org/10.1016/S0167-4870(00)00003-9).
 37. Grothmann T, Reusswig F: **People at risk of flooding: why some residents take precautionary action while others do not.** *Nat Hazards* 2006, **38**:101–120, <https://doi.org/10.1007/s11069-005-8604-6>.
 38. Hart PS, Nisbet EC: **Boomerang effects in science communication: how motivated reasoning and identity cues amplify opinion polarization about climate mitigation policies.** *Commun Res* 2012, **39**:701–723, <https://doi.org/10.1177/0093650211416646>.
 39. Hoffarth MR, Hodson G: **Green on the outside, red on the inside: perceived environmentalist threat as a factor explaining political polarization of climate change.** *J Environ Psychol* 2016, **45**(Supplement C):40–49, <https://doi.org/10.1016/j.jenvp.2015.11.002>.
Proposes an intergroup explanation for political polarization about climate change based on the perceived threat of environmentalists.
 40. Hornsey MJ, Harris EA, Bain PG, Fielding KS: **Meta-analyses of the determinants and outcomes of belief in climate change.** *Nat Clim Change* 2016, **6**:622–626, <https://doi.org/10.1038/nclimate2943>.
 41. Hulme M: *Why we disagree about climate change: understanding controversy, inaction and opportunity*. Cambridge University Press; 2009, <https://doi.org/10.1017/CBO9780511841200>.
 42. Jones C, Hine DW, Marks ADG: **The future is now: reducing psychological distance to increase public engagement with climate change.** *Risk Anal* 2017, **37**:331–341, <https://doi.org/10.1111/risa.12601>.
 43. Kahan DM: **Why we are poles apart on climate change.** *Nature* 2012, **488**, <https://doi.org/10.1038/488255a>. 255–255.
 44. Kalkbrenner BJ, Roosen J: **Citizens' willingness to participate in local renewable energy projects: the role of community and trust in Germany.** *Energy Res Soc Sci* 2016, **13**:60–70, <https://doi.org/10.1016/j.erss.2015.12.006>.
 45. Kashima Y, Paladino A, Margetts EA: **Environmentalist identity and environmental striving.** *J Environ Psychol* 2014, **38**:64–75, <https://doi.org/10.1016/j.jenvp.2013.12.014>.
 46. Keenleyside K, Dudley N, Cairns S, Hall C, Stolton S. In *Ecological restoration for protected areas: principles, guidelines and best practices*. Edited by Valentine P, IUCN; 2012.
 47. Kenrick DT, Griskevicius V, Neuberg SL, Schaller M: **Renovating the pyramid of needs: contemporary extensions built upon ancient foundations.** *Perspect Psychol Sci* 2010, **5**:292–314, <https://doi.org/10.1177/1745691610369469>.
 48. Kiatkawsin K, Han H: **Young travelers' intention to behave pro-environmentally: merging the value-belief-norm theory and the expectancy theory.** *Tourism Manag* 2017, **59**:76–88, <https://doi.org/10.1016/j.tourman.2016.06.018>.
 49. Koletsou A, Mancy R: **Which efficacy constructs for large-scale social dilemma problems? Individual and collective forms of efficacy and outcome expectancies in the context of climate change mitigation.** *Risk Manag* 2011, **13**:184–208, <https://doi.org/10.1057/rm.2011.12>.
 50. Kollmuss A, Agyeman J: **Mind the gap: why do people act environmentally and what are the barriers to pro-**

- environmental behavior? *Environ Educ Res* 2002, 8:239–260, <https://doi.org/10.1080/13504620220145401>.
51. Kothé EJ, Ling M, North M, Klas A, Mullan BA, Novorodovskaya L: **Protection motivation theory and pro-environmental behaviour: a systematic mapping review.** *Aust J Psychol* 2019, 71:411–432, <https://doi.org/10.1111/ajpy.12271>.
52. Lacasse K: **Don't be satisfied, identify! Strengthening positive spillover by connecting pro-environmental behaviors to an "environmentalist" label.** *J Environ Psychol* 2016, 48:149–158, <https://doi.org/10.1016/j.jenvp.2016.09.006>.
53. Lam S-P, Chen J-K: **What makes customers bring their bags or buy bags from the shop? A survey of customers at a taiwan hypermarket.** *Environ Behav* 2006, 38:318–332, <https://doi.org/10.1177/0013916505278327>.
54. Lange F, Dewitte S: **Measuring pro-environmental behavior: •• review and recommendations.** *J Environ Psychol* 2019, 63: 92–100, <https://doi.org/10.1016/j.jenvp.2019.04.009>.
Reviews the validity and measurement of diverse proenvironmental behaviors and provides recommendations based on the research objectives.
55. Lauren N, Fielding KS, Smith L, Louis WR: **You did, so you can and you will: self-efficacy as a mediator of spillover from easy to more difficult pro-environmental behaviour.** *J Environ Psychol* 2016, 48:191–199, <https://doi.org/10.1016/j.jenvp.2016.10.004>.
56. Leary MR, Raimi KT, Jongman-Sereno KP, Diebels KJ: **Distin-guishing intrapsychic from interpersonal motives in psy-chological theory and research.** *Perspect Psychol Sci* 2015, 10: 497–517, <https://doi.org/10.1177/1745691615583132>.
57. Lewandowsky S, Gignac GE, Oberauer K: **The robust relation-ship between conspiracism and denial of (climate) science.** *Psychol Sci* 2015, 26:667–670, <https://doi.org/10.1177/0956797614568432>.
Comments that people who believe more conspiracies in general also are more likely to deny climate change.
58. Lindenberg S, Steg L: **Normative, gain and hedonic goal frames guiding environmental behavior.** *J Soc Issues* 2007, 63:117–137, <https://doi.org/10.1111/j.1540-4560.2007.00499.x>.
59. Lorenzoni I, Nicholson-Cole S, Whitmarsh L: **Barriers perceived to engaging with climate change among the UK public and their policy implications.** *Global Environ Change* 2007, 17: 445–459, <https://doi.org/10.1016/j.gloenvcha.2007.01.004>.
Human and Policy Dimensions.
60. Mannetti L, Pierro A, Livi S: **Recycling: planned and self-expressive behaviour.** *J Environ Psychol* 2004, 24:227–236, <https://doi.org/10.1016/j.jenvp.2004.01.002>.
61. Marlon JR, van der Linden S, Howe PD, Leiserowitz A, Woo SHL, Broad K: **Detecting local environmental change: the role of experience in shaping risk judgments about global warming.** *J Risk Res* 2019, 22:936–950, <https://doi.org/10.1080/13669877.2018.1430051>.
62. McDonald RI, Chai HY, Newell BR: **Personal experience and the "psychological distance" of climate change: an integra-tive review.** *J Environ Psychol* 2015, 44:109–118, <https://doi.org/10.1016/j.jenvp.2015.10.003>.
Reviews how psychological proximity can have productive or unpro-ductive effects on climate change concern and action.
63. Moser S, Kleinhüchelkotten S: **Good intents, but low impacts: •• diverging importance of motivational and socioeconomic determinants explaining pro-environmental behavior, energy use, and carbon footprint.** *Environ Behav* 2018, 50:626–656, <https://doi.org/10.1177/0013916517710685>.
Psychological variables appear to predict self-reported behavior but not actual impact, which is better predicted by income.
64. Noppers EH, Keizer K, Bolderdijk JW, Steg L: **The adoption of sustainable innovations: driven by symbolic and environ-mental motives.** *Global Environ Change* 2014, <https://doi.org/10.1016/j.gloenvcha.2014.01.012>.
Human and Policy Dimensions.
65. Onwezen MC, Antonides G, Bartels J: **The Norm Activation Model: an exploration of the functions of anticipated pride and guilt in pro-environmental behaviour.** *J Econ Psychol* 2013, 39:141–153, <https://doi.org/10.1016/j.joep.2013.07.005>.
66. Palomo-Vélez G, Tybur JM, van Vugt M: **Is green is the new sexy? Romantic benefits of conspicuous conservation.** *J Environ Psychol* 2021, 73:101530, <https://doi.org/10.1016/j.jenvp.2020.101530>.
67. Poortinga W, Whitmarsh L, Suffolk C: **The introduction of a single-use carrier bag charge in Wales: attitude change and behavioural spillover effects.** *J Environ Psychol* 2013, 36: 240–247, <https://doi.org/10.1016/j.jenvp.2013.09.001>.
68. Prentice-Dunn S, Rogers RW: **Protection motivation theory and preventive health: beyond the health belief model.** *Health Educ Res* 1986, 1:153–161, <https://doi.org/10.1093/her/1.3.153>.
69. Prochaska JO, Velicer WF: **The transtheoretical model of health behavior change.** *Am J Health Promot* 1997, 12:38–48, <https://doi.org/10.4278/0890-1171-12.1.38>.
70. Ryan RM, Deci EL: **Self-determination theory and the facilita-tion of intrinsic motivation, social development, and well-being.** *Am Psychol* 2000, 55:68.
71. Scheel AM, Tiokhin L, Isager PM, Lakens D: **Why hypothesis testers should spend less time testing hypotheses.** *Perspect Psychol Sci* 2020, 1–12. <https://journals.sagepub.com/doi/pdf/10.1177/1745691620966795>.
72. Schultz PW, Nolan JM, Cialdini RB, Goldstein NJ, Griskevicius V: **The constructive, destructive, and reconstructive power of social norms.** *Psychol Sci* 2007, 18:429–434, <https://doi.org/10.1111/j.1467-9280.2007.01917.x>.
73. Schwartz SH: **Universals in the content and structure of values: theoretical advances and empirical tests in 20 coun-tries.** *Adv Exp Soc Psychol* 1992, 25:1–65, [https://doi.org/10.1016/S0065-2601\(08\)60281-6](https://doi.org/10.1016/S0065-2601(08)60281-6).
74. Sexton SE, Sexton AL: **Conspicuous conservation: the Prius halo and willingness to pay for environmental bona fides.** *J Environ Econ Manag* 2014, 67:303–317, <https://doi.org/10.1016/j.jeem.2013.11.004>.
75. Shove E: **Beyond the ABC: climate change policy and the-ories of social change.** *Environ Plann: Economy Space* 2010, 42:1273–1285, <https://doi.org/10.1068/a42282>.
76. Sparks P, Shepherd R: **Self-identity and the theory of planned behavior: assesing the role of identification with "Green consumerism.** *Soc Psychol Q* 1992, 55:388–399, <https://doi.org/10.2307/2786955>.
77. Spence A, Poortinga W, Pidgeon N: **The psychological distance of climate change.** *Risk Anal* 2012, 32:957–972, <https://doi.org/10.1111/j.1539-6924.2011.01695.x>.
78. Steg L, Bolderdijk JW, Keizer K, Perlaviciute G: **An inte-grated framework for encouraging pro-environmental behaviour: the role of values, situational factors and goals.** *J Environ Psychol* 2014, 38:104–115, <https://doi.org/10.1016/j.jenvp.2014.01.002>.
79. Steg L, Lindenberg S, Keizer K: **Intrinsic motivation, norms and environmental behaviour: the dynamics of overarching goals.** *Int Rev Environ Resource Economics* 2016, 9:179–207, <https://doi.org/10.1561/101.00000077>.
80. Tabernero C, Hernández B, Cuadrado E, Luque B, Pereira CR: **A multilevel perspective to explain recycling behaviour in communities.** *J Environ Manag* 2015, 159:192–201, <https://doi.org/10.1016/j.jenvman.2015.05.024>.
81. Tabuchi H: **"Rolling coal" in diesel trucks, to rebel and provoke.** The New York Times; 2016, September 4. <http://www.nytimes.com/2016/09/05/business/energy-environment/rolling-coal-in-diesel-trucks-to-rebel-and-provoke.html>.
82. Tezer A, Bodur HO: **The Greenconsumption effect: how using green products improves consumption experience.** *J Consum Res* 2020, 47:25–39, <https://doi.org/10.1093/jcr/ucz045>.

83. Truelove HB, Carrico AR, Weber EU, Raimi KT, Vandenberg MP: **Positive and negative spillover of pro-environmental behavior: an integrative review and theoretical framework.** *Global Environ Change* 2014, **29**:127–138, <https://doi.org/10.1016/j.gloenvcha.2014.09.004>. Human and Policy Dimensions.
84. van der Linden S, Leiserowitz AA, Feinberg GD, Maibach EW: **The scientific consensus on climate change as a gateway belief: experimental evidence.** *PloS One* 2015, **10**, e0118489, <https://doi.org/10.1371/journal.pone.0118489>.
85. van der Linden S, Leiserowitz A, Maibach E: **The gateway belief • model: a large-scale replication.** *J Environ Psychol* 2019, **62**: 49–58, <https://doi.org/10.1016/j.jenvp.2019.01.009>.
Replicates that a scientific consensus message promotes constructive beliefs and emotions about climate change.
86. van der Werff E, Steg L, Keizer K: **The value of environmental self-identity: the relationship between biospheric values, environmental self-identity and environmental preferences, intentions and behaviour.** *J Environ Psychol* 2013, **34**:55–63, <https://doi.org/10.1016/j.jenvp.2012.12.006>.
87. Van der Werff E, Steg L, Keizer K: **I am what I am, by looking past the present: the influence of biospheric values and past behavior on environmental self-identity.** *Environ Behav* 2014, **46**:626–657, <https://doi.org/10.1177/0013916512475209>.
88. van Vugt M, Griskevicius V, Schultz PW: **Naturally green: harnessing stone age psychological biases to foster environmental behavior.** *Social Issues Policy Rev* 2014, **8**:1–32, <https://doi.org/10.1111/sipr.12000>.
Explores how socio-evolutionary psychological biases (shortsightedness) affect environmental behavior and suggests intervention strategies.
89. Vesely S, Klöckner CA, Brick C: **Pro-environmental behavior as a signal of cooperativeness: evidence from a social dilemma experiment.** *J Environ Psychol* 2020, **67**:101362, <https://doi.org/10.1016/j.jenvp.2019.101362>.
90. Whitmarsh L: **Are flood victims more concerned about climate change than other people? The role of direct experience in risk perception and behavioural response.** *J Risk Res* 2008, **11**:351–374, <https://doi.org/10.1080/13669870701552235>.
91. Whitmarsh L, Capstick S, Moore I, Köhler J, Le Quéré C: **Use of aviation by climate change researchers: structural influences, personal attitudes, and information provision.** *Global Environ Change* 2020, **65**:102184, <https://doi.org/10.1016/j.gloenvcha.2020.102184>. Human and Policy Dimensions.
92. Whitmarsh L, Corner A: **Tools for a new climate conversation: a mixed-methods study of language for public engagement across the political spectrum.** *Global Environ Change* 2017, **42**: 122–135, <https://doi.org/10.1016/j.gloenvcha.2016.12.008>. Human and Policy Dimensions.
93. Whitmarsh L, O'Neill S: **Green identity, green living? The role of pro-environmental self-identity in determining consistency across diverse pro-environmental behaviours.** *J Environ Psychol* 2010, **30**:305–314, <https://doi.org/10.1016/j.jenvp.2010.01.003>.
94. Wilson TD, Dunn EW: **Self-knowledge: its limits, value, and potential for improvement.** *Annu Rev Psychol* 2004, **55**: 493–518, <https://doi.org/10.1146/annurev.psych.55.090902.141954>.