Energy and Climate Change: Key Lessons for Implementing the Behavioral Wedge

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Introduction

The individual and household sector accounts for roughly forty percent of U.S. energy use and carbon dioxide emissions, yet the laws and policies directed at reductions from this sector often reflect a remarkably simplistic model of behavior. This Essay addresses one of the obstacles to achieving a "behavioral wedge"[1] of individual and household emissions reductions: the lack of an accessible, brief summary for policymakers of the key findings of behavioral and social science studies on household energy behavior. The Essay does not provide a comprehensive overview of the field, but it discusses many of the leading studies that demonstrate both the extent and the limits of rational action. These studies can inform lawyers and policymakers who are developing measures to reduce energy use and carbon emissions and can serve as an entry point for more detailed studies of the literature.

An effective response to the climate change problem will require substantial reductions in energy demand in addition to new developments in low-carbon energy supplies.[2] The individual and household sector presents a major opportunity; the sector accounts for roughly forty percent of U.S. carbon emissions and a comparable percentage of total U.S. energy consumption.[3] Additionally, it is one of the most promising areas for reducing emissions.[4] A recent analysis estimates that behavioral measures directed at this sector could reduce total U.S. emissions by over seven percent by

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1. See Thomas Dietz et al., *Household Actions Can Provide a Behavioral Wedge to Rapidly Reduce U.S. Carbon Emissions*, 106 Proc. Nat'l Acad. Sci. 18452, 18452 (2009) (introducing the concept of a "behavioral wedge" as the potential emissions reductions that could result from policies targeting household actions).

2. *See* Nathan S. Lewis, *Powering the Planet*, 2 Engineering & Sci. 12, 19 (2007); *see also* Steven Pacala & Robert Socolow, *Stabilization Wedges: Solving the Climate Problem for the Next 50 Years with Current Technologies*, 305 Science 968, 969 (2004).

3. *Compare* Shui Bin & Hadi Dowlatabadi, *Consumer Lifestyle Approach to U.S. Energy Use and the Related CO2 Emissions*, 33 Energy Pol'y 197, 205 (2005) (estimating twenty-eight percent and forty-one percent share of U.S. energy and CO2 emissions due to direct behavior), *with* Shui Bin, *Re-estimation and Reflection: The Role of Consumer Demand in US Energy Use and CO2 Emissions*, *in* 2004 American Council for an Energy-Efficient Economy Summer Study on Energy Efficiency in Buildings 7-40, 7-44 (2004), *available at* http://www.eceee.org/conference_proceedings/ACEEE_buildings/2004/Panel_7/p7_4/Paper/ (estimating that direct energy used in the home and personal travel accounts for thirty-eight percent, or 36.9 QBTU of 96.3 QBTU total national energy use and forty-one percent, or 2,384 MMT of 5,715 MMT of total national CO2 emissions). *See also* Gerald T. Gardner & Paul C. Stern, *The Short List: The Most Effective Actions U.S. Households Can Take to Curb Climate Change*, 50 Env't 12, 16 (2008) [hereinafter Gardner & Stern, *The Short List*] (estimating thirty-eight percent share of energy use); Michael P. Vandenbergh & Anne C. Steinemann, *The Carbon-Neutral Individual,* 82 N.Y.U. L. Rev. 1673, 1694 (2007) (estimating thirty-two percent share of U.S. CO2 emissions in 2000).

4. *See, e.g.*, Hannah Choi Granade et al., McKinsey & Co., Unlocking Energy Efficiency in the U.S. Economy 10, 29–31 (2009) (noting the magnitude of the efficiency opportunities in the residential sector); Thomas Dietz et al., *supra* note 1, at 18452 (concluding that 123 million metric tons of carbon emissions reductions could be achieved in ten years).

2020, an amount larger than the combined emissions from several of the largest-emitting industrial sectors, and larger than the total emissions of France.[5] In many cases, these emissions reductions can be achieved at less cost than the leading alternatives.[6]

Despite this opportunity, recent regulatory and policy efforts are only beginning to direct substantial attention to the individual and household sector.[7] Findings from the social sciences provide valuable insights into how to capitalize on this opportunity, yet policymakers often have little time to develop new policies and are confronted with a barrage of often-conflicting approaches and theories.[8] This Essay addresses the policymaking challenge by distilling the findings from a broad range of fields into several key principles for those developing energy and climate laws and policies. The principles we outline here are a starting point for policymakers working in this area. We attempt to provide insight into which principles are most relevant to law and policy, but instructions as to how to incorporate these principles are beyond the scope of this Essay. The principles include only a subset of the insights from the behavioral and social science literature. In many cases, adherence to multiple principles will be necessary to develop the most effective policy design. These principles are not ranked according to importance, nor do we claim that all ten are of equal importance. Policymakers should consult the body of work referenced here, as well as experts in the social sciences to further their understanding of these and other principles. More extensive reviews of this literature and its relevance to energy and climate policy are also available.[9]

Key Behavioral Principles

1. Price Plays an Important but Limited Role

Price clearly affects behavior; however, its impact is easily overstated. In some cases, price accounts for less variance in behavior than other factors such as personal commitment or social norms.[10] Policymakers often gravitate towards price-based mechanisms such as rebates or other incentives when attempting to influence product purchase decisions.[11] Although price offsets are often effective at inducing purchases of efficient products, studies find that when the monetary value of price incentives are held constant, participation rates can vary by a factor of ten as a result of other variables.[12] This can, at least partially, be explained by non-financial factors such as program marketing and management or the ease of participating in the program.[13] These data also suggest that the stronger the financial incentives, the more critical non-financial factors are in inducing participation.[14]

Additional data show that individuals can be induced to change their behavior even when they are not financially responsible for their energy costs.[15] Interventions such as real-time feedback or comparative energy reports can reduce consumption within the range of five to fifteen percent even without changes in price.[16] For example, interventions have successfully reduced energy use among office employees, dormitory residents, and individuals living on military bases even though none of those groups were financially responsible for their energy use. Policymakers should not assume that home metering or other demand-side management programs are only valuable if they are linked to variable pricing. If the political will does not exist to raise prices, or if fears about pricing create public resistance, then tinkering with rebates, tax-breaks, or other price based incentives could undermine an otherwise viable means of reducing energy use and carbon emissions.

5. Thomas Dietz et al., *supra* note 1, at 18452–53.
6. *See, e.g.*, Florian Bressand et al., McKinsey Global Inst., Curbing Global Energy Demand Growth: The Energy Productivity Opportunity 57–58 (2007) (noting that the residential sector may be one of the top two global opportunities for low-cost CO2 emissions reductions); Hunt Allcott & Sendhil Mullainathan, *Behavior and Energy Policy*, 327 Science 1204, 1204 (2010) (concluding that a behavioral intervention of the type recently implemented by OPOWER "scaled across the United States would net $2.2 billion per year over the program's life"); Michael P. Vandenbergh et al., *Climate Change: The Low-Hanging Fruit,* 55 UCLA L. Rev. 1701, 1758 (2008).
7. *See* Vandenbergh et al., *supra* note 6, at 1757.
8. *Id.* at 1756.
9. *See, e.g.,* Gerald T. Gardner & Paul C. Stern, Environmental Problems and Human Behavior (2nd ed. 2002) [hereinafter Gardner & Stern, Environmental Problems]; Douglas McKenzie Mohr, Fostering Sustainable Behavior: An Introduction to Community Based Social Marketing (1999); Paul C. Stern, *Environmentally Significant Behavior in the Home, in* The Cambridge Handbook of Psychology and Economic Behaviour 363–82 (Alan Lewis ed. 2008); Wokje Abrahamse et al., *A Review of Intervention Studies Aimed at Household Energy Conservation,* 25 J. Envtl. Psychol. 273 (2005); Paul C. Stern, *Blind Spots in Policy Analysis: What Economics Doesn't Say about Energy Use,* 5 J. Pol'y Analysis & Mgmt. 200 (1986) [hereinafter Stern, *Blind Spots*]; Paul C. Stern, *What Psychology Knows about Energy Conservation,* 47 Am. Psychol. 1224 (1992) [hereinafter Stern, *What Psychology Knows*]; Paul C. Stern et al., *Design Principles for Carbon Emissions Reduction Programs,* 44 Envtl. Sci. & Tech. 48747 (2010); Charles Wilson & Hadi Dowlatabadi, *Models of Decision Making and Residential Energy Use,* 32 Ann. Rev. Envtl. Res. 169 (2007).
10. *See* Thomas A. Heberlein & G. Keith Warriner, *The Influence of Price and Attitude on Shifting Residential Electricity Consumption From On- to Off-Peak Periods,* 4 J. Econ. Psychol. 107, 125 (1983); Jessica M. Nolan et al., *Normative Social Influence is Underdetected,* 34 Pers. & Soc. Psychol. Bull. 913, 920–21 (2008).
11. Stern, *Blind Spots, supra* note 9, at 202.
12. *Id.* at 210–11; *see also* Paul C. Stern et al., *The Effectiveness of Incentives for Residential Energy Conservation*, 10 Evaluation Rev. 147, 155–160 (1986) (providing a more detailed discussion of the data discussed in Stern, *Blind Spots, supra* note 9).
13. Stern, *Blind Spots, supra* note 9, at 211.
14. *Id.*
15. *See, e.g.*, Andrea H. McMakin et al., *Motivating Residents to Conserve Energy Without Financial Incentives,* 34 Env't & Behav. 848, 856 (2002) (describing military base example); John E. Petersen et al., *Dormitory Residents Reduce Electricity Consumption When Exposed to Real-Time Visual Feedback and Incentives,* 8 Int'l J. Sustainable Higher Educ. 16, 29 (2007) (describing dormitory example); Amanda R. Carrico, Motivating Pro-Environmental Behavior: The Use of Feedback and Peer Education to Promote Energy Conservation in an Organized Setting (May 20, 2009) (unpublished Ph.D. dissertation, Vanderbilt University) (on file with author) (describing workplace example).
16. *See*, *e.g.*, Karen Ehrhardt-Martinez et al., American Council for an Energy Efficient Econ., Advanced Metering Initiatives and Residential Feedback Programs: A Meta-Review for Household Electricity-Saving Opportunities (2010), *available at* http://www.aceee.org/research-report/e105; Wokje Abrahamse et al., *supra* note 9, at 278–80.

2. *Both Technology Adoption and Use Are Important*

Policymakers should target both product purchase decisions (i.e., efficiency) and product use (i.e., curtailment) to maximize the potential for emissions reductions within the individual and household sector. Efficiency improvements generally offer greater long-term potential for reducing energy use and emissions.[17] A more efficient product can achieve savings without relying on consumers to develop and maintain energy-saving habits and may reduce actual or perceived sacrifices in lifestyle and comfort sometimes associated with curtailment.[18] Purchasing an efficient product, however, also involves a greater up-front cost to the consumer. Additionally, because appliances are only retired and replaced after several years of use, savings may take longer to realize.[19]

Studies suggest that behavior is sometimes as important as the physical properties of a product.[20] The Twin Rivers project demonstrated that energy use in identically constructed homes with similar appliances and demographic characteristics varied by as much as 300% due to behavior.[21] Efficiency gains through technological innovation can also be weakened by "take-back" effects, in which a portion of the technologically achievable savings is offset by an increase in the use of energy.[22] For these reasons, policymakers should select a balance of behavioral targets based on their potential impact as well as the rate at which energy and emissions reductions can be realized and the level at which these reductions can be expected to be maintained. By enacting policies that address both the purchase of efficient products and their use, policymakers can increase the potential of both near- and long-term emissions reductions while reducing the magnitude of take-back effects.

3. *Economic Incentives Can Be Counterproductive*

Relying solely on economic incentives or disincentives to change behavior can lead to motivational crowding, which occurs when external rewards undermine intrinsic motivation, resulting in a reduction in the desired behavior.[23] Introducing external rewards or punishments in situations that are otherwise governed by moral norms has been shown to lead to an increase in self-interested behavior in some contexts.[24] For example, in an effort to reduce the number of parents who arrived late to pick up their children, a group of day care centers imposed a fine per child for any parent who arrived ten or more minutes late. Rather than reducing the number of late pick-ups, the fine had the opposite effect; late pick-ups nearly doubled during the weeks after the fine was introduced and remained at that level even after the fine was removed.[25] This principle is most relevant to behaviors that are performed frequently and when the financial incentives or disincentives are perceived to be relatively trivial.[26] Policymakers should therefore be careful to avoid introducing economic incentives or penalties to change behaviors that may already be governed by moral norms. When economic incentives or disincentives are deemed appropriate, policymakers should also consider reinforcing moral norms using other avenues such as public education.[27] There is some evidence that pairing economic disincentives with public outreach or moral persuasion can produce synergistic effects.[28]

4. *Decisionmaking Is Limited by Incorrect or Incomplete Information*

Policymakers should not assume that individuals make decisions on the basis of full and accurate information. Individuals often act in ways they perceive to be in their own self-interest, or to benefit the common good, when in fact their actions are counterproductive to these ends.[29] For example, the average individual in the United States believes it is both economically and environmentally beneficial to idle one's vehicle for three minutes or more before turning it off.[30] In fact, the Environmental Protection Agency recommends idling for no more than thirty seconds to save gas, reduce emissions, and prevent vehicle wear and tear.[31] In this case, it is estimated that inaccurate beliefs are associated with over eight million metric tons of carbon dioxide emissions

17. For example, purchasing a fuel efficient vehicle offers greater potential energy savings than the combined savings of carpooling, trip-chaining, reducing highways speeds, and avoiding sudden acceleration and stops. Gardner & Stern, *The Short List*, *supra* note 3, at 17.
18. *Id.*
19. *Id.*
20. *See* Loren Lutzenhiser, *Social and Behavioral Aspects of Energy Use*, 18 Ann. Rev. Energy & Env't 247, 269 (1993).
21. Robert Socolow, *The Twin Rivers Program on Energy Conservation in Housing: Highlights and Conclusions*, 1 Energy & Buildings 207 (1978).
22. For example, studies suggest that households tend to increase their thermostat settings during the winter after weatherizing their homes, resulting in a decrease in the potential energy saving based on the technologically achievable potential of the changes, *see* Eric Hirst et al., *Indoor Temperature Changes in Retrofit Homes,* 10 Energy 861 (1985); *see also* Mathias Binswanger, *Technological Progress and Sustainable Development: What About Rebound Effects,* 36 Ecological Econ. 119, 130 (2001); Horace Herring, *Energy Efficiency—A Critical View,* 31 Energy 10, 12 (2006).
23. *See* Bruno S. Frey, *Motivation as a Limit to Pricing,* 14 J. Econ. Psychol. 635, 658 (1993); *see also* Edward L. Deci et al., *A Meta-Analytic Review of Experiments Examining the Effects of Extrinsic Rewards on Intrinsic Motivation,* 125 Psychol. Bull. 627, 658–659 (1999).
24. Samuel Bowles, *Policies Designed for Self-Interested Citizens May Undermine "The Moral Sentiments": Evidence from Economic Experiments,* 320 Sci. 1605, 1608–09 (2008); Ann E. Tenbrunsel & David M. Messick, *Sanctioning Systems, Decision Frames, and Cooperation,* 44 Admin. Sci. Q. 684, 704 (1999).
25. Uri Gneezy & Aldo Rustichini, *A Fine is a Price*, 29 J. Legal Stud. 1, 3, 8 (2000).
26. Tenbrunsel, *supra* note 24, at 704 ("[W]eak sanctions intended to increase cooperation may actually reduce it.").
27. Bowles, *supra* note 24, at 1609.
28. For example, a tax on plastic grocery bags in Ireland paired with an aggressive media campaign led to a ninety-four percent drop in the use of plastic bags. Elisabeth Rosenthal, *Motivated by a Tax, Irish Spurn Plastic Bags,* N.Y. Times, Feb. 2, 2008, at A3, *available at* http://www.nytimes.com/2008/02/02/world/europe/02bags.html?pagewanted=1&_r=1. Combining public education with regulatory measures has also been successfully used to reduce vehicle idling in a number of Canadian communities. *See* Lura Consulting, The Carrot, the Stick, and the Combo: A Recipe for Reducing Vehicle Idling in Canadian Communities 6–7 (2005), *available at* http://oee.nrcan.gc.ca/communities-government/transportation/municipal-communities/reports/carrot-stick-combo/carrot-stick-combo.pdf.
29. *See* Amanda R. Carrico et al., *Costly Myths: An Analysis of Idling Beliefs and Behavior in Personal Motor Vehicles*, 37 Energy Pol'y 2881, 2886–87 (2009).
30. *See id.* at 2885.
31. *See id.* at 2884 (citing U.S. Envtl. Prot. Agency, 420-F-93-002, Your Car and Clean Air: What You Can Do to Reduce Pollution 3 (1994), *available at* http://www.epa.gov/OMS/consumer/18-youdo.pdf.

annually.[32] Additional surveys find large knowledge deficits, in general, among consumers regarding how to save energy, often leading them to over-emphasize the impact of curtailment behaviors and under-emphasize the impact of efficiency upgrades.[33] Although simply providing information to consumers is rarely sufficient to change behavior,[34] accurate and actionable information is often a necessary component to achieving this end.

5. *Decisionmaking Is Limited by Our Ability to Process Information*

A growing body of literature within psychology and behavioral economics reveals that individuals often make purchase decisions that are economically suboptimal in terms of the later operation costs.[35] Most relevant to the discussion of energy and climate change is the tendency for individuals to act as if they are applying steep discount rates when making product purchase decisions.[36] For instance, relative to the higher up-front cost of purchasing a more efficient appliance, consumers tend to devalue savings achieved through lower operating costs at a rate that is well above market value.[37] This may be partially due to uncertainties about potential savings or future energy costs;[38] however, additional data suggest that individuals may simply miscalculate potential savings associated with operating costs.[39] Consumers may also fail to consider operating costs altogether so that what appears to be a steep discount rate in an expected utility calculation may well be a decision made on a different calculus altogether.[40] Alternatively, consumers may rely on a third party to make product purchase decisions, such as a contractor or designer who does not see the financial benefit of an efficient purchase. As such, consumers often make product purchase and use decisions that are economically disadvantageous to the consumer when the lifecycle costs of operating a product are considered.[41] Well-designed labels and educated salespersons can provide information regarding lifecycle costs at the point of sale that consumers often fail to properly consider.

6. *Cognitive Costs Matter*

Traditional rational actor models tend to underestimate the cognitive costs associated with seeking out, evaluating, and acting on new information.[42] Individuals often fall prey to a "status quo bias" in which they revert to the default option due to its convenience, even when that option may be less preferable to the individual.[43] Major reductions in carbon emissions could be achieved by policies that specify default settings in such a way as to "nudge" consumers towards the economically or socially optimal options.[44] In many cases default settings are unavoidable, and current policies (or the lack thereof) are, in effect, nudging consumers towards less than desirable choices. For example, a policy requiring new water heater installations to be set at the Department of Energy's ("DOE") recommended level of 120°F, rather than the more typical residential setting of 135°F could substantially reduce emissions and energy costs for the consumer with no impact on comfort.[45]

Policies that take steps to make efficiency and conservation more convenient also have greater prospects for success.[46] Home efficiency programs that make it easy to find competent installers or that minimize the number of steps required to participate are more successful than those that require more effort on the part of the homeowner. For example, home insulation rebate programs that require a home energy audit for eligibility are less successful than those that do not require this extra step.[47] Governments and utilities

32. *See id.* at 2886.
33. Shahzeen Z. Attari et al., *Public Perceptions of Energy Consumption and Savings*, 107 Proc. Nat'l Acad. Sci. 16054 (2010); Thomas Dietz. *Narrowing the US Energy Efficiency Gap,* 107 Proc. Nat'l Acad. Sci. 16007 (2010); Willett Kempton et al., *Do Consumers Know "What Works" in Energy Conservation*, 9 Marriage Family. Rev. 115, 122 (1985).
34. *See*, *e.g.*, P. Wesley Schultz, *Knowledge, Information, and Household Recycling: Examining the Knowledge-Deficit Model of Behavior Change*, *in* New Tools for Environmental Protection: Education, Information, and Voluntary Measures 67, 71–72 (Thomas Dietz & Paul C. Stern eds., 2002) (concluding that information by itself is not an effective means of promoting recycling); Abrahamse, *supra* note 9, at 278; Carrico, *supra* note 15, at 89–90 (finding that a randomized and controlled field experiment showed little effect of an information-only campaign on energy consumption).
35. Dan Ariely, Predictably Irrational: The Hidden Forces That Shape Our Decisions (2008); George Loewenstein & Drazen Prelec, *Anomalies in Intertemporal Choice*, 107 Q. J. Econ. 573, 590–91 (1992).
36. Richard Howarth & Alan H. Sanstad, *Discount Rates and Energy Efficiency,* 13 Contemp. Econ. Pol'y 101, 104 (1995).
37. *See* Kenneth Gillingham et al., *Energy Efficiency Economics and Policy,* 1 Ann. Rev. Resource Econ. 597, 606 (2009); Jerry A. Hausman, *Individual Discount Rates and the Purchase and Utilization of Energy Using Durables,*10 Bell J. Econ. 33, 51 (1979); *see also id.* at 102.
38. *See* Adam B. Jaffe & Robert N. Stavins, *The Energy-Efficiency Gap: What Does It Mean?*, 22 Energy Pol'y 804, 805 (1994).
39. Willett Kempton & Laura Montgomery, *Folk Quantification of Energy,* 7 Energy 817, 826 (1982).
40. Daniel C. Feiler & Jack B. Soll, *A Blind Spot in Driving Decisions: How Neglecting Costs Puts Us in Overdrive,* 98 Climatic Change 285, 289 (2010).
41. *See* Jaffe & Stavins, *supra* note 38, at 805–06.
42. *See* Cass R. Sunstein & Richard H. Thaler, *Libertarian Paternalism Is Not an Oxymoron,* 70 U. Chi. L. Rev. 1159, 1162, 1198 (2003).
43. *Id.* at 1196. For an example of the effect of the status quo bias on rates of organ donation, *see* Eric J. Johnson & Daniel Goldstein, *Do Defaults Save Lives,* 302 Science 1338, 1339 (2003).
44. *See generally* Richard H. Thaler & Cass R. Sunstein, Nudge (2008).
45. The DOE recommends 120°F as a level that provides a water temperature that meets the needs of most users. *Energy Savers Tips on Saving Energy and Money at Home: Water Heating*, U.S. Dep't Of Energy, http://www1.eere.energy.gov/consumer/tips/water_heating.html (last visited Feb. 4, 2010). The DOE assumes 135°F as the standard set point of a water heater in households when determining energy demand. U.S. Dep't of Energy, Technical Support Document: Energy Efficiency Standards for Consumer Products: Residential Water Heaters app. at D-2.2 (2000).
46. *See* Paul C. Stern, *Information, Incentives, and Proenvironmental Consumer Behavior,* 22 J. Consumer Pol'y 461, 468–469 (1986) [hereinafter Stern, *Consumer Behavior*]; *see also* Stern, *What Psychology Knows, supra* note 9, at 1229. Studies suggest that the convenience of an action stands out as a primary predictor of whether an individual chooses to adopt it. For example, the availability of curbside recycling bins is the strongest predictor of whether a household recycles. *See* Glenda Wall, *Barriers to Individual Environmental Action: The Influence of Attitudes and Social Experiences,* 32 Can. Rev. Soc. & Anthrop. 465, 477 (1995). Similarly, Ludwig et al. show that placing recycling bins in college classrooms where drinks are consumed rather than in the hallway decreased the number of cans thrown in the conventional trash by fifty percent. *See* Timothy D. Ludwig et al., *Increasing Recycling in Academic Buildings: A Systematic Replication,* 31 J. Appl. Behav. Anal. 683, 685–686 (1998).
47. Stern, *Consumer Behavior*, *supra* note 46, at 469; *see also* Michael P. Vandenbergh et al., *Implementing the Behavioral Wedge: Designing and Adopting Effective Carbon Emissions Reduction Programs*, 40 Envtl. Law Rep. 10547,

tend to impose paperwork burdens on households to ensure accountability, but these are likely to substantially reduce participation. Successful programs may need to accept a certain level of misuse in order to achieve widespread adoption, but the benefits of widespread adoption may far outweigh the costs of the misuse. In a sense, too much attention to misuse can lead to policies that are suboptimal.

7. *Choices Depend on the Way the Options Are Framed*

Individual choices are not always grounded in a stable set of preferences as many in the field of law and economics have assumed. A large and growing body of literature suggests than even when the expected utility of a set of options is identical, individuals reliably prefer certain choices to others based on how those choices are framed.[48] For example, individuals favor a hamburger that is seventy-five percent lean over one that is twenty-five percent fat.[49] Likewise, consumers are more willing to invest in a water heater blanket when it is framed as a way to avoid losing money, rather than a way to save money.[50] Frames often invoke systematic deviations from what neoclassical economists would view as rational, such as the tendency for losses to loom larger than gains when outcomes are effectively equivalent, as evidenced in the water heater example used above.[51] In other cases, frames interact with an individual's previous experiences or ideological worldview to trigger certain responses. For example, the term "tax" triggers many negative associations among those who are ideologically conservative that the term "offset" does not.[52] Consequentially, more Republicans and Independents are willing to purchase a more expensive product when its cost is inflated due to a "carbon offset" rather than a "carbon tax."[53] In most cases, it is simply impossible to avoid framing information. Instead of attempting to avoid framing effects, policymakers should consult psychologists or behavioral economists when developing messages that frame choices. Policymakers should be careful to avoid frames that may be polarizing or prevent audience members from fully considering an argument or policy proposal. Similarly, we should not assume from an initial negative reaction that the public is unwilling to accept certain policy measures. Reframing an issue in a way that challenges the public's preconceived beliefs may stimulate more thoughtful consideration of an issue.

8. *People Do Not Always Act the Way They Feel*

When designing public education campaigns, decisionmakers often gravitate toward an attitude-persuasion model for changing behavior.[54] Although this approach may raise levels of awareness and concern, there are a host of other barriers—both psychological and structural—that often prevent individuals from acting the way they feel.[55] Individuals may hold strong values to protect the environment on an abstract level, but these values are often overcome by countervailing influences at the time when decisions are made, such as the desire for convenience or status.[56] For example, an individual may intend to reduce his or her driving, but a busy schedule or infrastructure barriers may interfere with these intentions.[57]

Marketing a behavior is thus very different from marketing a product. Traditional marketing approaches, which tend to target attitudes, have had some success in raising levels of awareness and concern, but have a poor track record when it comes to promoting behavior change.[58] Successful social marketing efforts will take a systematic approach to understanding the barriers that may prevent individuals from adopting a behavior, such as convenience, access, or psychological barriers such as perceptions of efficacy and control.[59] Programs designed to overcome or minimize these barriers (to the extent possible) have a greater likelihood of success. For example, programs to promote the use of smoke alarms have achieved adoption rates within the range of thirty-three to ninety-four percent using door-to-door canvassing to distribute alarms.[60] This method also expended less financial and volunteer resources than using flyers to inform households of free alarm giveaways.[61]

Behavioral targets should be selected based on the potential impact of changing a behavior as well as the likelihood that a behavior can be changed (i.e., plasticity). In many cases, changes in infrastructure (i.e., improved access to public transportation) may be necessary before social marketing or other behavioral interventions have any chance of success for that behavior.[62] Policymakers should be cognizant of these factors when allocating resources and should consult

10552–54 (2010) (comparing three federal policies to encourage efficiency investments according to their ease of use for the consumer).

48. *See* Daniel Kahneman & Amos Tversky, *Choices, Value, and Frames,* 39 Am. Psychologist 341 (1984); *see also* Amos Tversky & Daniel Kahneman, *Judgment Under Uncertainty: Heuristics and Biases,* 185 Science 1124, 1131 (1974); Loewenstein & Prelec, *supra* note 35, at 586–590.
49. Irwin P. Levin & Gary J. Gaeth, *How Consumers are Affected by the Framing of Attribute Information Before and After Consuming the Product,* 15 J. Consumer. Res. 374, 376 (1988).
50. S.M. Yates, Using Prospect Theory to Create Persuasive Communications about Solar Water Heaters and Insulation (1982) (unpublished Ph.D. dissertation, University of California, Santa Cruz) (on file with author); *see also* Stern, *What Psychology Knows, supra* note 9, at 1227–28.
51. *See* Stern, *What Psychology Knows, supra* note 9, at 1227–28.
52. David J. Hardisty et al., *A Dirty Word or a Dirty World? Attribute Framing, Political Affiliation, and Query Theory,* 21 Psychol. Sci. 86, 88 (2010).
53. *Id.* at 88.
54. *See* Gregory A. Guagnano et al., *Influences on Attitude-Behavior Relationships: A Natural Experiment with Curbside Recycling*, 27 Env't & Behav. 699, 700 (1995).
55. *See id.* at 700–02.
56. *See id.* at 713–14 (noting that the impact of attitudes on behavior are bounded by contextual factors that may reduce their applicability).
57. *See, e.g.*, Linda Steg & Charles Vlek, *Encouraging Pro-Environmental Behaviour: An Integrative Review and Research Agenda.* 29 J. Envtl. Psychol. 309, 312 (2009) (discussing the role of contextual factors in predicting pro-environmental actions).
58. *See* Mark Costanzo et al., *Energy Conservation Behavior: The Difficult Path From Information to Action*, 41 Am. Psychologist 521, 526–27 (1986).
59. *See* Douglas McKenzie Mohr, *Fostering Sustainable Behavior: An Introduction to Community Based Social Marketing*, 56 J. Soc. Issues 543, 546 (1999).
60. Van M. Ta et al., *Evaluated Community Fire Safety Interventions in the United States: A Review of Current Literature,* 31 J. Community Health 176, 180 (2006).
61. *Id.*
62. *See* Mohr, *supra* note 59, at 546–47.

experts in social marketing in addition to those who have expertise in product marketing.[63]

9. People Often Follow the Crowd

People generally do not like to be in the minority. Bringing attention to a common behavior within a population, termed a *descriptive norm*, will induce many individuals to conform to that behavior.[64] For example, learning that one's peers are taking steps to conserve energy, recycle, or even reuse a bathroom towel before sending it to laundry induces many to do the same.[65] A recent study has shown that providing utility customers with a bar graph displaying their monthly electricity use compared to that of a group of their comparable neighbors and a group of "efficient neighbors" led to a one to two percent reduction in electricity use through curtailment that persisted for up to a year after the intervention.[66]

Although logical on the surface, this psychological principle requires many to suspend intuition regarding how to motivate behavior change. Public information campaigns often begin with statements that explicate the scale of the problem.[67] By doing this, they may be inadvertently promoting the undesirable behavior by communicating a descriptive norm.[68] These findings indicate that it is better to emphasize what people are "doing right" than what they "aren't doing right."[69] When what is typical within a group is undesirable, it is better to emphasize what is desirable (i.e., an *injunctive norm*) while de-emphasizing the undesirable norm.[70] Furthermore, identifying and promoting "early adopters" of efficient technologies and behaviors may be a powerful means of triggering processes of normative influence, particularly when individuals are well-known or respected members of a community.[71] Work on diffusion of innovation suggests that the adoption of new technologies such as solar panels often follows patterns of social affiliation and group membership.[72]

10. People Strive for Consistency

Dissonance refers to the discomfort that is felt when a person holds contradictory ideas, cognitions, or behaviors.[73] For example, a self-proclaimed environmentalist would likely feel anxious about purchasing an inefficient vehicle or failing to recycle a plastic bottle. To reduce dissonance, individuals will modify an attitude, belief, or behaviors to bring them in line with one another.[74] Those interested in changing behavior have learned that calling attention to behavioral inconsistencies can motivate individuals to act more in line with the way they feel.[75] For example, individuals who express attitudes in support of resource conservation have been shown to curtail water and energy use after receiving feedback indicating that they are high users of a resource.[76] Individuals asked to make an upfront commitment are also more likely to follow through and adopt that behavior.[77] To our knowledge, this approach has not been studied with respect to efficiency decisions; however, individuals who hold positive attitudes towards the environment, or resource conservation in general, may be motivated by messages that prime them to consider the energy use impacts of their appliance purchase at the point of decision. Although there are deep political divisions over climate change, the majority of Americans value environmental protection and energy efficiency regardless of their political affiliations.[78] When the impact of one's purchase or product use decision is made salient, it may induce dissonance if the individual cannot otherwise rationalize his or her actions.[79]

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63. For an overview of social marketing techniques, *see id.* at 546–49.
64. Noah J. Goldstein et al., *A Room with a Viewpoint: Using Social Norms to Motivate Environmental Conservation in Hotels*, 35 J. Consumer Res. 472, 472–73 (2008).
65. P. Wesley Schultz, *Changing Behavior with Normative Feedback Interventions: A Field Experiment on Curbside Recycling,* 21 Basic Appl. Soc. Psych. 25, 26 (1998); P. Wesley Schultz et al., *The Constructive, Destructive, and Reconstructive Power of Social Norms,* 18 Psych. Sci. 429, 429–30 (2007); Goldstein et al., *supra* note 64, at 478–480.
66. Ian Ayres et al., *Evidence from Two Large Field Experiments that Peer Comparison Feedback Can Reduce Residential Energy Usage* 4, 7 (National Bureau of Econ. Research, Working Paper No. 15386, 2009). This data suggests that even larger gains may also be possible by tailoring home energy reports to high energy-using households. In this study, the highest energy users reduced their energy use by around seven percent while the lowest energy-using households (which received feedback that they used less energy than their peers) actually increased energy, again demonstrating the impact of social norms in both directions.
67. Robert B. Cialdini, *Crafting Normative Messages to Protect the Environment,* 12 Current Directions in Psychol. Science 105, 105–107 (2004).
68. For example, in an effort to reduce the amount of petrified wood stolen from park lands, Arizona's Petrified Forest National Park posted signs reading, "Your heritage is being vandalized every day by theft losses of petrified wood of 14 tons a year, mostly a small piece at a time." When the sign was changed to simply communicate that removing wood is undesirable (i.e., an injunctive norm) rates of theft declined from eight percent to just under two percent. *Id.* at 107.
69. *See id.*
70. *See id.*
71. Stephen Sawyer, *Leaders in Change: Solar Energy Owners and the Implications for Future Adoption Rates,* 21 Tech. Forecast & Soc. Change 201, 209 (1982).
72. John Darley, *Energy Conservation Techniques as Innovations and Their Diffusion,* 1 Energy & Buildings 339, 339 (1978); *id.* at 209. Additional work within the public health literature suggests that opinion leaders can have a powerful influence on behavior. For example, interventions that recruited popular members of the gay community to communicate messages about HIV/AIDS prevention led to a thirty percent decline in the percentage of individuals who reported having unprotected intercourse within that community. Jeffrey A. Kelly et al., *Randomised Controlled, Community-Level HIV-Prevention Intervention for Sexual-Risk Behaviour Among Homosexual Men in US Cities,* 350 Lancet 1500, 1504 (1997). For a replication of this effect, see also Jeffrey Kelly et al., *HIV Risk Behavior Reduction Following Intervention with Key Opinion Leaders of Population: An Experimental Analysis,* 81 Am. J. Pub. Health 168, 171 (1991).
73. *See* Leon Festinger, A Theory of Cognitive Dissonance 2–3 (1957).
74. *See id.* at 3.
75. *See* Chris Ann Dickerson et al., *Using Cognitive Dissonance to Encourage Water Conservation,* 22 J. Appl. Soc. Psychol. 841, 842 (1992).
76. Campbell K. Aitken et al., *Residential Water Use: Predicting and Reducing Consumption,* 24 J. Appl. Soc. Psychol. 136, 154, 156 (1994); S. J. Kantola et al., *Cognitive Dissonance and Energy Conservation,* 69 J. Appl. Psychol. 416, 420 (1984); *id.* at 850.
77. Michael S. Pallak et al., *Commitment and Voluntary Energy Conservation,* 2 Personality & Soc. Psychol. Bull. 27, 28 (1976).
78. Edward Maibach et al., *Saving Energy is a Value Shared by All Americans: Results of a Global Warming Audience Segmentation Analysis, in* Human Resources for Climate Solutions: Energy Smart Behaviors, People Centered Policies, and Public Engagement (Karen Ehrhardt-Martinez ed., forthcoming).
79. Wilson & Dowlatabadi, *supra* note 9, at 177.

Conclusion

The principles we present here are a starting point for decisionmakers to begin to incorporate social scientific findings into their analyses. Adding these insights can improve the prospects for success of laws, programs, and policies directed at individual and household behavior. To maximize the potential for success, policymakers should combine multiple approaches to behavior change, such as measures to reduce cognitive costs, increase motivation, and provide more actionable and pertinent information. In most cases, a single approach to changing behavior, such as the provision of information, is not sufficient to induce meaningful levels of behavior change and, therefore, multiple strategies are needed to target a wider audience and to encourage greater rates of adoption.[80] Policymakers should consult experts in the field, as well as the literature referenced here, to further their understanding of these principles and how to apply them.

80. Gardner & Stern, Environmental Problems, *supra* note 9, at 159.