



NUDGING TOWARD A HEALTHY NATURAL ENVIRONMENT

How behavioral change research
can inform conservation

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Executive summary

As the world's human population has surpassed 7 billion, few places on the globe escape the pervasive impact of our species. Human behavior constitutes the primary threat to the world's biodiversity both directly, via harvesting of living natural resources, and indirectly, as a result of habitat destruction, pollution, the introduction of invasive species, and climate change. While traditional policy tools, such as regulations, taxes, and subsidies, have been successful in achieving many conservation gains, continued environmental degradation has spurred interest in new “soft policy” approaches based on social and behavioral science that encourage the voluntary adoption of individual behaviors supportive of sustainable resource use. This paper synthesizes foundational knowledge from psychology and behavioral economics, and other applied fields like public health, to develop recommendations for incorporating behavioral-change interventions in promotion of the health and wellbeing of natural ecosystems. We identify five “areas of influence” that provide opportunities for promoting pro-environmental behavior: attitudes, agency, emotions, social norms, and environmental or decision context.

We discuss the ways in which these areas of influence might be utilized by conservation practitioners and provide a framework within an adaptive management structure for the implementation and evaluation of behavioral-change interventions targeted at individuals. Specific recommendations in considering programmatic development include:

1. Explicitly utilize evidence from social and behavioral sciences in the design of conservation initiatives.
2. When possible, include social science research within conservation programs in designing strategies, selecting behavioral targets, and evaluating results. There is

especially a need for experimental or quasi-experimental designs to identify causal relationships.

3. Develop and track social indicators for target sites (similar to ecological indicators) that represent attitudes toward conservation, perceptions of fairness, resource dependency, and other factors that influence the success of conservation efforts.
4. Bring behavioral change researchers and conservation practitioners together regularly at “consensus conferences” to identify the most important problem areas for research and application; target weaknesses in theoretical understanding to improve the effectiveness of conservation interventions; and agree upon consistent terms for behavioral change techniques and influential factors. Publish results in both the grey and academic literatures to encourage the adoption of standardized research frameworks.
5. Develop and manage a searchable database of field applications of behavioral interventions and outcome variables.
6. Develop tiered funding mechanisms for behavioral interventions and express a preference for experimental designs, when possible. Similar to medical research, interventions should be tested in controlled settings first, and then scaled up. This will allow for more efficient use of resources through an iterative approach to the design and framing of interventions.

While not all of these recommendations are novel, together they suggest a more comprehensive approach to improving conservation outcomes based on behavioral science.

Introduction

Many of the world's most vexing conservation problems result either directly or indirectly from people's everyday behaviors that, when multiplied by a global population of seven billion, places enormous pressures on habitats and natural resources, contributing to air and water pollution, land degradation and soil erosion, deforestation, species extinction, fishery depletion, water resource losses, and climate change. Successful interventions to conserve species and natural resources must change human decisions and behavior (Clayton & Myers, 2009; Saunders, Brook, & Eugene Myers, 2006; Schultz, 2011), but efforts to alter the ways people think and act are often ineffective, and may result in outcomes that are counterintuitive (Milner-Gulland, 2012), or even counterproductive to conservation goals (Barrett & Arcese, 1998). Research in psychology and behavioral economics can help to provide us with an understanding of the mechanisms at work in human actions and decision-making, and offer lessons that governments, including the United Kingdom and United States, have begun to incorporate into public policy (Dorning, 2010; Wintour, 2010). In turn, theoretically-informed behavioral change strategies are likely to be more effective than ad hoc approaches (Dombrowski et al., 2012; Glanz & Bishop, 2010; Taylor, Conner, & Lawton, 2012).

While conservationists have acknowledged the importance of social science insights in meeting biodiversity targets (Keane, Jones, & Milner-Gulland, 2012; Mascia et al., 2003; Redford, 2011; St. John, Edwards-Jones, & Jones, 2010), challenges remain in translating the voluminous academic research—which traverses the fields of psychology, economics, and neuroscience, among others—in a way that is both accessible and relevant for practitioners. There has been relatively little application of behavioral change research with respect to habitat, species, and natural resource conservation (St. John et al., 2010), especially when compared to

other fields like public health. The majority of empirical research on pro-environmental behavior has focused on energy use and recycling (Osbaldeston & Schott, 2012). Further, theoretical models have been assessed more frequently with data from western developed countries, while the focus of many conservation programs, which target highly biodiverse “hotspots,” is often on the developing world (Myers, Mittermeier, Mittermeier, da Fonseca, & Kent, 2000).

Recognizing these limitations, this report synthesizes research from psychology and behavioral economics in an effort to highlight the opportunities and challenges associated with influencing human behavior in diverse conservation settings¹. The focus is on addressing individual-level actions, which, in aggregate, have tangible impacts on ecological systems². These insights should be useful for both improving “traditional” conservation approaches (e.g., protected areas, payments for ecosystem services) and developing novel conservation interventions that directly target behavioral processes.

In the following sections we review the need for interventions that promote pro-environmental behaviors and provide a synopsis of the empirical evidence supporting their efficacy. We introduce guidelines for the development and implementation of behavioral interventions, and provide suggestions for the development of a more robust and coherent literature focused on individual behavior change and conservation. We close with a review of five important “areas of influence” for behavior change. A series of accompanying case studies illustrates the relationships between these factors and conservation outcomes.

¹ Due to the scope of this paper, we do not thoroughly explore implications of behavioral science research for the broad set of specific policy interventions currently being used in conservation. Further, we do not delve deeply into interactions between behavioral science and resource governance (institutions, community-based management, political economy, and property rights), or private sector conservation efforts.

² Our use of the term “conservation” speaks broadly to resource, habitat and species conservation, not specifically biodiversity conservation. As such, we use the term “pro-environmental behaviors” interchangeably with “conservation behaviors,” as have other authors (Monroe, 2003).

The behavioral science literature from psychology and behavioral economics is the focus of this report due to the unique relationship of the two fields and their implications for public policy formation. Economics has long been intertwined with policy, but psychology is a relative newcomer. In the 1970s, critiques by cognitive and social psychologists of economic models of individual decision-making gradually led the way to a behavioral approach within economics, and ground-breaking interdisciplinary work, such as that by psychologist and economic sciences Nobel laureate Daniel Kahneman (Shafir, 2013). This new perspective brought recognition that human judgment and behavior at times does not follow strict expected utility functions, and can be enormously influenced by characteristics of the social and physical environment, even those that may seem intuitively irrelevant. Empirical testing, frequently including experiments, in the design and evaluation of policy is a hallmark of this evolving multidisciplinary area, and has been termed “behavioral policy.” By providing an overview of the contributions these fields can make to conservation efforts, we hope to interest those who influence the shape and direction of many of these programs.

Traditional policies for changing behavior

Historically, public policy approaches to changing behavior have relied on either direct regulation (e.g., legal restrictions on product or resource use), or financial incentives (e.g., taxes or subsidies), assuming that people and organizations are primarily motivated by self-interest and material rewards or costs (Tyler, 2011). For instance, the harvesting and trade of endangered species is illegal in most countries, and many ecologically sensitive habitats are protected by limitations on access and/or allowable use. Germany imposes taxes on electricity produced from fossil fuels, in part due to the associated negative environmental impacts, and in the United

States, there are a number of programs designed to conserve endangered species and their habitats through subsidies and other incentive-based methods (Shogren, 2005).

Both regulations and financial incentives have been used with varying degrees of success in conservation settings³. Regulations that impose hard limits on behavior are “non-voluntary” (e.g., protected areas, hunting regulations, and endangered species laws); incentive-based approaches are “voluntary.” The focus on incentives has helped to “rationalize” regulations through the recognition that regulations often induce changes in behavior, sometimes with unintended consequences. For instance, in a study investigating the effects of the listing of the Preble’s meadow jumping mouse as threatened under the Endangered Species Act (ESA), researchers found the majority of landowners would not allow a biological survey due to concerns over regulation, and an equal number of respondents had managed their land to minimize mouse habitat as to improve it (Brook, Zint, & De Young, 2003). Economists have proposed a number of mechanisms to better align private and public incentives, and some of these recommendations have been incorporated into agency regulations (Shogren, 2005; Shogren et al., 1999). Understanding incentives and accounting for behavioral responses can help to lower the cost of achieving environmental standards.

Despite some successes of regulatory and incentive-based approaches for conservation, many environmental problems persist in both developed and developing nations. Environmental degradation often results from the aggregate effects of many seemingly-innocuous individual actions. Even when pro-conservation regulations and legislation are politically viable, individual behaviors are often challenging—if not impossible—to monitor and control. Difficulties in

³ Note that regulatory- and incentive-based approaches are used in a number of institutional settings, including top-down structures, community-based natural resource management regimes (CBNRM), and others.

verification and enforcement, in addition to cost, often preclude the effective use of both voluntary incentive-based approaches and non-voluntary regulatory measures. Problems of oversight are amplified in countries that lack the institutional capacity to enforce even minimal environmental restrictions on resource use. Add to this the widely held belief that environmental protection necessitates forfeited economic activity, and the result is that prospects for achieving increased environmental gains solely through regulation and legislation are not promising.

While institutional factors (e.g., strength of governance structures) are frequently to blame for non-effective interventions, social factors can also mediate the success of conservation efforts (Clements et al., 2010; Kronenberg & Hubacek, 2013; Milne & Adams, 2012). For instance, payments for ecosystem services (PES) are a common incentive-based approach for conserving important habitats. A recent study of a community conservation initiative for forest management in Peru (Cranford & Mourato, 2011) suggests that community conservation efforts—with a focus on education, social consensus, and consideration of alternative structural policy options—can help to create an environment in which PES schemes are more likely to succeed.

One of the contributions of psychology has been to understand that pro-social and pro-environmental motivations—including attitudes, values, identity, fairness, and trust—can be as strong, or stronger, than self-interest in obtaining public cooperation to achieve collective goals, and do not require the institutional infrastructure and financial commitments required for regulations and incentives, or commitments to their long-term implementation (Stern, 2000a; Tyler, 2013). Induced behavioral changes due to external sanctions and incentives are likely to cease when these motivations are removed; not so with behaviors that are intrinsically motivated. As a corollary, a second contribution has been that the understanding that motivations—

regardless of their orientation—are insufficient if situation-dependent factors in the physical and social environment present barriers to taking action (Campbell, 1963; Kaiser, Byrka, & Hartig, 2010). Taken together, these dynamics of people and places can open new vistas for more effective public policy development and implementation.

“Soft” policies for behavioral change

Evidence from psychology, the neurosciences, and behavioral economics can be useful for both restructuring traditional policy interventions and thinking about novel policy instruments that, while not limiting the choices of citizens directly or targeting monetary incentives, are still effective in changing behavior. These gentle pushes—or “nudges”—can include restructuring the way that choices are delivered; shaping physical and social environments to promote preferred actions instead of prohibiting others; and inspiring identification with common social goals, rather than paying people to behave in the community interest. The behavioral science foundation for these types of “soft policy” approaches is an understanding that the rational, analytical processing assumed by traditional economic models of human behavior (termed “Type 2”) does not account for the majority of decisions people make every day. In contrast, “Type 1” processing is part of our wider evolutionary heritage shared with other species. It automatically and swiftly processes environmental stimuli, and registers information from the environment in terms of frequencies and associations (Sloman, 1996), at times tagging it with overtones of negative or positive affect. This approach helps to explain why humans often rely on simple heuristics when making decisions, rather than methodically examining choice options, and can provide a theoretical basis for the power of environmental

context and choice design⁴. For example, in an experiment on portion size and popcorn consumption, when subjects were given larger buckets of popcorn, they unconsciously consumed one-third more than subjects given smaller buckets, even when the popcorn was 14-days old and described by subjects as “stale,” “soggy” and “terrible” (Wansink & Kim, 2005; Wansink & Sobal, 2007).

The biological advantage of humans’ ability to automatically respond to environmental cues is the low demand on our cognitive capabilities. Making choices exacts mental and physical costs (Vohs et al., 2008); thus, people rely on external cues (e.g., portion size) to reduce the quantity of information they consider, and the number of conscious decisions that must be made (Todd & Gigerenzer, 2012). Research on the interaction between the framing of choices, environmental cues, and behavioral outcomes has generated enthusiasm among policymakers for the pursuit of interventions under the banner of “nudges” and “libertarian paternalism,” in which situational contexts are designed to subconsciously influence decisions and behavior to improve individual and societal health and wellbeing (Thaler & Sunstein, 2008). Examples include requiring people to “opt-out” rather than “opt-in” to employer-subsidized savings programs; “decision-point prompts” such as those employed by hotel chains to encourage the re-use of towels and water conservation; and separating junk food from buffet lines to reduce temptation. Insights from experiments in the lab and in the field offer hope for a broad set of “low cost, low pain” tools to nudge citizen behaviors toward pro-social goals for health, financial welfare, reduced crime and environmental sustainability (Dolan et al., 2012; Dolan, Hallsworth, Halpern, King, & Vlaev, 2010).

Recognizing that individual behavior often deviates from core assumptions in traditional

⁴ The purposeful design of a decision-making context.

economic models, behavioral economists have proceeded to integrate insights from psychology into descriptive models of human behavior. This research is generally focused on understanding three phenomena: bounded rationality, bounded self-interest, and bounded willpower (Mullainathan & Thaler, 2000; Shogren, 2012). All three of these categories of deviations from the economic model of rational choice can significantly influence conservation outcomes, particularly when there are systematic biases within populations. “Bounded rationality” reflects people’s cognitive limitations in processing information, calculating probabilities, and understanding risk. For instance, individuals systematically overestimate the likelihood of low-probability risks and underestimate the likelihood of high-probability risks. Further, instead of evaluating choice options thoroughly, people will often use “rules of thumb”—or heuristics—to make decisions, or prefer a known (but perhaps inferior) status quo. “Bounded willpower” refers to people’s demonstrated lack of self-control and incoherent preferences, whereby stated preferences differ from actions. For example, the observation that many people consume products that lead to their poor health, despite a stated desire for increased wellbeing, has led to a push for paternalistic policies, such as limiting the size of sugary drinks and restricting ingredients in processed food (Grynbaum, 2012). Finally, “bounded self-interest” captures the fact that many people act in altruistic ways, perhaps motivated by concerns for social fairness and justice, or environmental preservation, and are influenced by the attitudes and behaviors of others.

These motivations can be particularly important in the maintenance of collective goods, such as environmental protection. For example, one experiment demonstrated the importance of visible public commitments to sustainable fishing practices, especially in influencing the behaviors of those less environmentally conscious (Mosler, 1993), demonstrating that people

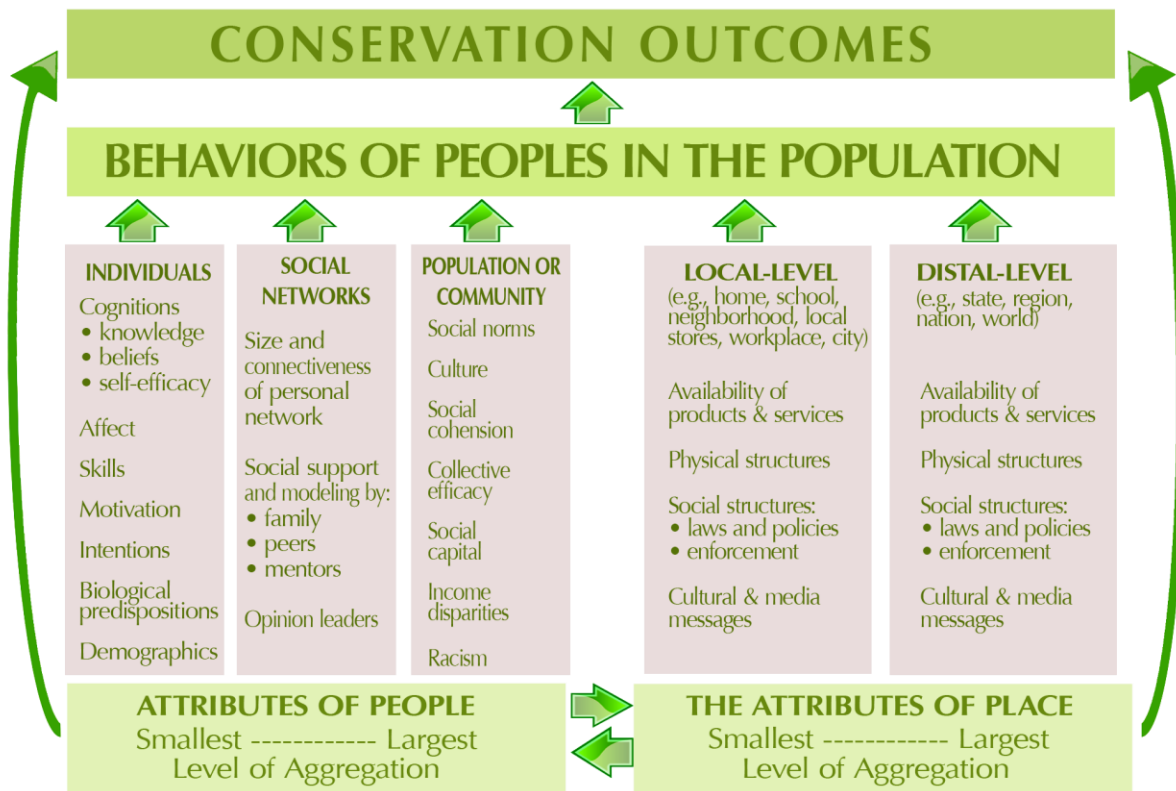


Figure 1. A social ecological framework for conservation outcomes based on the “People & Places” model for public health by Maibach and colleagues (2007).

will voluntarily engage in pro-social behavior even if it results in restrictions on their self-interest, e.g., their immediate ability to take more fish from stocks.

The range of ways in which individuals’ behavior can be influenced can be conceptualized as a social ecological model, such as that developed by Maibach and colleagues (Maibach, Abrams, & Marosits, 2007) (Figure 1). The “People & Places” framework demonstrates multiple “fields of influence” that affect behavioral change: not just within individuals (such as their beliefs, skills and intentions), but their social networks, and characteristics of their community and physical environment. Within each of the five fields,

represented as columns, relevant attributes of people and places signify potential targets for influencing behavior. Notably, within this figure, individual knowledge—the facts that people need to know to make a decision—represents only a small fraction of the overall influences on their behavior, while social and situational factors loom large. The authors recommend that behavioral change practitioners should consider all fields of influence, selecting one or more of them in designing interventions to increase their odds of success. In this report, we address a selected number of attributes representative of the five fields of influence from within this framework: attitudes, personal agency, emotion, social norms, and environmental context.

Of particular relevance to international conservation efforts, the People & Places model also distinguishes between two critical fields of influence—local versus distant contexts—capturing one of the key dynamics in globalization, in which drivers of environmental degradation may be far removed from its impacts, necessitating the development of international environmental agreements. For example, palm oil production for global use in processed foods and consumer products results in biodiversity losses in Southeast Asia (Foster et al., 2011), and the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) serves as one example of a distal factor that—while considered effective—has also spurred unintended behavioral changes in the development of illegal trade in tigers and rhinoceros species (Brooks, Wright, & Sheil, 2009).

Distilling lessons for evidence-based practice from research

Evidence from studies of pro-environmental behavioral change and other applications such as public health suggests behavioral interventions can be very effective. For instance, a 2012 meta-analysis of promotion of pro-environmental behaviors found statistically significant

effects associated with 10 different types of interventions (Osbaldiston & Schott, 2012). Research from public health has provided further confidence. A synthesis of meta-analyses based on 1,011 investigations found small to medium effects for behavioral change interventions (Johnson, Scott-Sheldon, & Carey, 2010). Before selecting interventions, practitioners should question not only whether they work, but how well they work, how they work, for whom they work, and under what circumstances (Michie & Abraham, 2004; Pawson & Tilley, 1997). Ideally, interventions selected for broad-scale implementation should be supported by evidence from experimental field or laboratory trials, and should evince effect sizes that justify intervention costs. Research programs that publicly generate these types of quantitative data and identify causal links between interventions and behavioral changes to allow for objective evaluation add to the evidentiary base, and, in doing so, further the progress and effectiveness of subsequent research and conservation efforts.

While the volume of studies on individual behavior change relevant to impacts on natural resource, habitat, and species conservation is not large, the general behavioral change literature from which to draw upon is vast. Recent reviews have included numerous models and theories (Darnton, 2008; Jackson, 2005), which can be divided between those that predict whether or not an action is taken, those that focus on the process of behavior change (Fishbein et al., 2001), and applied processes that prescribe an entire management cycle of formative research, strategy development, implementation, and evaluation (Maibach, 1993; McKenzie-Mohr & Smith, 1999).

Building behavioral science into conservation efforts

It is increasingly recognized that the success of conservation efforts is inextricably linked to the social, political, and cultural landscape in which interventions are implemented, and that

lessons from social psychology and other behavioral science fields can be useful when implementing conservation programs (DeCaro & Stokes, 2008). Conservation psychology is an example of a field that was specifically created a decade ago to foster these types of connections among the natural and social sciences, and between researchers and practitioners (Saunders, 2003). For instance, Saunders et al. (2006) illustrate three challenges for biodiversity conservation that can be addressed through a better understanding of human psychology and behavior: (1) creating a shared language to describe conservation problems and communicate them effectively; (2) resolving natural resource conflicts and creating opportunities for collaboration; and (3) recognizing the linkages between people's values and their environmental attitudes and behaviors.

In evaluating the historical success of marine protected areas (MPAs) in achieving biological goals, Pomeroy et al., write: “[e]xperience shows that social, cultural, economic and political factors, more than biological or physical factors, shape the development, management and performance of MPAs” (2004). Further, some organizations, such as World Wildlife Fund (WWF), Rare, and The Nature Conservancy (TNC)⁵, have been making significant progress incorporating principles from the behavioral and social sciences in their conservation programs. Rare is perhaps unique among conservation organizations in advancing these themes, using behavioral-change principles from social marketing⁶ as the basis for targeting individuals’ knowledge, attitudes, and interpersonal communication in designing its community-based programs (Rare, n.d.). WWF measures the social impacts of its conservation programs, and

⁵ See The Nature Conservancy’s “People and Conservation”:
<http://www.conservationgateway.org/ConservationPractices/PeopleConservation/Pages/people-and-conservation.aspx>.

⁶ Social marketing is defined as the use of commercial marketing techniques to promote voluntary pro-social behavior changes (Andreasen, 1994).

assesses the environmental and economic conditions that lead to successful community strategies⁷.

Yet the explicit incorporation of theory and evidence from the social/behavioral sciences in programmatic design is not universally common. For example, consider the Conservation Measures Partnership (CMP) model of adaptive management, which has developed the “Open Standards for the Practice of Conservation” (OS) in an effort to provide conservation practitioners with guidelines for the formulation of conservation interventions, from conception to implementation, evaluation and dissemination of results (Conservation Measures Partnership, 2007). The Standards have been utilized effectively to design, implement and audit conservation initiatives (O’Neill, 2007), and have been praised for their relatively flexible structure, ease of use, and systematic focus on information sharing and objective evaluation (Schwartz et al., 2012). However, while stakeholder engagement is a key component of these programs—as well as an emphasis on understanding the social, cultural, and economic context of a given situation—systematically evaluating intervention effects using key social, cultural, and economic indicators is still at an early stage (Leisher, Samberg, van Buekering, & Sanjayan, 2013).

Recognize social, cultural, and economic factors. Bringing social and behavioral scientists into the early program-design process may help practitioners identify additional social, cultural, and economic opportunities—and barriers—to achieving conservation outcomes. While many conservation programs are explicit about the need for evaluation of the social and cultural setting in which interventions are to be applied, we suggest it is important to go even further, acknowledging and utilizing recent research from behavioral science as part of the diagnostic

⁷ See WWF’s “Assessing the Impact of Conservation”: <http://worldwildlife.org/initiatives/assessing-the-impact-of-conservation>

process. For example, understanding social context and preferences is important when considering the potential effectiveness of PES programs, as strong private conservation incentives may be “crowded out” by market incentives (Pattanayak, Wunder, & Ferraro, 2010). Kerr et al. (2012) show that in Tanzania, while high payments to individuals do not undermine participation in communal tasks, they do appear to reduce the satisfaction felt by those exerting effort. Further, in Mexico, they find that communal payments lead to lower participation rates in group tasks when people distrust their leaders, as compared to the no-payment alternative.

A more general risk of conservation interventions is the possibility that existing social norms, including environmentally-protective taboos and related informal institutions, may be undermined by efforts to introduce broad-based reforms (St. John et al., 2010). For instance, Aswani et al. (2012) caution about the potential consequences associated with ecosystem-based management in coastal areas in the South Pacific that currently operate under customary tenure rules, as these rules offer a backstop in the case of unintended institutional vacuum and can often be leveraged to reinforce more extensive conservation efforts. Understanding the strength of cultural and community customs and norms, as well as any informal institutions that currently exist, may help to avoid inadvertently dismantling existing governance structures⁸. Additionally, local norms related to fairness can mitigate or increase the need for monitoring and enforcement of environmental regulations. For example, Zhiyuan et al. (2012), describing the results of a laboratory experiment in China, suggest that normative perceptions of fairness may play a role in ensuring cooperation with conservation efforts in low-monitoring situations. Specifically, they find that potential violators of conservation rules may be dissuaded by the possibility that their

⁸ Paying heed to these concerns can also reduce the risk that conservation efforts that either fail to precipitate improved social outcomes or otherwise fail (due to funding, etc.) will undermine subsequent conservation efforts (Aswani et al., 2012).

neighbors may lose subsidies that are contingent on conservation outcomes.

Collection and tracking of key social indicators. The systematic collection and tracking of project-specific qualitative and quantitative social, economic, and cultural variables may offer broader opportunities for meeting the program evaluation goals of CMP's Open Standards and other collaborative initiatives. Biological and ecological indicators (presence of keystone species, measures of diversity or density) distill complex ecological knowledge into measurable and comparable variables. Indicators can be tracked temporally and spatially, and are useful for measuring conservation progress, as well as communicating trends to policymakers and the broader public. The P-MAP approach developed by Stephenson and Mascia was specifically developed to complement the CMP planning model through the addition of social indicators (2009). It presents a framework for measuring both indicators and benchmarks of social well-being across five domains: health, education, culture, political empowerment, and economic well-being. Millennium Development Goals Indicators (United Nations, n.d.) and government surveys present rich data sets for this use, if at times not on the same geographic scale as needed for conservation project evaluation and planning (Stephenson & Mascia, 2009). TNC also recently developed guidelines for the development and incorporation of social indicators as part of conservation efforts (Wongbusarakum, Hadley, & Kroeger, 2013), and social indicators have been used in practice, including as part of the implementation of REDD+ programs aimed at reducing tropical deforestation. TNC's Leisher and colleagues recently reviewed 31 indices of human well-being, recommending Stiglitz and colleagues' 2009 report (Leisher et al., 2013; Stiglitz, Sen, & Fitoussi, 2009). They found typical focal areas for human well-being include living standards, health, education, social cohesion, security, environment, governance, work-life balance, subjective well-being, equity, and culture. Especially important perhaps are factors that

closely relate to the robustness of informal institutions and norms that govern natural resource extraction and other environment-related behaviors in natural-resource dependent communities, particularly those lacking formal institutions or strong private property rights.

Developing behavioral interventions programmatically

Insights from behavioral research can be useful for the development, implementation, and evaluation of novel conservation interventions. Extensive analysis has already been done to determine which types of individual behavioral changes result in the largest reductions of energy consumption and subsequent greenhouse gas emissions (Dietz, Gardner, Gilligan, Stern, & Vandenberg, 2009; Gardner & Stern, 2008). Within the field of public health, systematic assessments of key theoretical constructs and associated behavioral change techniques have been proposed for the research and implementation of targeted interventions (Abraham & Michie, 2008; Michie et al., 2005). Similar efforts to methodically categorize and quantify behavioral impacts and intervention successes within the conservation realm are more rare. While in recent years, there have been a number of efforts to identify top priorities and research questions for conservation generally (Fleishman et al., 2011), and more specifically global biodiversity (Sutherland et al., 2009, 2011)⁹, there is no consensus on which individual behaviors are most important to address when pursuing specific conservation outcomes. Habitat destruction, introduction of invasive species, and air and water pollution all pose threats to biodiversity conservation and represent effects from distinct types of individual behaviors that are differentially motivated, amenable to change, and impactful. This problem is aggravated by the

⁹ In 2009, one of the exercises resulted in 15 priority research questions for the development of more impactful conservation interventions that have social components (Sutherland et al., 2009).

wide variety of conservation goals that may be considered priorities: not just species preservation, but that of entire ecosystems, indeed the health of global physio-biogeochemical processes, including Earth's oceanic and climatic systems. Conservation Evidence (www.ConservationEvidence.com) provides one model for narrowing the scope, identifying specific interventions for a species or habitat with empirical bases for support. Developing similar databases and synopses of behavioral science case studies, including not only targeted conservation behaviors, but systematized constructs and techniques, would likely advance researcher and practitioner ability to detect causal mechanisms and trends¹⁰.

Evidence suggests that interventions utilizing theoretical knowledge and empirical evidence are more effective for influencing behavior (Dombrowski et al., 2012; Glanz & Bishop, 2010; Taylor et al., 2012). Further, there is considerable knowledge to be gained in testing interventions as part of multi-stage process of implementation and evaluation (McKenzie-Mohr & Smith, 1999; Steg & Vlek, 2009). Figure 2 demonstrates a development cycle for behavioral change programs, not unlike other models of adaptive management in conservation (Conservation Measures Partnership, 2007). The process can be broken into four general components: (1) research to create the optimal program design for the desired conservation outcome (e.g., selection of behaviors, audiences, factors, techniques), (2) pilot testing the strategy, (3) implementing the final strategy, and (4) evaluation, which feeds back into the design of subsequent programs¹¹.

Selecting behaviors to target. Determining specific behaviors or actions to target with interventions may seem straightforward, but in practice can prove difficult, particularly when

¹⁰ For a related online resource, see <http://www.conpsychmeasures.com/CONPSYCHMeasures/>.

¹¹ These steps are also part of recommended strategies within community-based social marketing programs (McKenzie-Mohr, 2002).

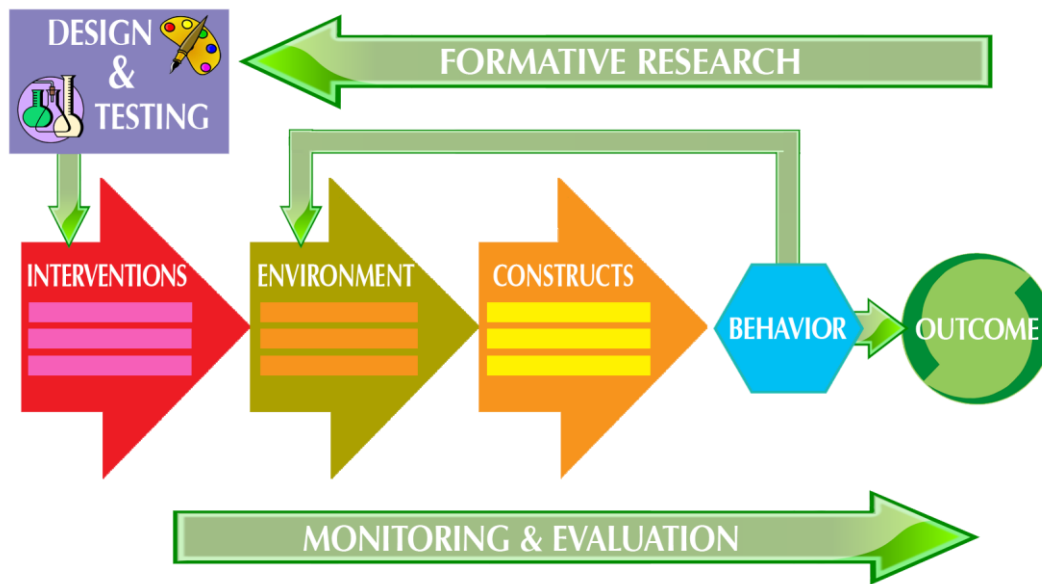


Figure 2. A process map for creating and evaluating evidence-based behavioral change interventions (Aunger & Curtis, 2007). Interventions shape the environment in a ways that influence constructs—or factors—known to lead to the behavior, and in turn affect conservation outcomes.

there exists little quantitative data on (a) the aggregate environmental impacts of the behavior, in isolation from other human behaviors and activities, (b) the current extent of behavioral practice, and, (c) the probability of an intervention targeted at a particular factor leading to behavior change. These three factors determine the space in which a given behavioral change program will either succeed or fail. In a world of limited program funds, where multiple behaviors in the population frequently contribute to an identified conservation problem, it is important to know where programs may get the biggest bang for their buck (Gardner & Stern, 1996).

Types of behavior change can be divided into three categories: curtailment of the activity; changing to a different action; and, adoption of technological solutions (e.g., energy-efficient products) (Clayton & Myers, 2009). The latter is often easier to achieve because it requires a

one-time purchase instead of long-term maintenance of the behavioral change, and is viewed as an improvement (Stern, 1992). When quantitative measures of the impacts of behaviors and the likelihood of adoption new practices are known, a weight for each contributing behavior can be generated, providing a means of comparing the predicted effectiveness of different targets for intervention (see equation below) (McKenzie-Mohr, Lee, Schultz, & Kotler, 2011). Larger weights indicate a behavior for which behavioral change interventions would be more likely to result in improvements to the desired outcome. Weight-to-program cost ratios can then be developed, providing an objective, ex-ante measure of the expected return across various program alternatives.

$$\text{Weight} = \text{Impact} \times (1 - \text{Practice}) \times \text{Probability}$$

For example, in considering household measures to reduce carbon dioxide emissions—the installation of high-efficiency showerheads versus five compact fluorescent light bulbs—the showerhead program was shown to likely be more impactful as it presents much larger potentials for greenhouse gas reductions (see Table 1) (McKenzie-Mohr et al., 2011, p. 9).

Audience identification. The selection of behaviors to target should be made concurrently with the selection of an audience for the interventions. Characteristics such as socioeconomic status, cultural values, awareness of environmental issues, and current behaviors can allow for the tailoring of interventions, as well as the targeting of specific sub-groups identified as particularly engaged or otherwise likely to be responsive to a given behavioral change technique (Forthofer & Bryant, 2000). For example, *Global Warming's Six Americas*, an

Table 1
Comparing behaviors: Impact, audience size, and probability of change

	Pounds of CO ₂ /household/year	% of population practicing behavior	Probability of behavioral change	Comparison weight
High-efficiency showerhead	400	.40	2.2	352
Installation of 5 compact fluorescent bulbs	100	.20	3.4	68

Taken from McKenzie-Mohr et al. 2011.

audience segmentation of global warming beliefs, attitudes and behaviors (Maibach et al. 2011), represents such an analysis designed to achieve pro-environmental goals, and has been used by a number of organizations, including zoos and U.S. federal agencies.

Surveys are one means of acquiring information for the purpose of identifying and segmenting audiences. Other techniques can include focus groups, in-depth interviews with individuals in the population, and observational studies of people conducting the behaviors. In one innovative study, the authors used a survey to map prevalence of population pro-environmental behaviors for a region of the Netherlands in order to determine target audiences, and those behaviors that are neither so popular nor so difficult that they would be unsuitable for promotion (Kaiser, Midden, & Cervinka, 2008).

Designing a strategy: Factors and techniques. Program strategies can be divided into two related components: the specific factors that are targeted to affect a behavioral change (such as knowledge, attitudes, or environmental barriers), and the techniques employed to do so. The influence of any factor on the behavior in question may vary significantly depending on the desired action and its specific context (McEachan, Conner, Taylor, & Lawton, 2011). This suggests the need for greater natural resource conservation-specific analyses of behavioral

change techniques, as lessons from other fields, and even other environmental domains, may not always apply.

In addition, some intervention techniques work effectively for multiple behavioral factors, and others are more limited (Abraham & Michie, 2008). For example, a simple sign may remind people to enact a behavior they have already committed to, such as turning off lights when exiting a room, while a radio drama in the developing world scripted to convey pro-social goals may convey information, transmit social norms, and model new behaviors. Theoretical research coupled with experimental evidence is important for determining both the factors that are most responsive to interventions and the most effective mechanisms for influencing them, yet exploratory studies are expensive, time-consuming, and not always feasible in the field. Table 2 describes a four-step process for program design and evaluation with respect to encouraging pro-environmental behavior.

Implementation and evaluation. In an ideal conservation program, the process cycle for managing behavior change programs forms a complete circle: the evaluation of behavior changes induced by an intervention generates useful data and information about the important factors of influence, and the efficacy of various techniques. These data are then analyzed, leading to an improved understanding of the causal mechanisms, which then feeds back into formative research for project continuation or subsequent programs.

Mascia et al. (in review) suggest measurement and evaluation can be implemented in a number of different ways, and at different stages of the management cycle: pre-, post-, or during the intervention. The authors break the approaches into five categories—ambient monitoring, management assessment, performance measurement, impact evaluation, and systematic review—each answering a different question.

Table 2
Four questions for program design and evaluation

1. Which behaviors should be changed to improve conservation outcomes?
–*Highly significant **impact** to conservation, low levels of current **practice**, and high **probability** of behavioral adoption*
–*Identify the groups of people who will be the focus of the campaign*
2. Which factors determine the relevant behavior?
–*Attitudes, agency, emotion, social norms, environmental context*
3. What is the most optimal strategy to address those factors?
–*Choose techniques to influence one or more factors (examples: augmenting pro-behavioral messaging, altering perceptions of social norms, increasing feedback, changing decision contexts, or reducing opportunity barriers)*
4. Does the strategy work? (Pilot testing and evaluation)
–*Evaluate for changes in the factors that influence the behavior, the behavior itself, impacts on conservation, other individual and social impacts*

Adapted from McKenzie-Mohr et al. (2011), and Steg and Vlek (2009).

These questions include:

- What is the social and physical environment like, and how is it changing?
- What is the flow of activities, inputs and outputs over the course of the intervention?
- Is the intervention achieving targeted goals?
- What are the impacts of the intervention, either intended or unintended?
- How weak or strong is the evidence on the effectiveness of the intervention?

Organizations such as CMP, the Center for Evidence-based Environmental Policies and Programs (CEEP), the Collaboration for Environmental Evidence (CEE), the Environmental

Evaluators Network (EEN), and the Abdul Latif Jameel Poverty Action Lab (J-PAL), among others, support the need for better evaluation of conservation programs. While a full discussion of the importance of evaluation is outside the scope of this paper, we recommend consideration of experimental design principles when implementing conservation programs (Salafsky, Margoluis, & Redford, 2001). These can be either passive-design—taking advantage of natural system variation—or of active-design through the purposeful implementation of control and treatment subgroups (Ferraro & Pattanayak, 2006; Ferraro, 2009).

Whereas behavioral interventions have been implemented and evaluated with field experiments (notably, energy and water consumption interventions) (Allcott & Mullainathan, 2010; Ferraro & Price, 2013), in the broader practice of conservation, field experiments are rare (Ferraro & Pattanayak, 2006). Barriers to performing field experiments within environmental programs include conservation practitioners' unfamiliarity with social- and behavioral-science approaches to experimentation, the complications associated with managing large-scale, site-specific conservation programs, the difficulty of defining appropriate indicators against which outcomes are judged, and tight program budgets that cannot justify significant monitoring efforts in areas that have not been targeted for intervention (Ferraro, 2009). Further, and similar to treatment-control clinical drug experiments (Emanuel, Wendler, Killen, & Grady, 2004), there may be ethical concerns associated with withholding potentially successful interventions at control sites, and there is often a strong desire to target interventions to those areas which appear *ex-ante* more likely to yield successful outcomes.

In the absence of explicit experimental design, quasi-experimental methods can often be used to evaluate interventions or factors of behavior change *ex-post* (Miteva, Pattanayak, & Ferraro, 2012). Quasi-experimental methods use well-established econometric techniques to

isolate treatment effects and allow for causal inference. However, a necessary requirement is that there exist appropriate data, further supporting the development and tracking of social, cultural, and economic indicators discussed above.

Finally, even when quantitative experimental and quasi-experimental evaluations are not feasible, evaluative frameworks exist for judging the management effectiveness of conservation programs (Margoluis, Stem, Salafsky, & Brown, 2009; Mascia et al., in review), and secondary sources and expert judgment can be used to assess the performance of interventions in project mid-stream. In the next section we review a set of five areas of behavioral influence with empirical evidence from psychology and behavioral economics that stretch across both aspects of people and places. These include: attitudes, agency, emotions, social norms, and environmental context.

Areas of Influence for Changing Individual Behaviors

1. Promote favorable attitudes

Attitudes represent the invisible internal predispositions of the people who hold them, resulting from their evaluations of the world around them (Ajzen, 1989), and the influence of the attitudes of others (Friedkin, 2010), but that none-the-less consistently correlate with observable pro-environmental behaviors (Bamberg & Moser, 2007). As Heberlein describes attitudes, “they are based on values and built on beliefs, some of which are knowledge and some of which contain an emotional component” (2012). When individuals are exposed to information or experiences, they form either positive or negative attitudes about a specific object, issue or behavior, illustrated by Aldo Leopold’s famously writing in *A Sand County Almanac*, “I am in love with pines” as he described cutting red birch to favor the growth of pine (2001, p. 128).

Strengthening attitudes. The goal in promoting conservation behaviors is to increase the strength and frequency of positive attitudes that favor them. For example, Aipanjiguly et al. (2003) investigated the link between beliefs, attitudes and social norms on boater intentions to protect Florida manatees in speed zones in order to develop better community communication interventions, finding a gap between formative beliefs and attitudes. The attitude-behavior link is strengthened by direct experiences, repeated expression, increased certainty of being “correct,” and exposure to information biased toward action—qualities that increase their ease of recall and the length of time they are held (Glasman & Albarracín, 2006). The same factors for communicating social norms (described below) can be applied to influencing attitudes by placing the emphasis on the common degree to which others hold the same evaluations about the behavior, especially those people who are liked, have authority, or are in their social network (Cialdini, 2006). Farmers participating in a Farming and Wildlife Advisory Group in the United Kingdom, for example, had significantly different attitudes toward conservation than non-members, and were more likely to cite the influence of important referents (Beedell & Rehman, 2000). However, attitudes based on nudges from others may be less enduring than those that result from thoughtful evaluation (Cialdini, Petty, & Cacioppo, 1981).

Barriers. Positive attitudes are a necessary condition for adoption of pro-environmental behaviors, but not always sufficient, especially if they are not specified at the same level of the behavior, or if the social or physical context poses barriers (Heberlein, 2012). The relationship between attitudes and behaviors can be highly variable (Glasman & Albarracín, 2006), and in some studies has been so weak as to be labeled a “gap” (Kollmuss & Agyeman, 2002). While knowledge gain and attitude change are often necessary conditions for behavioral adoption, other factors can interfere with the progression from pro-environmental knowledge and attitudes to

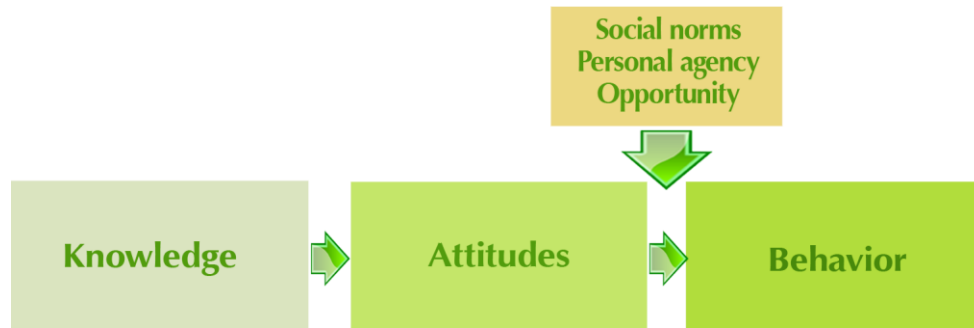


Figure 3. Early psychological models of behavior elevated attitudes as a central component in determining behavior. They still remain important, but we now know other factors can serve as facilitators or barriers in this process, such as social norms, ability to act, and the opportunity to do so (Kollmuss & Agyeman, 2002).

action. These factors include perceptions as to whether others support the action (social norms), beliefs about the feasibility of completing the action and obtaining a favorable outcome (termed personal agency here), and the presence (or absence) of opportunities to do so (Kollmuss & Agyeman, 2002). (See Figure 3 and Case Study 2) The major lesson for practitioners is that information and attitudinal change are important, but not always sufficient to elicit behavior change.

Cognitive dissonance. Beliefs form the basis for subsequent attitudes about the favorability of a behavior. Cognitive dissonance occurs when individuals are faced with evidence of internal inconsistencies, such as between their beliefs and behavior (Festinger, 1962), and has been explored as a means of changing both attitudes and behaviors (Rubens, Gosling, Bonaiuto, Brisbois, & Moch, 2013). In order to avoid unpleasant feelings of dissonance, people will change their beliefs or behaviors to become consistent, and avoid circumstances that cause it to arise. For instance, cognitive dissonance implies that individuals whose actions result in the emissions of large amounts of greenhouse gases may be less likely to believe in the science behind

anthropogenic global warming (Stoll-Kleemann, O’Riordan, & Jaeger, 2001). One technique for overcoming cognitive dissonance is through the use of the “hypocrisy procedure,” in which individuals are reminded that their beliefs are not supported by their actions (Aronson, Fried, & Stone, 1991).

The procedure to induce feelings of dissonance, as developed by Aronson and colleagues, involves two steps: (1) requesting that participants publicly advocate for a belief or behavior that they support (preach); and (2) privately asking the participants to describe times when they had failed to perform that same behavior (experience mindfulness). In Aronson’s original 1991 study on student condom use, cognitive dissonance induced in those students who both “preached” and “experienced mindfulness” produced large changes in behavioral intent, compared to students who were asked to participate in only one of the conditions. Studies have confirmed that cognitive dissonance can be effective (Dickerson, Thibodeau, Aronson, & Miller, 1992), but also that its effects may be sensitive to delays between the experienced dissonance and opportunities for behavioral enactment (Rubens et al., 2013).

2. Increase personal agency

A “can-do spirit” goes a long way in determining whether people try to take an action, and if they do, whether they succeed. What we term here “personal agency”—what psychologists call self-efficacy—is driven largely by “a belief about what one can do under different sets of conditions with whatever skills one possesses” (Bandura, 1997, p. 37), with the implication being that people are unlikely to attempt an action of which they think they are incapable. The magnitude of the influence of personal agency on behavioral outcomes depends on the action and the situation. When there are few perceived constraints associated with performing a behavior,



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Sown paddy fields after flooding in Pakistan.

Case Study 1

Beliefs, attitudes and behavior: Farm forestry in Pakistan

With one of the lowest percentages of forest cover globally, Pakistan is facing growing unmet demands for timber, firewood, industrial materials and energy. The planting of trees on farms increases the sustainability of marginal or degraded lands, and provides an additional economic resource to rural households. In order to assess which factors contribute to the successful adoption of “forestry farming,” researchers surveyed 124 farmers—both adopters and non-adopters—in Pakistan’s North West Frontier Province. Respondents maintained beliefs about planting trees on their lands that were both negative (pests and problematic for agricultural operations) and positive (source of income, fuel and erosion control). Both adopters and non-adopters had generally positive attitudes, but those farmers engaging in planting of trees more strongly believed that trees provided income, shade, and control erosion than those who did not, suggesting a possible role for positive messages in promotion of this behavior.

Zubair, M., & Garforth, C. (2006). Farm level tree planting in Pakistan: The role of farmers’ perceptions and attitudes. Agroforestry Systems, 66(3), 217–229.



Trini Eco Warriors

Sea turtle meat at a beach in Trinidad.

Case Study 2

Attitude and action gap: Ecotourism's influence on attitudes, but not behaviors

Evidence for the success of ecotourism in promoting conservation has been mixed. A 2009 study of impacts in Trinidad illustrates that conservation knowledge and attitudes do not always translate into conservation behaviors. The village of Grande Riviere on the northeast coast of Trinidad is one of the key remaining habitats for an endemic species of bird and a coastal nesting site for leatherback turtles, both Critically Endangered on the IUCN Red List. The authors of the study found villagers had positive attitudes toward conservation and ecotourism, with the majority supporting more effort for conserving plants and animals in Trinidad. However, conservation attitudes have not translated to changes in hunting and wild meat consumption. While the majority of residents cited hunting as the biggest threat to wildlife, one-third of surveyed lived in households with at least one hunter, and most avowed a preference for meat of local wildlife. With hunting motivated by sport and cultural reasons, and possibly high market price, socio-cultural norms and/or conflicting attitudes based on monetary incentives may be barriers between attitudes and behaviors.

Waylen, K. A., McGowan, P. J. K., & Milner-Gulland, E. J. (2009). Ecotourism positively affects awareness and attitudes but not conservation behaviours: a case study at Grande Riviere, Trinidad. Oryx, 43(03), 343–351.

feelings of personal agency matter little; however, when there are real or perceived impediments to the action, they increase the probability of action (Armitage & Conner, 2001). Further, the influence of personal agency decreases when there are uncertainties in the outcome due to external factors (Sadri & Robertson, 1993). Even in cases where top-down interventions are implemented to accomplish conservation goals, such as PES, people's perceptions of their own skills, and beliefs about their resource dependency, may influence their ability to fully participate, and affect the success of these schemes, as posited in a study in a national park in Vietnam where PES were being considered (Petheram & Campbell, 2010).

Influential factors. Beliefs about one's own abilities arise from four sources: 1) personal experiences with the behavior; 2) learning or comparisons with others performing actions; 3) persuasion or influence from others about one's capabilities to succeed; and 4) how one feels, both physically and emotionally, prior to or during the activity. In a review of 27 studies that attempted to increase participants' beliefs in their competence to promote physical activities, the most effective interventions provided feedback either about past actions, or in comparison with others, and allowed for opportunities to see others model the behavior (e.g. vicarious experience) (Ashford, Edmunds, & French, 2010). A number of studies have documented the powerful effects of providing periodic feedback on electricity or water usage on subsequent consumption. Experiments with real-time feedback, through electronic displays, have shown to be even more effective (Allcott & Mullainathan, 2010; Darby, 2006). Many new vehicles provide real-time fuel consumption information, framing information in ways to make feedback as effective and instructive as possible (Telematics News, 2011). Further, treatment effects have been shown to be persistent, suggesting individuals are either developing new behavioral habits, investing in more efficient durable goods (e.g., household appliances), or both (Allcott & Rogers, 2012). At

the same time, however, these treatment effects depend on the receptiveness of individuals, and can backfire in some circumstances (Costa & Kahn, in press).

Positive feedback that attributes successful behavior to personal qualities (as opposed to external circumstances) may increase feelings of self-efficacy and heighten goal-setting (Tolli & Schmidt, 2008). However, people rarely receive information about their actions from just one source. When people see others whom they perceive as similar successfully enact a behavior, their sense of their own capability is bolstered (Bandura, 1997). Conversely, failures will weaken those beliefs.

Modeling behaviors. One increasingly popular means of portraying role models through the mass media is entertainment-education (Singhal, Wang, & Rogers, 2013). Using radio, television, music, films and gaming as a platform for storytelling, campaigns develop characters whom audiences identify with, and who model pro-social and pro-environmental behaviors. For instance, Rare employs entertainment education as one of the components of its social marketing programs targeting threats to biodiversity (Jenks, Vaughan, & Butler, 2010). On a smaller scale, training programs can improve personal efficacy by providing role models and experiences in mastering the behavior, imparting skills and information for those who need them, and addressing low personal efficacy directly (See Case Study 4).

3. Facilitate emotional motivation

Human beings frequently rely on their feelings and gut instincts to respond quickly to factors in their environment. This characteristic, based in the type of automatic “Type 1” processing that we share with other animals, has enabled us to survive as a species (Slovic, Finucane, Peters, & MacGregor, 2004). Emotion and “affect”—a feeling that something is bad or



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Recyclable bottles at a dump in Hunan Province, China.

Case Study 3

From believing you can do it to doing it: Positive self-assessments translate to recycling

Most studies of recycling behaviors have been conducted with suburban or urban residents of developed nations. Yet China, still a developing country, has the world's largest population and the majority of its citizens are rural. The authors of a 2011 study in Hunan, China sought to identify which factors are most important for increasing recycling from the following list: (1) personal morals about waste and recycling, (2) others' attitudes toward recycling, (3) perceptions about others' attitudes toward their own behavior, (4) knowledge of harms associated with not recycling, (5) ease of recycling, (6) belief in personal knowledge and capabilities for how to recycle, (7) perceived impact of recycling, (8) justifications for not taking action, or (9) concern for the health and wellbeing of the community. Individuals' beliefs in their knowledge and capabilities for how to recycle were second only to their concern for the community in predicting which household residents recycled their waste. "I can do it" can be critical in determining whether people even try.

Tang, Z., Chen, X., & Luo, J. (2011). Determining socio-psychological drivers for rural household recycling behavior in developing countries: A case study from Wugan, Hunan, China. Environment and Behavior, 43(6), 848–877.



USAID/Rainforest Alliance Forestry Enterprises, Creative Commons license

Harvesters of the wild palm Xate' are known as "Xateros."

Case Study 4

Providing opportunities to master new behaviors: Cultivating overharvested species

Some conservation behaviors require complex skill sets and knowledge. Training courses can provide both the necessary information and experiences that increase a sense of personal efficacy, and the probability that individuals will engage in conservation actions. Increased wild harvesting of xate'—a Central American palm—threatens the species. In 2005, the Belize Botanic Garden provided training to farmers in four villages in domestic cultivation of the plant as a way to augment household incomes, and also decrease pressures on native populations. Five years after the training sessions, researchers compared trained to untrained farmers, and found increases in perceived capability to cultivate xate' among those trained. Combined with knowledge gains, personal efficacy was predictive of whether farmers grew the plants.

Williams, S. J., Jones, J. P. G., Clubbe, C., & Gibbons, J. M. (2012). Training programmes can change behaviour and encourage the cultivation of over-harvested plant species. PLoS ONE, 7(3), e33012.

good—are linked to images and associations that can be quickly recalled and evoke a strong response. When cognitive and affective assessments differ, affect becomes the primary influencer of behavior (Loewenstein, Weber, Hsee, & Welch, 2001). Cognitive evaluations of information in deciding upon opinions and a course of behavior represent “cold” assessments compared to the “hot” responses of negative or positive feelings that the behavior evokes (Bamberg & Schmidt, 2003). For instance, a recent analysis of 687 studies found that emotions significantly affected not only behavior, but judgment, cognitive processes, physiological responses, and experiences (Lench, Flores, & Bench, 2011).

For example, affect and emotions have been shown to influence public preferences for conservation of species. Positive feelings toward recognized charismatic wildlife, or those with material value, lead to public interest (Reading, Clark, & Kellert, 1994) and have motivated conservation organizations to choose attractive “flagship” species—often those easily represented as plush toys—as core components of their brands and marketing (Home, Keller, Nagel, Bauer, & Hunziker, 2009).

Value of good feelings. Infantile characteristics, such as big eyes, large rounded heads, and a flat nose, predispose humans to care for the young during a highly vulnerable development period (Bjorklund, Blasi, & Periss, 2010). Similarly, the affectionate feelings inspired by “cute” animals induce greater feelings of value (Hsee & Rottenstreich, 2004), and a sense of connection and perceived similarity to an animal correlate with an interest in conservation (Clayton, Fraser, & Burgess, 2011). People who imagine how a bird—or tree—feels develop more empathy, and are more willing to expend funds to protect them (Berenguer, 2007). They also score more highly as “biospheric,” or environmentally concerned (Schultz, 2002).

These good feelings can be expressed toward the object of the behavior (e.g., donating

money to save a baby seal), or broader conservation efforts, producing a “warm glow” feeling about oneself (Andreoni, 1990). Mandatory contributions through taxes do not create the same positive feelings as voluntary gifts, so have less personal value, even though they represent the same net cost. Good feelings may be enhanced by ancillary benefits associated with conservation actions, including perceived changes in others’ evaluations of oneself for enacting the behavior, staying within social norms, achieving or maintaining status, and personal validation of congruence with privately-held goals or standards (Maibach, 1993).

Fear appeals. High public awareness and lack of perceived threat are two of the most common criteria used in choosing flagship species. Research evidence confirms that fear, especially of large carnivores, decreases willingness to support conservation efforts (Johansson, Sjöström, Karlsson, & Brännlund, 2012; Wilson, 2008). Alternatively, fear can motivate pro-environmental actions. In trying to evoke a response to a threat—be it health or environmental—communicators sometimes use fear of an unpleasant personal outcome as a component of persuasion, such as extreme weather disasters from climate change, or infertility and cancer from hormone-disrupting chemicals. Termed “fear appeals,” these messages work best paired with equal emphasis on the ability of individuals to take protective measures, and their effectiveness in avoiding the threat (Witte, 1992), such as changes in animal husbandry activities to reduce conflicts with large carnivores (Treves & Karanth, 2003). If people do not believe they can self-protect, they resort to managing their fear instead of its source, and ignoring risks (Moser & Dilling, 2004).

Likely due to their evolutionary roots as protective mechanisms, specific emotions are more easily inspired by certain contexts. For instance, snakes and spiders easily arouse fear, probably as an evolutionarily-driven aversion to avoid being bitten. For more intangible dangers

with no evolutionary predecessor—like climate change—fear may not be a natural response. Fear appeals can also diminish in their effectiveness over time, backfire, reduce trust in the messenger, or create concern about one problem at the cost of reducing attention to another from within a “finite pool of worry” (O’Neill & Nicholson-Cole, 2009; Weber, 2006).

4. Communicate supportive social norms

When people observe the behaviors of others, it provides them with information about how to perform an action, and their own probable success in doing so, but it also serves as guidance about what others are doing, or what is considered normal (“descriptive social norms”). People conform to what they perceive to be the predominant actions and decisions taken by others, particularly under ambiguous circumstances, even when those actions run counter to a known desired pro-social behavior (“injunctive norms”) (Cialdini et al., 2006). As social animals, our instincts are to identify with our family members and immediate community, cooperating with them and defending them (Benhabib, Bisin, & Jackson, 2011; Gigerenzer, 2007). This process of imitation and conforming to social norms allows humans to take advantage of the wealth of information accrued through culture linking actions to probable outcomes.

Social norms may be particularly important for pro-environmental behaviors, which are often associated with little private gain by individuals, but great benefits for the social groups to which they belong. Garrett Hardin’s “tragedy of the commons” illustrated the problem of managing common resources in an absence of property rights, which reduces private incentives to conserve resources or make improving investments (Hardin, 1968). More recent evidence indicates there are many cases where groups successfully manage common pool resources,



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A protest in Cardiff, Wales in 2003.

Case Study 5

Emotion motivates action: Acknowledging its role in forest management protests

When forestry decisions cause conflict between stakeholders, emotions can run high, but also be overlooked in understanding the dynamics of the disagreements. In a recent study on forest management based on experiences in the United Kingdom and Netherlands, the authors pointed to emotions as motivators for political action to protect forests, and for escalation of conflicts. The public and environmental campaigners may experience feelings of anger at loss of forests, combined with emotional responses to perceptions of not “being heard.” By viewing emotions as irrational, forest managers lose the ability to effectively manage differences that emerge between them and the public or environmental campaigners.

Buijs, A., & Lawrence, A. (in press). Emotional conflicts in rational forestry: Towards a research agenda for understanding emotions in environmental conflicts. Forest Policy and Economics.

especially when group norms support trust, reciprocity, and reputations based on wise use (Ostrom, Burger, Field, Norgaard, & Policansky, 1999). Psychological models for pro-environmental behavior similarly demonstrate the importance of norms in providing alternate valuations of outcomes, such as positive self-evaluation (Schwartz, 1973; Stern, 2000b), or comparative performance. Where cultures have long practiced behaviors that are no longer considered sustainable, successful conservation efforts may require resetting defaults on perceptions of what is socially expected. For example, in China, turtle conservation is hindered by views of what constitutes normal societal practices in the consumption and medicinal use of these species (Lo, Chow, & Cheung, 2012).

Boomerang effects. Chinese turtle conservation is not the only area in which social norms aren't always in congruence with public goals. Over the past 15 years, campaigns deploying messages describing public levels of drug and alcohol use, recycling, and littering, for example, have sought to heighten adoption of pro-social behaviors in these areas, with often little success (Schultz, Nolan, Cialdini, Goldstein, & Giskevicius, 2007). Investigating why this might be the case, the authors of a study of household energy use in the United States found that messages describing average neighborhood use produced changes in consumption, but residents using *less* than the publicized average increased their energy use, even as those using *more* increased their conservation—leaving mean energy usage unchanged. This is referred to as the “boomerang effect,” a phenomenon that can be avoided if descriptive norms describing the behavior of individuals within an environment are communicated alongside injunctive norms describing what society believes constitutes appropriate behavior (See Case Study 6).

Breaking the social contract. A common concern about providing financial motivation to encourage pro-environmental behaviors is that it may undermine intrinsic motivation, a

phenomenon termed “crowding out” (Carlsson & Johansson-Stenman, 2012; Deci & Ryan, 1985; Frey, 1997). For instance, in Israel, when a daycare center that was experiencing habitual tardiness in afternoon collection of children implemented a fee for late pickups, the number of late pickups actually increased. When the fees were dropped, parents still maintained higher rates of late pick-ups, suggesting the social contract had been irreversibly broken (Gneezy & Rustichini, 2000). Similarly, a 2001 study, found a decline in public willingness to conserve water when costs for water usage were raised, and increased willingness to conserve when highly visible community commitments to conservation were made, such as halting watering of public gardens (Heiman, 2002).

Personal norms. Individuals’ expectations about their own behavior—their “personal” or “moral” norms—develop from experiences accrued over time within social groups, and thus overlap with social norms, but are more strongly linked to conceptualizations of self than community (Schwartz, 1973). In models of behavior that emphasize morality as a primary determinant of action, personal norms assume a pivotal role. By conforming to personal norms, individuals gain pride and self-esteem; alternatively, violations result in guilt and loss of self-worth. When the personal costs of complying are greater than violating, individuals may attempt to reduce the dissonance that arises by either denying the need for action, or absolving themselves of personal responsibility (Schwartz, 1977). Moral norms are highly correlated with individuals’ attitudes about behaviors (Kaiser, 2006). As with social norms, economic incentives to promote these intrinsically motivated behaviors may backfire (Brekke, Kverndokk, & Nyborg, 2003).

Fairness. Perceptions of fairness and equity affect people’s decision-making processes and may affect the success of interventions. Community standards of fairness represent a form of

social norm that sets behavioral expectations (Kahneman, Knetsch, & Thaler, 1986). When individuals believe that actions are fair, they are more inclined to be satisfied with an outcome and trust others (Schweitzer & Gibson, 2008). Circumstances judged to be unfair may result in anger, rejection of offers, or retaliation. For example, the relocation of a small group of endangered male monk seals in Hawaii by the National Marine Fisheries Service without prior discussions with local fishers about the implications for their fisheries created a backlash of resentment against the service (Clark & Wallace, 2002).

Even subtle differences in situational context can influence perceptions of fairness. Using household surveys of Canadians, Kahneman demonstrated that under conditions of high demand for a product, consumers viewed raising prices by \$200 over list price as unfair, but that increasing prices by \$200 up to list price was considered acceptable (Kahneman et al., 1986). The list price acts as a reference point, against which people judge fairness; in the more agreeable situation in which the list price was re-established, the price and reference point remained the same. Further, experimental evidence on “strong reciprocity” has suggested individuals are willing to accept personal losses in an effort to sanction behavior that is deemed “unfair” (Fehr & Gächter, 2002).

Social and cultural histories influence community perceptions of fairness, making them highly variable across audiences. For example, fishers in the Gulf of Mannar Marine National Park off India lost the ability to set up temporary camps on islands in the park when the marine protected area was established (Bavinck & Vivekanandan, 2011). The perceived inequity of MPA prohibitions provoked conflict: Fishermen believed that they had historically-based rights to use the islands, and were not the source of negative environmental impacts. In Germany and Australia, a study of perceptions toward ecological issues argued that “universal” principles of

justice in the distribution of environmental goods, governing processes, and interactions over environmental goods directly motivate pro-environmental behaviors, even more so than self-interest and economic incentives (Syme, Kals, Nancarrow, & Montada, 2000).

5. Alter the environmental context; design the choice

“Human rational behavior ... is shaped by a scissors whose two blades are the structure of task environments and the computational capabilities of the actor,” wrote economic sciences Nobel laureate Herbert Simon (2009, p. 7). One of the most significant findings from psychology and behavioral economics is that the choices individuals make are influenced by the context and range of possibilities (Thaler, Sunstein, & Balz, 2010). Even minor changes in the way in which decisions are presented can have large implications for outcomes. Changing the context of decisions, or the environment in which people act, may present a much easier hurdle for influencing behavior than changing human capabilities. For example, the availability of goods and services in the community that affect the feasibility of a new behavior can determine the rate of uptake of actions (McKenzie-Mohr et al., 2011). Conveniently located prompts represent one of the most effective ways of altering the physical environment to facilitate behavioral change, such as a sticker on a light switch reminding people to turn off the lights (Osbaldiston & Schott, 2012). Qualities of effective prompts include: spatial placement near the decision point, high visibility, and self-explanatory text or visuals. Further, prompts should be “positive” in affect; favorable associations with the action create good feelings and support continuation of the behavior.

Context and choice design can help to overcome instances of incoherent preferences and bounded willpower. People struggle with problems of commitment, addiction, and impulse



Lisa Strobel-Hendricks, Arizona Daily Sun

A ranger at the Petrified Forest National Park kneels next to a pile of rocks that have been either confiscated from or returned by visitors.

Case Study 6

Defining what's socially acceptable: Theft of petrified wood in a national park

A sign at Arizona's Petrified Forest National Park informed visitors: "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." Psychologists wondered if in fact the sign was encouraging theft, instead of discouraging it. By testing signs telling guests what they should not do (steal the wood) against those that informed them that others routinely committed the thefts, the authors of a 2006 study showed that the rate of stealing decreased significantly for negatively phrased messages telling people what behaviors were not considered acceptable at the park, compared to messages that emphasized that others were routinely violating the prohibition. Messages that convey environmentally destructive behaviors are socially normative may backfire.

Cialdini, R. B., Demaine, L. J., Sagarin, B. J., Barrett, D. W., Rhoads, K., & Winter, P. L. (2006). Managing social norms for persuasive impact. Social Influence, 1(1), 3–15.



Environmental Protection Agency

Cobb County residents were instructed to install new faucets and showerheads.

Case Study 7

Social norms vs. information provision: Water conservation messages that motivate

Water shortages already commonly occur in some places in the world, and governments frequently pursue voluntary behavioral change programs to reduce household water usage. A randomized experiment design in Cobb County, Georgia in 2007 compared information provision alone to information plus socially normative messages, including the ability to compare one's water usage to median rates for the county from the previous year. Information how to reduce water consumption had little effect on usage rates: a one percent reduction in the experimental group compared to the control. By adding messages conveying social norms and enabling social comparisons to median county water use the previous year, water consumption reduced by another 4.8%. This effect is likely comparable to an increase in water costs of approximately \$5 a month to median households. Socially normative messages more strongly appealed to high-use than low-use consumers with a 94.1% difference in the treatment effect between groups.

Ferraro, P. J., & Price, M. K. (2013). Using non-pecuniary strategies to influence behavior: Evidence from a large scale field experiment. The Review of Economics and Statistics, 95(1), 64-73.

control that interfere with their abilities to achieve their goals (Ayres, 2010). Incoherent preferences reflect the difference between people's "revealed" preferences through the choices they make, and their "normative" preferences, or stated best interest. A number of factors can lead to incoherent preferences (Beshears, Choi, Laibson, & Madrian, 2008; Thaler et al., 2010), but the roles of defaults, complexity, and intertemporal choice are particularly relevant for this discussion.

Defaults. People exhibit a bias in favor of the status quo, even when the alternative presents no additional costs. This has been documented in examples ranging from pension savings to organ donation. By creating defaults that lead individuals to make choices that support their long-term health and wellbeing, policymakers can "nudge" them without taking away their ability to choose for themselves. One example is the Save More Tomorrow program (Thaler & Benartzi, 2004), where employees can automatically commit their salary raises to their savings. Defaults are also relevant for energy consumption. In a study of "green" energy purchases, participants in an experiment were more likely to choose green energy when it was the default option (Pichert & Katsikopoulos, 2008). Defaults could be utilized for increasing revenues for conservation activities by requiring participants to opt-out, rather than opt-in, to conservation surcharges through tourism and other recreational activities (Smith & Sanders, 2011).

Reference dependence. People have been shown to be sensitive to reference points in making decisions (Tversky & Kahneman, 1991). For instance, people have indicated in surveys that they require greater compensation for lost environmental amenities than they are willing to pay for an equivalent increase (Knetsch, 1990). Thus, changing the reference point for a choice can potentially change the decision outcome. People have also been shown to be generally averse to uncertainty. This can lead to individuals avoiding decisions with uncertain outcomes, or an

“action bias,” in which they are willing to incur costs to reduce ambiguity (Carlsson & Johansson-Stenman, 2012). Further, individuals have been shown to prefer their efforts result in concrete outcomes. One study found individuals preferred environmental projects that resulted in visible improvements or restoration, versus those that simply maintained the status quo (Patt & Zeckhauser, 2000).

Complexity. Human beings filter enormous amounts of information to extract meaning (Pichert & Katsikopoulos, 2008). When choices are complex, either because of many different alternatives, high cognitive processing requirements, or attributes of risk, uncertainty, or ambiguity, individuals tend to use heuristics, or “rules of thumb,” to help them simplify their decisions (Mullainathan & Thaler, 2000). These heuristics are often based on a combination of pre-defined rules and characteristics, such as reputation. One reason why advertising of brands is so successful is that when people are presented with two options, one which they recognize, and the other that they don’t, they are more likely to choose the one they know, and will perceive it as higher value (Todd & Gigerenzer, 2012). Using the recognition rule was a safe bet for our ancestors—the unknown plant might be poisonous. This tendency can also lead individuals to stay with defaults. Recognition differs from perceptions of how often one has been exposed to information; it is simply the sense of “yes, I remember encountering that” or “I don’t remember that at all.”

Intertemporal choice. Finally, intertemporal choice and discounting are both important issues for conservation. When individuals discount the future at a higher rate, present gains are favored over future gains, a situation that has long been associated with poor long-term resource stewardship and ecological degradation. While weak institutions, especially in developing countries, are often implicated in creating the conditions of uncertainty that undermine

investments in future gains and lead to high implied discount rates, the nature of individual decision-making may also be to blame. People place more value on decisions and actions that have immediate results than those that will manifest many years hence (Laibson, 1997; Loewenstein & Prelec, 1992), e.g., individuals are present-biased (O'Donoghue & Rabin, 1999). For example, a person may decide to begin saving for retirement next month, but when the day arrives, she procrastinates and chooses not to do so. This phenomenon has inspired a number of efforts to lock individuals into commitments ahead of time, and has even created a demand for these types of commitment mechanisms (Ayres, 2010; Thaler & Benartzi, 2004). Even informal commitments, such as public statements or signing of pledges, can increase the probability that an individual will carry through by increasing their sense of involvement and self-identification with the goal (Burn & Oskamp, 1986; McKenzie-Mohr & Smith, 1999). Commitments are particularly effective when they are made in public, because of people's desires to maintain consistency (Cook & Berrenberg, 1981; Dickerson et al., 1992), and have been used effectively for promoting recycling, and energy and water conservation. These lessons have implications for conservation as well. For instance, in managing a communal agricultural project that requires regular land-maintenance investments, asking individuals to commit publicly to one another to "do their part" may be one tool to overcome dynamically inconsistent preferences for leisure.

Putting it together: Multiple factors

One of the more complex questions for practitioners and academics regarding behavioral change is how combinations of factors—such as those described in Maibach and colleagues' People & Places model—work together to affect the probability that an intervention strategy will be effective. Psychological models describe the correlations between these factors and their



International Centre for Diarrhoeal Disease Research, Bangladesh

In Bangladesh, wells with higher levels of arsenic are painted red to discourage their use.

Case Study 8

Simplifying choices: Less information makes for better decisions

The design of risk information shapes the context for individuals' choices. In an effort to reduce consumption of bacterially contaminated surface water, responsible for high rates of child mortality, the government recommended the use of in-ground tube wells in the 1970s, not realizing high rates of naturally occurring—and potentially toxic—arsenic existed in ground water. Millions of Bangladeshis have since been exposed to harmful levels, creating a need to communicate risk levels of individual wells to residents. In a 2008 randomized control study of the effects of limited versus more complete information about levels of arsenic, researchers found that more information decreased rates of switching to less contaminated wells by 40% compared to simpler messages that conveyed whether the water was above or below the government standard for safety. This experiment demonstrates how simplification of the choice environment can create better decisions for public health.

Benneer, L., Tarozzi, A., Pfaff, A., Soumya, H. B., Ahmed, K. M., & van Geen, A. (2010). Bright lines, risk beliefs, and risk avoidance: Evidence from a randomized intervention in Bangladesh. Retrieved from <http://ipl.econ.duke.edu/bread/papers/working/285.pdf>



Al_HikesAZ, Creative Commons license

A prescribed burn by the National Park Service in 2007 spreads across the North Rim of Grand Canyon National Park.

Case Study 9

Certain gains win over uncertainty of losses: Presenting managed fires as necessary

Typically, people are more sensitive to losses than gains. Studying the impact of messaging designed to increase support for controlled burns, Wilson et al., (2012) tested specific messages explaining the motivation for managed fires, and found that gain messages—when in reference to a forest’s “lost” ability to tolerate fires—increased public willingness to support options with a greater level of risk of failures than messages that framed the need for managed burns to maintain or improve the status of land conditions. The certainty of improving forests already seen as damaged over-rides the tendency for individuals to become more risk-averse in gain frames.

Wilson, R. S., Ascher, T. J., & Toman, E. (2012). The importance of framing for communicating risk and managing forest health. Journal of Forestry, 110(6), 337–341.

relative strengths in predicting behavioral intent, or enactment. Arguably the most influential of the theories about how factors relate to each other, the Theory of Planned Behavior (TPB), incorporates attitudes, perceived social norms, and sense of personal agency (Ajzen & Madden, 1986; Ajzen, 1991). When these three factors combine favorably, they promote an individual's "intention" to take an action, which can be facilitated by environmental conditions or hindered by lack of opportunity. A review of 30 papers applying the theoretical framework in interventions reported small to medium effects, and behavioral changes in two-thirds of the cases where it could be assessed (Hardeman et al., 2002); a larger review (185 papers) found these factors predicted about a quarter of the variance in behavior (Armitage & Conner, 2001).

The fundamental differences in motivations between actions taken to protect *collective* environmental resources—like clean water and air, and species diversity—and improving one's own *individual* wellbeing (per much of the behavioral change literature), have drawn attention to a potentially larger role for personal morality in shaping pro-environmental behaviors¹². A framework developed explicitly for pro-environmental behaviors—the Value-Belief-Norm Theory (VBN)—posits that the deep, underlying values we hold about ourselves, others and the environment serve as the wellspring for action (Stern, 2000a). As is with pro-environmental behaviors generally, these relationships have been studied less thoroughly than those developed in other applied fields. However, a test of the model using support for energy policies that reduce carbon dioxide emissions indeed found that values and beliefs about human-environmental relationships in turn impact specific beliefs and personal norms about behaviors, and finally, policy acceptability (Steg, Dreijerink, & Abrahamse, 2005). These two theories (TPB and VBN,

¹² Influencing values can be a part of a communicative strategy (Schultz & Zelezny, 2003). For a review of the use of different approaches based on these types of models, see Schultz and Kaiser (2012).

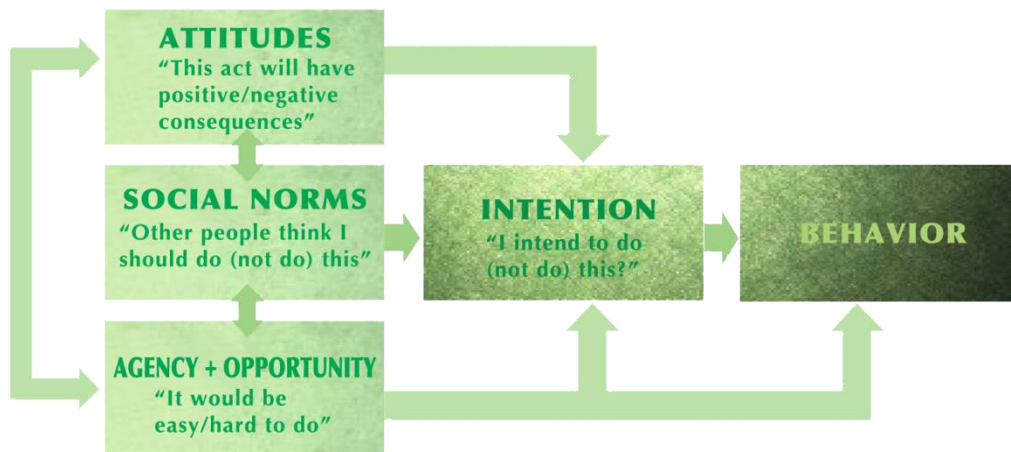


Figure 4. In the Theory of Planned Behavior, attitudes, social norms and perceptions of personal agency combine to promote the adoption of behaviors (Gifford, Kormos, & McIntyre, 2011).

Figures 4-5) represent not so much competing possible behavioral change pathways as areas of different emphasis, which may be complementary to the extent that values and beliefs also precipitate favorable or unfavorable attitudes toward taking action (Gifford et al., 2011).

In assessing where to target interventions among the wide range of variables in these models, different emphases may be more appropriate on different operational timescales. In conservation psychology, researchers have suggested distinguishing between behavioral change goals with shorter timeframes—e.g. targeted efforts, frequently using marketing-based approaches on factors such as environmental contexts, social norms and attitudes—from those that are longer-term, such as changes to underlying personal values and morals using education and formative environmental experiences (Monroe, 2003).

Moving targets: The evolution of behavioral change in people and populations

The “static” set of behavioral change factors we have presented might misleadingly



Figure 5. Values held about ourselves, others and the environment underlie the beliefs that lead to behavioral changes according to Value-Belief-Norm Theory (Gifford et al., 2011; Stern, 2000a).

suggest that levers of behavioral influence are only useful for prompting new behaviors, or that all individuals are equally influential in precipitating large-scale population changes. Yet, adopting new behaviors, and successfully maintaining them, is a long-term, multi-stage process, with individuals at differing levels at any time, and with potentially distinct sets of motivations and considerations. Certain individuals in a population have wider social networks as well that allow them to serve as sources of information and behavioral role models for many more people than those less communicative and well-connected.

Stages of change. Recognizing where individuals are in thinking about, planning for, and implementing behavioral changes has been proposed as a means for segmenting audiences into groups with different needs at each stage: pre-contemplation, contemplation, preparation, action, maintenance and termination (as the behavior becomes habit) (Prochaska & Velicer, 1997). The notion that different types of interventions work best at each stage of adoption was introduced to better understand how individuals overcome addictive behaviors. The concepts may still have value as a holistic representation of change over time in populations (Darnton, 2008), and the recognition that interventions can support continuing behavioral changes. Separately staged interventions, however, have not been found to be particularly effective (West, 2005).

Network dissemination of ideas and behaviors. Behaviors ebb and flow over time, but

also across webs of social networks. Research from communication and marketing suggest certain individuals may be more influential than others in promoting individual and societal changes, serving as intermediaries in the dissemination of new ideas, technologies, behaviors and product adoption (Berry & Keller, 2003; Rogers, 2003). Popularized by books like Malcolm Gladwell's *The Tipping Point*, these opinion leaders, or "influentials," can theoretically push adoption of new behaviors more quickly to thresholds where large-scale societal changes can occur (Valente, 1996). Initial research in the diffusion of innovations was based on adoption of new agricultural practices by opinion leaders (Rogers, 2003), but some of the strongest empirical evidence has come from public health. In a famous example, opinion leaders were identified among gay men in one city and trained to successfully endorse the use of condoms (Kelly et al., 1991). This intervention precipitated a 25% reduction in unprotected sex and an 18% decrease in men with multiple sexual partners over the course of only two months, compared to no observable change in two comparison cities.

The use of opinion leaders for the dissemination of pro-environmental attitudes and behaviors has been suggested for climate change (Nisbet & Kotcher, 2009), as well as ecological conservation generally (Groffman et al., 2010). For instance, a recent study of 130 co-managed fisheries found that strong leadership was the most important factor for the success of the system in managing resources and effort, followed by the presence of harvest quotas, measures of social cohesion, and the implementation of protected areas (Gutiérrez, Hilborn, & Defeo, 2011), suggesting a potential avenue for future conservation efforts.

Next steps

Much of the existing behavioral change research has been conducted in public health, but

even in that field classification of distinct behavioral change techniques has only begun to coalesce in last decade. Without common terms and protocols for interventions addressing specific types of behavioral change, developing the empirical basis for furthering theory and practice is difficult (French et al., 2012; Michie, Hyder, Walia, & West, 2011; Michie & Johnston, 2012; Michie, 2008). For the purposes of making research from these fields more accessible to conservation practitioners, it may be important to hold “consensus conferences” to identify components of behavioral intervention programs, bring together theoretical experts and practitioners to select and define the most influential behavioral interventions, synthesize across theories and unify them with practice, and identify future needs and areas of research.

Other authors have stressed the necessity for close relationships between researchers and practitioners (Saunders, 2003). Indeed, multi-disciplinary consensus exercises have been held in the field of conservation in recent years, assessing broad trends and research questions (Fleishman et al., 2011; Sutherland et al., 2009, 2011). Public health offers a different set of models for theoretical and applied development of behavioral change research. In 1991, the National Institute of Mental Health sponsored a workshop of the developers and/or proponents of five predominant behavioral theories to select the major determinants of behavior for the purposes of reducing the incidence of risky sexual behaviors that were contributing to the AIDS epidemic (Fishbein et al., 2001). Similarly, within the last decade public health researchers in the United Kingdom have brought together researchers and practitioners to formulate baseline definitions for behavioral change techniques within bounded sets of theoretical constructs and domains (Michie, Abraham, et al., 2011). These typologies of behavioral change constructs and techniques likely will create a common language shared by both researchers and practitioners, and facilitate cross-boundary learning, even as refinements may be required for particular

behaviors (Michie, Ashford, et al., 2011).

The field of individual behavior change for conservation faces problems similar to those that public health has recently tried to surmount: both a lack of systematized naming conventions for interventions, and identified behavioral change techniques of most probable success for specific conservation challenges. Additionally, the research base for pro-environmental behaviors is substantially lower than that of other fields, and has been conducted for the most part in developed nations on issues such as energy conservation and recycling. This literature is spread over a wide set of academic publications and grey literature, and represents research from diverse fields, making it difficult to track progress within the knowledge base. For many practitioners, the academic literature simply may be inaccessible due to database fees. Alternately, academics may find it difficult to access research and reports from environmental non-governmental organizations. In developing countries—where many conservation efforts are concentrated—these problems are likely to be magnified. Other options for increasing the transparency of intervention results include improving online accessibility and promoting submissions by a wide variety of academics, governmental organizations, and NGOs. Establishing effective experimental programs may be more difficult, but funders are in the best place to enact change. A current challenge facing many conservation organizations is the tradeoff between critical review of initiatives, and the need to demonstrate success.

In holding the purse strings, funding organizations can facilitate a rapid expansion of social-science research and experimentation in conservation efforts. From a broad research perspective, greater emphasis should be placed on establishing social indicator baselines, and tracking them over time. Establishing these indicators will allow for the investigation of correlation between social variables and conservation outcomes, perhaps illuminating

Table 3

Recommendations for conservation organizations, researchers, and practitioners to advance individual behavioral change research and practice for conservation

1. Explicitly utilize evidence from social and behavioral sciences in programmatic design for conservation initiatives.
2. Recognize the value of social science research within conservation programs in designing strategies, selecting behavioral targets, and evaluating results.
3. Develop and track social indicators for target sites that represent attitudes toward conservation, perceptions of fairness, resource dependency, and other factors that influence the success of conservation efforts.
4. When possible, use experimental designs to increase the quality of research/evaluation. Utilize quasi-experimental empirical methods to identify causal effects of non-experimental conservation initiatives.
5. Bring behavioral change researchers and conservation practitioners together regularly at “consensus conferences” to identify most important problem areas for research and application; target weaknesses in theoretical understanding to improve effectiveness of conservation interventions; and agree upon common terms for behavioral change techniques and primary factors of influence. Publish results in both the grey and academic literatures encouraging the adoption of these standards.
6. Develop and manage a searchable database of field applications of different behavioral interventions, with an emphasis on both positive and negative results.
7. Facilitate academic publication and/or open access of conservation program results in a searchable database by types of interventions, areas of program activity, and targeted behavioral factors for use by both researchers and practitioners to inform theoretically-based programs designs and as data for meta-analytical analyses. ConservationEvidence.com, led by William Sutherland at the University of Cambridge, is one example of a similar concept, though focused on compiling evidence from conservation interventions more broadly in conjunction with the mission of Conservation Evidence Journal.
8. Bring early career social scientists and conservation biologists together in collaborations.

Table 4

Recommendations to foundations and other funding sources to advance individual behavioral change research

1. Develop funding initiatives that focus strongly on experimental approaches to evaluating the effectiveness of social- and behavioral-science interventions, particularly in developing and poor countries. This requires recognizing that program costs will likely be higher, as randomly chosen intervention sites must be paired with randomly chosen control sites, and each will require effective monitoring.
2. Develop tiered funding mechanisms for behavioral interventions. Similar to medical research, interventions can be tested in controlled settings first, and then scaling up to broader field investigations. This will allow for more efficient use of resources through an iterative approach to the design and framing of interventions.
3. Encourage the development and tracking of key social indicators, such as measures of social capital or community cohesion, resource dependency, conservation attitudes and beliefs, and other variables of interest.
4. Encourage critical review (internal and/or external) of program successes and failures. Reviews should be diagnostic, and attempt to develop links between experimental approaches and conservation outcomes.
5. Require the sharing of data on the effectiveness of conservation interventions and behavioral interventions. Facilitate sharing by developing an informational clearinghouse for practitioners and funders. This should also encourage the development of meta-programs aimed at evaluating interventions across a variety of environmental and cultural settings.

important links in the social-ecological system. It will also require a more concerted *ex-ante* focus on social sciences. Establishing effective experimental programs may be more difficult, but funders are in the best place to enact change. A current challenge facing many conservation organizations is the tradeoff between critical review of conservation initiatives, and the need to display competence for the purposes of securing funding from individuals, foundations, and

governmental funding agencies, providing a disincentive to make information about conservation failures available. However, case examples of what doesn't work for individual behavior change in conservation can be every bit as valuable to be researchers and practitioners as incidences of success. This is not unique to conservation organizations; academia has file drawers full of null results that never make publication. In recent years, however, some journals have been more open to accepting these papers, recognizing the implications for biased conclusions that can result from literature reviews and meta-analyses from a partial range of research evidence. Further, by designing funding initiatives that place a greater emphasis on innovative, experimental approaches to conservation, funding sources can help to invigorate research on the effectiveness of behavioral interventions, including revisiting the designs of traditional conservation initiatives.

Conclusion

Collaboration among social scientists, conservation biologists, and program managers remains challenging due to academic conventions and historical trends. However, progress is being made. In a 2003 *Conservation Biology* editorial "Conservation and the Social Sciences," Mascia et al. suggested "conservation is about people as much as it is about species or ecosystems" and challenged the Society for Conservation Biology (SCB), governmental and nongovernmental conservation organizations, and the academic community to mainstream the social sciences into conservation science and practice (Mascia et al., 2003). That same year, the society created a Social Science Working Group (SSWG), and by 2008 the group claimed 700 members. The SSWG has sought to catalog social science tools online since 2006 (<http://www.conbio.org/groups/working-groups/social-science>). The NSF-funded National

Socio-Environmental Synthesis Center (SESYNC), based at the University of Maryland, has followed on the success of the more ecology-focused National Center for Ecological Analysis and Synthesis (NCEAS), supporting inter-disciplinary collaborations to address issues including the management of marine protected areas, community use of tropical forests, and local and regional impacts of ocean acidification.

Conservation organizations—both governmental and nongovernmental—should collaborate with social science researchers to build research designs into their programs, and make resulting data available for analysis and public dissemination online and in academic publications, preferably in open access journals or other un-gated venues. By sharing the successes and failures of conservation strategies, we can increase the speed of implementation of interventions that work, and shelve those that don't. This will require conservation organizations to critically and publicly evaluate their projects, something that may be unattractive in a world in which foundation and government funding is scarce and evidence of failure may be perceived as a handicap. However, funding sources can facilitate more robust program and intervention evaluation by making funding contingent on open standards, external review, and experimental program evaluation.

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Appendix

Methodological approach

The psychological and behavioral economic literature on behavioral change over the past few decades is vast, although not in habitat-, species- and natural resources-conservation. As a result, the search strategy was focused on recent meta-analyses and review papers, and then was broadened to include case studies and papers of greater relevance to conservation. Some of the recent larger reviews of behavioral theory from psychological and economic perspectives have been funded as white papers by the British Government. The search also sought to incorporate that grey literature.

The search databases included: SSRN, JSTOR, Google Scholar, ProQuest's Environment Abstracts, Environment Complete, ENVIOnetBASE, and Web of Science. We also searched in specific journals of interest, including *Conservation Biology*, *Environment and Behavior*, and *Journal of Environmental Psychology*.

Initial searches for meta-analyses, review papers, and taxonomies included the terms: behavior change, behavior change theory, theories of change, pro-environmental behavior, behavioral interventions and behavioral economics. In particular, those with environmental subject matter were flagged for their importance.

Subsequent searches focused on specific behavioral change theories. The search terms were "environment + behavior + name of theory/construct." The list of theories and constructs is as follows. For a subset, we also searched using the terms "conservation" and "biodiversity."

Social Norms; Fear Appeal Theory; Theory of Reasoned Action/Planned Behavior; Social; Cognitive Theory; Social Learning Theory; Theory of Interpersonal Behavior; Social networks;

Stages of Change; Social marketing; Value Belief Norm Theory; Social Comparison Theory
Intrinsic Motivation Theory; attitudes; emotion; affect; efficacy; loss aversion; ambiguity
aversion; risk misperception; dread; cumulative prospect theory; anchoring; endowment effect;
default options; passive choice; nudge; framing; choice ordering; hyperbolic discounting; present
bias; pre-commitment; self-control; addiction; bounded willpower; self-prophecy; sunk cost
fallacy; implementation intention; cognitive evaluation theory; crowding out; bounded
rationality; mental accounting; decision heuristics; salience; inattention; “internality”; choice
fatigue; altruism; reciprocity; fairness; cooperation; social preferences; pro-social behavior; peer
effects; status; reputation; cognitive dissonance.

