Catalysts for Conservation

Exploring Behavioral Science Insights for Natural Resource Investments

Lynn Scarlett, James Boyd, and Anna Brittain,
with Leonard Shabman and Tim Brennan

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with contributions from Leonard Shabman and Tim Brennan[1]

Executive Summary

Scientific complexities and uncertainties, interconnections, and the need to coordinate across jurisdictions and scales challenge our ability to address environmental issues. These challenges and their solutions are linked to the attitudes, choices, and actions of individuals, families, communities, businesses, lawmakers, and nations. Ultimately, their resolution depends on scientific knowledge, technology developments, economic incentives, legal and institutional innovations, and, most importantly, public awareness, interest, and capacity to act.

What are the ingredients for successful action? Scientists offer insights about "how the world works"—its physical, chemical, biological, and other components, functions, and systems. Economists offer tools for examining costs, benefits, trade-offs, incentives, and their relationship to public and private institutions. Political scientists assess governance, public attitudes, and decisionmaking by both the public and its representatives. Sociologists and psychologists probe the "people factor"—why do people think what they think, how do values and attitudes form, and how do they affect choices and actions? There is also the looming presence of communications—understanding how people respond to different messages and media, targeting messages to specific audiences, and tracking how messages spread.

This report summarizes insights from multiple social and behavioral science research disciplines to shed light on environmental attitudes and corresponding behaviors. We define environmental behavior as the decisions and choices that (a) affect the efficient and effective use of natural resources; (b) reduce waste (energy, water, material, and so on); (c) reduce pollution; and (d) facilitate the management of terrestrial and marine ecosystems to restore, enhance, or preserve these ecosystems, their functions, and interconnected biodiversity.

Because of the breadth of relevant research, the report presents selected highlights. This information can enhance efforts to engage individuals in saving energy, recycling water, or undertaking countless other personal actions that reduce environmental impacts. It can help agencies engage communities and can aid companies trying to protect species, sustain water supplies in small and large watersheds, or reduce the impacts of energy or mineral extraction. It may help governments communicate environmental challenges and work in concert to address them.

In this review, we address questions directly pertinent to environmental actions and conservation. We apply an "individual, commercial, community, and society" organizational structure to the discussion; however, many of the ideas apply to all four behavioral contexts.

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General Theories on Attitudes and Behavior

The literature on attitude formation and on the relationship between attitudes and actions is extensive and includes a vast subset of research specifically focused on environmental attitudes and behavior. Attitude formation itself involves more than knowledge; it involves a combination of knowledge, affect, and intentions. Even accounting for these factors, behavior does not flow directly from "attitudes" or "values." Instead, attitudes (including norms, beliefs, and values) interrelate with the situational context that influences perceived costs and benefits and with other competing values that jointly affect environmentally significant behavior.

Summary of Selected Findings—Attitudes and Behavior

- The link between attitudes and behavior is strongest when contextual factors don't impose high costs or constraints.

- Drivers of behavioral change vary by type of conservation action, underscoring the potential relevance of an environmental problem–oriented approach to behavior change strategies.

- Approaches that involve continuous learning are more effective than "passive audience" approaches.

- Environmental information may be more effective if it is specific rather than general.

Individual Attitudes and Environmental Actions

People often use mental shortcuts to help them make decisions. These shortcuts are both necessary and useful, but they can also reinforce biases, prejudices, and ideological divides. These mental shortcuts also apply to how people interrelate with others. In the context of environmentally significant behavior, this phenomenon has led to increasing recognition of the importance of identifying community champions (both individuals and institutions) and organizing opinion-leader interventions.

Neoclassical economics tends to assume self-interest and rationality on the part of individuals, businesses, and other institutions. Although economists are aware that people are not always self-interested and rational, they consider self-interest a good baseline assumption regarding people's motivations and rationality a reasonably good predictor of behavior. The emerging field of behavioral economics is increasingly confronting the messier truths about human behavior, including the psychological biases and departures from rationality and self-interest. Given interacting motivations, incentives alone may not lead to widespread adoption of a desired behavior.

Selected Findings—Individuals

- "Motivated reasoners," influenced by values and emotion, may discount or ignore information that challenges their existing attitudes.

- People use mental shortcuts, so decisions and actions are often shaped by context, biases, and other subconscious responses.

- People are more likely to cooperate with those they perceive as similar to themselves, or as peers.

- People have strong loss aversion, so framing issues in terms of losses avoided can be more effective than framing them in terms of gains.

Commercial Sector, Consumers, and Environmental Choices and Actions

Beyond individual behaviors, this report examines how information, social settings, and other factors affect incentives and choices; how market and policy rules, contracts, and structures affect incentives that, in turn, influence choices in the marketplace; and how processes of public engagement and collaboration affect choices and action. Within this context, a significant analytical focus regarding environmental behavior has centered on profit maximization and externalities. However, the theory of change implied by the "profit maximization and externalities" perspective is limited and somewhat unrealistic.

This "foundational theory" of business behavior is limited because it focuses on government as the primary creator of environmental business incentives. Yet profit-related environmental business incentives take a much wider variety of forms, many unrelated to government policy per se. The foundational theory is unrealistic because it oversimplifies the relationships among business, government, and the public. The theory works cleanly as a theory of change only if one assumes that the government acts only in the broad public interest, the public interest is clear and uncontroversial, and government action is effective and itself uncontroversial. Conservation strategy in this naïve scenario would take the form of demonstrating and communicating the existence of public environmental costs or benefits associated with business activity, presenting that evidence to the government, and waiting for a corrective policy response.

Closer observation shows that businesses routinely engage in environmentally beneficial behaviors that are not motivated directly by statutes or regulations. They engage in a variety of actions that go "beyond compliance" and that can loosely be described as voluntary. But, though voluntary, these actions should usually not be considered altruistic. Businesses can be strategic and sophisticated when it comes to the richer social and political factors that affect their long-run profitability. This section describes a range of factors that can lead businesses to go beyond their legal and regulatory responsibilities.

Selected Findings—Commercial Sector

- Voluntary, beyond-compliance environmental business actions are more likely to be driven by profit motivations than by altruism.

- Pro-environment business behaviors are driven by a range of consumer, employee, business partner, and community factors.

- Marketing, labeling, and certification programs have been shown to influence consumer behavior (and thus the features of products sold by businesses), but the environmental benefits of labeling and certification programs are poorly understood.

- Supply chain motivations for beyond-compliance behavior are most likely to be associated with large companies and valuable brands.

Collective Action, Communities, and Collaboration

Extensive research also points to the relevance and potential of collaborative and community interventions to identify adverse environmental consequences and galvanize actions to address them—even in contexts of conflicting values and environmental attitudes. Natural resource

management decisions often involve common pool resources in which access to resources is unrestricted or difficult to restrict. Increasingly, decision contexts involve multiple governing jurisdictions, many agencies at different levels of government, public and private lands and resources, and numerous nongovernmental organizations (NGOs) and individual stakeholders.

Successful conservation in these settings requires the actions of multiple public-sector, nonprofit, and private-sector participants working in concert toward common goals. Community engagement becomes, thus, an important aspect of addressing complex environmental issues. The broadening of such community efforts underscores the importance of community-level behavioral insights regarding how collections of interests and stakeholders engage, collaborate, build legitimacy, and resolve conflicts around conservation issues.

Elinor Ostrom and others have described the emergence of co-managed common pool resources in a variety of settings in which communities craft complex governing networks. Also, a growing literature addresses the ecological outcomes of collaborative conservation processes and networks and the relationship between these processes and norms, changes in norms or attitudes, and conservation action. Much of the literature on collaboration focuses on the design of collaborative processes, but critical to their relevance to conservation is the effect of collaboration on behavior and relationships.

A number of studies suggest that collaborative decision processes can influence norms and actions. Two aspects of this research are particularly relevant. First, research on the role of cognitive processes and heuristics contributes to an understanding of how collaborative processes, particularly those involving face-to-face engagement, can influence choices and decisions. Second, some research on collaborative processes has explored their relationship to trust-building and the role of trust in influencing actions. The general literature on cognition, values, collaboration, and trust points to the importance of both institutional structures and the design of collaborative processes.

Selected Findings—Collective Settings

- Conservation, like a growing number of public-sector activities, increasingly involves governments acting as facilitators, brokers, and partners.

- Governing networks and co-management of common pool resources can: (a) enhance legitimacy, (b) create and utilize the social capital of local knowledge of local conditions, (c) tailor responses to local conditions, and (d) offer flexibility in the context of changing conditions.

- The trend toward public-engagement approaches to natural resource management and decisionmaking reflects the growing complexity of natural resource issues.

- Collaborative processes can influence norms and actions, build trust, and enhance perceptions of legitimacy of information and actions.

Collaboration and Science

The credibility, relevance, and legitimacy of knowledge determine its impact on decisionmaking. Credibility refers to the extent to which the science is perceived to meet technical standards, relevance refers to user perceptions of the appropriateness of the knowledge for addressing their needs, and legitimacy relates to perceptions that the processes for generating and using the information are procedurally fair. The importance of credibility, relevance, and legitimacy has turned attention to the role of collaborative processes in bringing together scientists, stakeholders, and decisionmakers. Some

research suggests that collaborative approaches contribute to perceptions of legitimacy, play a role in changing attitudes and behavior, and may facilitate collective action. Significant empirical research affirms that early involvement of intended users may correlate with greater linking of science to decisions after project completion.

Several emerging decision frameworks reflect the analytical–deliberative approach to science and decisionmaking that links scientists, stakeholders, and decisionmakers in ongoing dialogue and relationships. These include joint fact-finding, collaborative values assessment, collaborative adaptive management, and computer-aided dispute resolution processes. Many of these processes involve science–decisionmaking boundary organizations.

Selected Findings—Collaboration and Science

- Early and ongoing interactions between scientists and users of scientific information improve the effectiveness of such interactions.

- Four factors influence individual trust: (a) a willingness to take risks, (b) responses to betrayal, (c) a sense of altruism, and (d) an assessment of the likelihood that others in a particular setting will act in trustworthy ways. Whereas the first three elements are relatively stable personal attributes, the fourth is subject to change.

- Collaborative and network governance—both formal and informal—must: (a) provide accountability and flexibility; (b) be characterized by inclusivity in collaboration, accompanied by shared agreement on the processes and rules that will guide decisionmaking; (c) allow for ongoing learning; and (d) attend to the broader policy context and ensure that existing rules and authorities allow for and facilitate coordination.

Broad Social, Cultural, and Political Settings

An obvious way to promote conservation through public policy is to build support for conservation in the electorate, so that public officials give conservation prominence on their agendas. Of course, even if that support exists, barriers hinder its translation into policy action. Investments in building support for conservation through messaging and social marketing occur at city, county, and regional scales, in collaborative settings, and are pursued by universities, scientific organizations, and environmental NGOs. Environmental challenges like nonrenewable energy and climate change have led to the creation of independent information and communication organizations devoted solely to these issues. A growing body of research is available on how people process and internalize information and how to engage audiences (including on scientific or technical topics) and to address or circumvent belief in misinformation.

Selected Findings—Broad Social, Cultural, and Political Settings

- Because most citizens have little direct interaction with the institutions or organizations that manage risk, they establish risk perceptions based on other cues and indirect sources of information, such as the media.

- Three strategies have been identified that can increase the effectiveness of countering misinformation: (a) "warnings" that coincide with exposure to misinformation, (b) repetition of a retraction or correction without repeating the misinformation, and (c) corrections that tell an alternative story that can fill the "coherence gap" otherwise left when a belief is called into question. The last strategy has been found to be most effective.

- When presenting new or corrective information, it is often critical to do it in a way that provides identity or self-affirmation—a way that supports or is consistent with a conclusion that affirms the audience's worldview.

- Social marketing campaigns should focus on building and supporting social capital and should work through existing social networks rather than appealing to private individuals. The most significant gains from social marketing may be realized by targeting networks, civil society organizations, and other broadly defined "communities."

A Case Example—Florida Ranchland Environmental Services Project

One case study on the origins and structure of a new payment for ecosystem services (PES) program in Florida helps illustrate how basic principles of collaborative decisionmaking brought stakeholder agreement on the implementation of a market-like environmental program. The Florida program has market-like features designed to encourage private landowners—in this case, cattle ranchers—to supply ecosystem services. The program took many years to develop and implement and involved collaboration among a wide variety of stakeholders.

Selected Findings—Florida Ranchland Environmental Services Project

- A combination of broad-based technical understanding and facilitation skills were important both to the process and to the ultimate design of the program, given the need to reconcile the participants' often differing interests in the collaboration.

- Designing a PES program demands the willingness and the opportunity to "learn while doing." Learning while doing has implications for program design. First, one needs pilot sites and funding to support them. Second, one needs time to learn through conversations and experimentation to reach agreement among the collaborators.

- One must develop credible technical arguments to support the PES design. Credibility can be enhanced via transparent, iterative interactions around technical analysis, and by engaging credible and trusted scientific experts.

Case Example—Communicating Climate Change

Despite the significant amount of research on climate change mitigation and adaptation, as well as efforts to build public awareness and connect science and decisionmaking, broad awareness of the available research on climate change messaging, communications, and social marketing is lacking. Many research findings are nested within more overarching communications and marketing research, including the importance of knowing the audience, using narratives and frames in keeping with audience worldviews, identifying trusted community messengers, and using stories and imagery to capture attention and help messages stick. Research suggests that interventions could have broader and deeper impact by targeting social networks and horizontal marketing between organizations. Although some of the findings may seem straightforward (e.g., using metaphors, making messages personal, and appealing to the heart over the head), their implementation is still uncommon in many professional, academic, and scientific spheres.

Selected Findings—Communicating Climate Change

- The majority of climate change messaging is analytical, despite overwhelming evidence from social psychology that the experiential processing system is a much stronger motivator for action.

- Shifting from frames focused on the probability of climate change to frames emphasizing climate risks may better motivate behavioral change. Many people are cognizant of low-probability, high-consequence events and the need to address them (e.g., by purchasing fire insurance).

- Climate change communications need to use carefully selected metaphors and examples that prompt new ways of thinking about the personal relevance of climate change.

- Individualistic framing of climate change may be problematic. Some behavioral and social scientists argue that communication processes need to promote civic engagement and public dialogue, rather than focusing on small-scale behavior change.

Conclusion

The social sciences have a lot to say about how conservation programs work, how conservation science (natural science) is interpreted and acted on by individuals and institutions, and how environmental advocates can motivate green behaviors. A recurring theme in our synthesis is the cognitive and behavioral implications of complexity. Conservation and environmental issues are distinctive in that they often involve large-scale, interconnected social and biophysical phenomena and trigger correspondingly diverse social reactions and conflicts. Conservation science plays a schizophrenic role in this complexity. In helping us understand and communicate the workings of the natural world, science provides important tools to help people grapple with the unknown. However, as conservation science deepens, it also reinforces the complexities and uncertainties associated with both environmental problems and their possible solutions. It may be tempting for conservation advocates to think that, if only the public understood "the science," they would be converted to the cause.

However, even if "the science" is conclusive, the social implications rarely are. More typically, the science is not conclusive and its communication to "publics" reveals uncertainties, opening the door to doubt. Thus, better science by itself, conducted and communicated in isolation from the social interests it is meant to inform, may have a limited contribution to conservation advocacy. Much more promising is the integration of science with collaborative processes that bring stakeholders and knowledge providers together to iteratively frame the issues and develop data, tools, policies, and solutions.

A contribution of our report is the organizational distinction between individual, collaborative, and social behavior. We think that this is a useful device for drawing distinctions among the very diverse social science disciplines, theories, and applications reviewed. We think that collaborative behaviors are of particular ongoing relevance to conservation advocates. However, too much can be made of the distinctions. Social messaging clearly relies on individual-scale psychological factors, not just social norms. Collaborations are collections of individuals, and so on. Our analysis of business behavior is perhaps the place where the distinctions most clearly dissolve.

Businesses are themselves collaborations of individuals, leading to analyses of both the role of the individual in a business (as employee, manager, or shareholder) and the ways in which individuals cooperate as members of the same business. Also, businesses routinely find it in their interest to collaborate with the communities in which they operate and with government and NGO stakeholders. They are also both influenced by social norms (e.g., current feelings regarding tobacco or genetically modified organisms) and manipulators of those norms via sophisticated marketing resources. Of course, they are ultimately beholden to the consumer, in all his or her irrational, biased glory.

Despite the wide expanse of research surveyed in this study, empirical examination of natural resource conservation behaviors per se remains thin. To date, conservation practice has been dominated by natural scientists. Conservation behavior has long been an interest of social scientists, but is often pursued from the desktop rather than the field. Philosophical, not just practical barriers have also inhibited joint understanding. But that is all quickly changing. Conservation NGOs increasingly embrace social goals as measures of their conservation effectiveness. Solutions-oriented natural scientists see human behavior as the key to making their science matter. And social scientists have become, not only more ecologically sophisticated, but also better at communicating the social importance of natural systems.

These trends suggest that ecological–behavioral conservation studies and interventions are poised to take an important step forward. Given that the complexities of human behavior clearly matter to conservation outcomes, we hope that this report will promote discussion of next steps.

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Introduction

On July 26, 1943, news headlines in Los Angeles exclaimed that the city was under attack, not by foreign intruders but by a domestic threat—smog. Two decades later, an oily stew of polluted waters in the Cuyahoga River caught fire. Then Love Canal, an untamed depository of chemical wastes, erupted into the news with reports of toxins leaking into the soils of surrounding neighborhoods. These events galvanized environmental action in the United States, motivating civic, business, and legislative responses. Achievements were significant. Air is cleaner; some waste sites have been cleaned up; iconic species like the bald eagle once again thrive. Yet environmental challenges—in the United States and globally—persist and evolve in their extent and complexity.

The cartoon character, Pogo, quipped that "we have met the enemy and he is us." The quip seems apt in contemplating the challenges of addressing persistent environmental problems. These challenges link to the attitudes, choices, and actions of individuals, families, communities, businesses, lawmakers, and nations. Ultimately, their resolution depends on scientific knowledge, technology developments, economic incentives, legal and institutional innovations, and, most importantly, public awareness, interest, and capacity to act.

As the Pogo quip suggests, the "people factor" looms large. Increasingly, environmental challenges are characterized as "wicked problems," in which formulating the problem and specifying the sought-after outcome often *is* the problem.[2] These problems present inherent trade-offs among many environmental management choices and sometimes significant distributional effects. Environmental interventions can impact people, their traditions, their communities, and their livelihoods—affecting some more than others. Even defining problems can evoke controversy, provoke skepticism, and stall action.

Today, scientific uncertainties, complexities, interconnectedness, and the need to coordinate across scales and institutions amplify the difficulties. Consider the scale of just a handful of current environmental challenges. The US Environmental Protection Agency (EPA) reports that greenhouse gas (GHG) emissions, linked to a changing climate, increased 16-fold worldwide between 1900 and 2008. The emissions spring from actions of billions of people, thousands of companies, and the policy choices of all nations. The International Risk Governance Council reports that an estimated 25 percent of fish stocks are overexploited or fully depleted. Some marine resources have dimensions suitable for action by one community or nation; others require regional or international action. Even within a single nation, like the United States, challenges involve actions of millions of people, dozens of

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[2] K. Leong, D. J. Decker, T. B. Lauber, D. B. Raik, and W. F. Siemer, "Overcoming Jurisdictional Boundaries through Stakeholder Engagement and Collaborative Governance: Lessons Learned from White-Tailed Deer Management in the US," in *Beyond the Rural Divide: Cross-Continental Perspectives on the Differentiated Countryside and Its Regulation*, ed. K. Anderson et al. (United Kingdom: Emerald Group, 2009).

communities, and multiple states. In the western United States, for example, a recent Bureau of Reclamation report projects prospects of severe droughts lasting as long as 50 years, presenting significant water supply–demand challenges for seven states. The actions of one state in the Colorado River Basin affect all the others.

What does this setting mean for thinking about the ingredients of successful action? Insights drawn from many forms of expertise and experiences are relevant. Scientists offer insights about "how the world works"—its physical, chemical, biological, and other components, functions, and systems. Economists offer tools for examining costs, benefits, trade-offs, incentives, and their relationship to public and private institutions. Political scientists assess governance, public attitudes, and decisionmaking by both the public and its representatives. Sociologists and psychologists probe the "people factor"—why do people think what they think, how do values and attitudes form, and how do they affect choices and actions? And, of course, there is the looming presence of communications—how messages form and how people respond to different messages and different delivery modes.

Many forms of knowledge" come into play in efforts to define, describe, and determine responses to environmental challenges. But purveyors of environmental actions—whether governments, nonprofit organizations and foundations, civil society, or the business community—still struggle to bring all these "knowledges" together to motivate and sustain environmental improvements. They struggle to inform public attitudes, public policies, and on-the-ground actions with scientific knowledge. They struggle to heighten individual awareness of environmental issues and to help translate that awareness into meaningful actions. They struggle to catalyze and engage communities, economic sectors, and lawmakers to address environmental problems.

This report synthesizes insights from multiple social and behavioral science research disciplines to shed light on environmental attitudes and corresponding behaviors. Because of the breadth of relevant research, the report is not exhaustive; instead, it presents selected highlights of this research. This information can enhance efforts to successfully engage individuals in saving energy, recycling water, or undertaking countless other personal actions that reduce environmental impacts. It can help agencies mobilize communities and companies in efforts to protect sage grouse across 11 states, or sustain water supplies in small and large watersheds, or reduce the impacts of energy or mineral extraction. It may help nations communicate environmental challenges and work in concert to address them.

This report is written primarily for the benefit of environmental nonprofit organizations, environmental entrepreneurs, and philanthropies interested in advancing environmental goals and missions. The question for such individuals and institutions is: How might one influence behavior so that those goals are more likely to be met? In this context, behavioral insights yield instrumental insights—that is, they describe ways in which behavior can be influenced to move toward a given goal. The social sciences also sometimes consider what those goals should be. It is one thing to ask how, say, to influence people to drink less soda (an instrumental question); it is another thing to argue that drinking less soda is good for an individual or for society. Because this report is written for those who begin with an interest in advancing environmental goals, our focus is on what is known about how attitudes form and what influences environmentally significant behavior. Our purpose is not to presume to articulate what values people should hold or how they should prioritize them.

Part One provides a broad overview of relevant issues drawn from the literature, including a summary of challenges associated with framing and understanding conservation attitudes and behaviors. Part Two examines these attitudes and behaviors within four related, but distinguishable, areas of inquiry—individual, commercial, community, and sociopolitical. Parts Three and Four provide

case examples that illustrate some of the report's key themes. We conclude with a summary of findings in Part Five.

Part One: Overview—Theories of Attitude Formation and Behavior

Human values, attitudes, motivations, and actions affect environmental conditions and shape conservation behavior.[3] We define environmental behavior as the decisions and choices that (a) affect the efficient and effective use of natural resources; (b) reduce waste (energy, water, material, etc.); (c) reduce pollution; and (d) facilitate management of terrestrial and marine ecosystems to restore, enhance, or preserve these ecosystems, their functions, and interconnected biodiversity. The extent and success of environmental actions depend, not only on understanding conservation ecology, but also on the economic, social, and cultural processes that influence such behavior.

The social sciences provide frameworks and experience relevant to understanding the development and evaluation of human attitudes and actions and the processes of individual and social change. Insights from psychology, decision science, organization theory, political science, public administration, economics, social anthropology, marketing, sociology, and communications studies are specifically relevant. In addition, a growing literature on the sociology of science explores how scientific information relevant to environmental issues is developed, communicated, comprehended, and applied in organizational and social settings.

I. Challenges Associated with a Broad Overview

The literature on attitude formation and the relationship between attitudes and actions is extensive and includes a vast subset of research specifically focused on environmental attitudes and behavior.[4] This literature spans at least four decades. Several challenges complicate the distillation of this research and any attempts to draw conclusions from it.

- *What constitutes environmental action or behavior?* Much behavior that is environmentally significant results from actions undertaken for other purposes, but which nonetheless impact the environment. In some cases, these actions (for example, electricity generation, mineral extraction, or commercial fishing) have environmental consequences that may be more extensive than individual consumption or household behavioral choices. Some social and behavioral research focuses on what forces shape and influence environmental attitudes and behaviors that are directly intended to reduce environmental impacts.[5] Other research focuses on factors that influence environmental outcomes even where such outcomes are not the

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[3] We use the term "conservation" to reflect our primary focus on natural resources and ecosystem management but recognize that the discussion is also relevant to a broader suite of environmental issues, including human exposures to environmental risks, materials usage in production and consumption, and related public policies.

[4] Thomas Dietz, and Paul Stern, eds., *Public Participation in Environmental Assessment and Decision Making* (Washington, DC: National Academies Press, 2008), http://www.nap.edu/catalog/12434.html.

[5] See, for example, Stuart Cottrell, "Influence of Sociodemographics and Environmental Attitudes on General Responsible Environmental Behavior among Recreational Boaters, *Environment and Behavior* 35, no. 3 (2003): 347–375; Thomas Dietz, Paul C. Stern, and Gregory A. Guagnano, "Social Structural and Social Psychological Bases of Environmental Concern," *Environment and Behavior* 30 (1998): 450–471; Niklas Fransson, and Tommy Garling, "Environmental Concern: Conceptual Definitions, Measurement Methods, and Research Findings," *Journal of Environmental Psychology* 19 (1999): 369–382; Jody Hines, Harold R. Hungerford, and Audrey N. Tomera, "Analysis and Synthesis of Research on Responsible Environmental Behavior: A Meta-Analysis," *Journal of Environmental Education* 18, no. 2 (1986/87): 1–8; Paul C. Stern, "Psychology and the Science of Human–Environment Interactions," *American Psychologist* 55, no. 5 (2000): 523–530.

primary motivating purpose of the individual or organizational activity.[6] Others distinguish between behaviors that directly cause environmental change and behaviors that are more indirect—for example, behaviors that shape the context in which choices are made.[7] Finally, one can measure environmentally significant behaviors in terms of intentions or outcomes; this distinction "highlights the possibility that environmental intent may fail to result in environmental impact."[8]

- *What kinds of environmentally significant behaviors are relevant?* Conservation and environmental behaviors take many forms, including personal consumption patterns, ways people manage their private property, actions in the workplace, membership in conservation organizations, engagement in protests and activism, support for environmentally significant public policies, and so on. The relationships among values, attitudes, and actions may vary, depending on the types of environmental and conservation activities.

- *What are the actual effects of behavior intended to enhance conservation or environmental outcomes, and how does information about these effects influence attitudes and actions?* Individuals and organizations may support particular actions, believing that they will be environmentally beneficial, even if the actions produce little conservation benefit. For example, recycling household and commercial waste may not reduce overall environmental impacts (life-cycle analyses of certain types of recycling indicate that such efforts do not always yield net benefits in terms of energy, water, and material savings or emissions reductions). In other words, improving environmental outcomes involves more than changing attitudes and intentions. This observation suggests that those pursuing environmental improvements often need to grapple with complex sources of information to select actions that produce net environmental benefits. The importance of such specialized information to the identification of, and motivations for, environmentally significant actions suggests that research on how individuals, organizations, and communities receive and react to scientific and technical analyses is particularly relevant to efforts to enhance conservation. The complexities of understanding and measuring environmental outcomes also underscore the importance of life-cycle analysis, net benefits analysis, and related kinds of analytical tools, though a review of those tools is beyond the scope of this report.

II. Social Science Insights on Behavior: A Broad Summary

Theories and research on environmental values, attitudes, motivations, and actions have proliferated over the past four decades in the fields of psychology, sociology, economics, organization theory, political science, and public administration, among others. Other research—for example, on risk perceptions, knowledge transfers, corporate cultures and management, and multijurisdictional governance—also offers relevant insights for understanding attitudes and environmentally significant behavior. We define such behavior as "the extent to which [the behavior] changes the availability of materials or energy from the environment or alters the structure and dynamics of ecosystems or the biosphere itself."[9]

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[6] For example, Eugene Rosa and Thomas Dietz suggest that understanding the forces of global environmental change comes less from understanding the drivers of environmental impacts and more from understanding what drives reductions in those impacts. Eugene Rosa and Thomas Dietz, "Climate Change and Society: Speculation, Construction and Scientific Investigation," *International Sociology* 13 no. 4 (1998): 438.

[7] Paul Stern, "Toward a Coherent Theory of Environmentally Significant Behavior," *Journal of Social Issues* 56 no. 3 (2000): 407–424.

[8] Ibid., 408.

[9] Paul Stern, "Toward a Coherent Theory of Environmentally Significant Behavior," *Journal of Social Issues* 56 no. 3 (2000): 407.

Some aspects of environmentally significant behavior remain poorly understood. For example, a well-recognized "value–action" gap has been demonstrated by research showing that environmental values do not necessarily result in corresponding environmental action.[10] Simple, transferable explanations are elusive. Similarly, research on the relationships among environmental attitudes, cultural context, and cognitive biases is a relatively new field. Notable gaps remain in our understanding of the decision processes, institutions, organizational rules, communities, and broader political units that affect environmental attitudes and behavior. But despite these knowledge gaps, some broad conclusions can be drawn from the extensive theoretical, empirical, and practical research available to us.

A. Attitude Formation and Behavior

Several consistent themes recur, across different research disciplines, in much of the work on attitudes and environmentally significant behavior. These include four general observations.

- Multiple factors shape attitudes and link attitudes to environmentally significant behavior.

- Motivations for environmentally significant behavior vary by the type of action.

- Many different types of environmental issues unfold at different scales and within widely varying decision settings, affecting which participants, attitudes, and behaviors are relevant.

- The relevance, credibility, and perceived legitimacy of information affect the learning and use of information.

A-1. Multiple Factors Shape Attitudes and Link Attitudes to Behavior

Some early research on environmental attitudes and behavior applied a linear model, assuming that knowledge was linked to attitudes, which in turn affected behavior.[11] Subsequent research has largely invalidated the linear model.[12] Not surprisingly, environmental behavior is more difficult to predict and involves numerous interrelated factors, though "lack of knowledge explains some of the weak relationship between environmental concern and environmentally responsible behavior."[13] Attitude formation itself involves more than knowledge; it involves a combination of knowledge, affect, and intentions.[14] Even accounting for these factors, behavior does not flow directly from "attitudes" or "values." Instead, attitudes (including norms, beliefs, and values) interrelate with the situational context that influences perceived costs and benefits and with other competing values that, jointly, affect environmentally significant behavior. But even the perception of costs and benefits is

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[10] Although a growing body of research has explored this gap, the factors that explain it are various and context specific. Andrew Darnton, Jake Elster-Jones, Karen Lucas, and Mike Brooks, "Promoting Pro-Environmental Behaviour: Existing Evidence to Inform Better Policy Making: Summary Report," study prepared for the Department for Environment, Food, and Rural Affairs (Centre for Sustainable Development, University of Westminster, no date).

[11] Stuart Cottrell, "Influence of Sociodemographics and Environmental Attitudes on General Responsible Environmental Behavior among Recreational Boaters," *Environment and Behavior* 35 no. 3 (2003): 347–375. See, for example, L. Ajzen and M. Fishbein, "Attitudinal and Normative Variables as Predictors of Specific Behavior," *Journal of Personality and Social Psychology* 27 (1973): 41–57; M. Fishbein and L. Ajzen, "Attitudes toward Objects as Predictors of Single and Multiple Behavioral Criteria," *Psychological Review* 81 (1974): 59–74; M. P. Malony, M. Ward, and G. Braucht, "A Revised Scale for the Measurement of Ecological Attitudes and Knowledge," *American Psychologist* 30 (1975): 787–790.

[12] Cottrell, "Influence of Sociodemographics," 349.

[13] Niklas Fransson and Tommy Garling, "Environmental Concern: Conceptual Definitions, Measurement Methods, and Research Findings," *Journal of Environmental Psychology* 19 (1999): 369–382. The authors point to 17 studies that show that knowledge of issues and of behavior strategies were important moderators of whether attitudes predicted behavior (373).

[14] Ibid. Intentions refers to a determination to behave in a certain way; affect as used here refers to an emotional state.

complex and includes, for example, community expectations, legal and institutional factors, habits and routines, and personal capabilities, along with direct monetary impacts.[15]

In the 1990s, several researchers analyzed a large data set on environmental attitudes and behavior.[16] This research shows that general support for environmental goals (positive environmental attitudes) is associated with the expectation of harmful consequences to the environment and adherence to a cluster of values, such as altruism, among other variables. Experimental tests have shown that activation of environmental behavior requires both an awareness of adverse consequences associated with an environmentally damaging behavior and a sense of personal responsibility for those consequences.[17] But even where such awareness and sense of responsibility exist, pro-social (environmental) norms "will not be activated in situations where the personal costs are perceived as too high."[18] Stern notes that "the key to behavioral change is the immediate context of behavior, not deeper values."[19] The link between attitudes and behavior is, thus, strongest when contextual factors do not impose high costs or constraints.[20]

Setting details aside, the overall conclusion is that conservation and environmental strategies aimed at behavior change should focus not on isolated factors, but rather on bundles of them. In this regard, consider Gardner and Stern, who describe several types of interventions perceived as potentially affecting environmentally significant behavior.[21] These include, for example: (a) moral and educational interventions, (b) material incentive structures, and (c) community (institutional) management. These types of social interventions are likely to be more powerful in concert than in isolation.

A1-a. Moral and Educational Interventions: The contextual nature of environmental behavior suggests significant limits to both moral and educational initiatives, and, indeed, such efforts have shown limited results in empirical analyses. For example, research shows that "education interventions by themselves have little or no effect in promoting new pro-environmental behaviors."[22] However, research regarding the influence of education points to some specific opportunities. As noted earlier, understanding the potential adverse environmental and social consequences of certain behaviors can contribute to attitude formation and change. However, the understanding of how scientific knowledge of specific environmental effects influences attitudes and motivations to act is not well understood.[23]

A1-b. Incentives: A voluminous economics literature points to the influence of financial incentives (or disincentives) on environmental behavior. Although such incentives and disincentives affect behavior, their influence is determined (and sometimes limited) by other factors, including personal and social norms, knowledge, and institutional capacities.

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[15] Paul Stern, "Toward a Coherent Theory of Environmentally Significant Behavior," *Journal of Social Issues* 56 no. 3 (2000): 407–424.

[16] Thomas Dietz, Paul C. Stern, and Gregory A. Guagnano, "Social Structural and Social Psychological Bases of Environmental Concern," *Environment and Behavior* 30 (1998): 450–471.

[17] Paul Stern and Stuart Oskamp, "Managing Scarce Environmental Resources," in *Handbook of Environmental Psychology*, ed. D. Stokols and I. Altman (New York: Wiley & Sons, 1987), 1055.

[18] Paul Stern, "Psychology and the Science of Human–Environment Interactions," *American Psychologist* 55, no. 5 (2000): 525.

[19] Ibid.

[20] G. A. Guagnano, P. Stern, and T. Dietz, "Influences on Attitude–Behavior Relationships: A Natural Experiment with Curbside Recycling, *Environment and Behavior* 27 (1995): 699–718.

[21] G. T. Gardner and P. Stern, *Environmental Problems and Human Behavior* (Boston: Allyn and Bacon, 1996).

[22] Paul C. Stern, "Psychology and the Science of Human–Environment Interactions," *American Psychologist* 55 no. 5 (2000): 526.

[23] Ibid.

These confounding factors are evident in research regarding price incentives to motivate household participation in recycling, for example. The success of pay-as-you-throw recycling programs that offer free recycling alongside waste fees pegged to the amount of trash disposed depends both on the size of the fee and on program design (whether and what kind of trash bags or containers are used, program complexity, information provided, and so on). Attempts to site solid waste facilities reveal similar limits to the role of monetary incentives in influencing behavior, particularly where the proposed actions are perceived, at least in part, in moral terms. For example, changes in the levels of host-community compensation for the siting of waste facilities have resulted in little variation in opposition to siting.[24] Researchers note the role of moral considerations over the role of financial compensation.[25] This research also reveals the importance of direct citizen engagement in decisionmaking and its positive role in facilitating siting decisions.[26]

A1-c. Community Management: Extensive research points to the relevance and potential of place-based, community interventions to identify adverse environmental consequences and galvanize actions to address them—even in contexts of conflicting values and environmental attitudes. The following highlights recur in research on community engagement and community environmental management.

- Community engagement is correlated with enhanced effectiveness of conservation actions, though effectiveness also depends on process and institutional design.

- Collaborative and community-engagement processes can influence norms and actions by building trust and by providing social cues that affect environmental attitudes.

- Collaborative processes influence problem-framing, which relates to one particular factor—perceptions of the capacity to act—identified as important to translating attitudes into action.

Summarizing research on the effectiveness of different types of interventions, Stern notes that "even incentive- and community-based approaches rarely produce much change on their own. By far the most effective change programs involve combinations."[27] In short, no type of intervention appears to affect behavior on its own. Affirming this conclusion, a recent study of existing evidence on environmental behavior changes notes that behaviors are complex, with different audiences behaving differently and requiring tailored interventions; and behavior change is best motivated by "circular" rather than "linear" social processes, where partnerships that involve continuous learning are more effective than "passive audience" approaches, and feedback is critical.[28] Reflecting on this complexity, the authors of that study conclude: "Policies that aim to encourage pro-environmental behavior need to reflect these complexities. They should combine multiple types of instruments in a 'package' of measures."[29]

Because of the relevance of this work to understanding effective conservation, we provide greater detail and offer specific examples in subsequent sections (including the section on community action in Part Two and a Florida ecosystem services payment project in Part Three).

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[24] Carissa Shively, "Understanding the NIMBY and LULU Phenomena: Reassessing Our Knowledge Base and Informing Future Research," *Journal of Planning Literature* 21 (2007): 260.

[25] Ibid.

[26] Robin R. Jenkins, Kelly M. Maguire, and Cynthia Morgan, *Host Community Compensation and Municipal Solid Waste Landfills* (National Center for Environmental Economics, US Environmental Protection Agency [EPA], 2002).

[27] P. Stern, "Toward a Coherent Theory of Environmentally Significant Behavior," *Journal of Social Issues* 56, no. 3 (2000): 420.

[28] Andrew Darnton et al., "Promoting Pro-Environmental Behaviour," Executive Summary.

[29] Ibid., 5.

A-2. Motivations for Environmentally Significant Behavior Vary by Type of Action

No uniform system exists for the classification of types of environmentally significant behavior (or actions), which include the following.

- *Personal and household consumption decisions*, which, in turn, break down into the purchase and use of major goods, such as houses and automobiles; the purchase of smaller or daily consumption items; household maintenance and operational decisions, such as thermostat settings for heating and cooling; and waste disposal decisions.

- *Resource stewardship* by private landowners and managers, including farmers; by landholding corporations; and by the public sector managing public lands, waters, and other resources.

- *Environmental citizenship and activism*, including (a) membership in, and financial support for, environmental organizations and (b) support for public policies, environmental movements, and campaigns.

- *Organizational engagement*, including participation in the workplace, professional societies, or other groups that design products, set standards, or undertake other actions that have direct or indirect environmental consequences.

Several studies have shown that different behavior types may be motivated by different patterns of sociopsychological and sociodemographic predictors.[30] One examination of different behavior types—consumer behaviors, environmental citizenship, policy support, and activism—concludes that one can predict each of these types of activities by different patterns of norms, beliefs, and values.[31] That study further concludes that behavior is affected by a combination of personal values, knowledge of the adverse effects of certain actions, a sense of personal responsibility, knowledge of remedial actions, and the capacity to take action.

In addition, research on environmentally significant behavior suggests that the factors that determine individual political action are not the same as those for collective action.[32] Environmental knowledge and a belief in the efficacy of individual action, among other factors, are more important for individual than for collective action. In contrast, the extent of acceptance of "an environmentalist creed" better explains collective environmental action.[33]

Because drivers of behavior change vary by type of conservation action, some researchers suggest a problem-oriented approach to behavior change strategies—one that identifies specific environmentally important activities and determines "whose actions and which actions matter most."[34] Following this line of analysis, Stern and Oskamp suggest that environmental information may be more effective if it is specific, rather than general.[35]

At least one meta-analysis provides support for this focused approach to change strategies, showing a stronger relationship between eventual environmental action and positive attitudes toward

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[30] Paul Stern, "Toward a Coherent Theory of Environmentally Significant Behavior," *Journal of Social Issues* 56, no. 3 (2000): 407–424.

[31] Ibid., 420.

[32] Donald E. Blake, "Contextual Effects on Environmental Attitudes and Behavior," *Environment and Behavior* 33 (2001): 708–725, http://eab.sagepub.com/content/33/5/708.

[33] Ibid.

[34] Paul C. Stern, "Psychology and the Science of Human–Environment Interactions," *American Psychologist* 55, no. 5 (2000): 527–528.

[35] Paul Stern and Stuart Oskamp, "Managing Scarce Environmental Resources," in *Handbook of Environmental Psychology*, ed. D. Stokols and I. Altman (New York: Wiley & Sons, 1987), 1055.

specific actions than between eventual actions and more general positive attitudes toward environmental protection.[36] Stern and Oskamp note that the failure to see a causal relationship between environmental attitudes and behavior appears, in part, to result from a "mismatch in specificity between the attitude measures, which are usually general, and behavioral indexes, which are usually specific."[37]

A-3. Different Types of Environmental Issues Unfold at Different Scales and in Different Settings

Environmental issues vary significantly in their characteristics, with implications for identifying the decisionmakers, information, and actions relevant to addressing them. Many environmental problems comprise "commons" dilemmas, as described by Elinor Ostrom and others.[38] Other environmental issues have been described using a "needs, opportunities, abilities" model relating to consumer attitudes and behaviors.[39] Charles Vlek usefully categorizes environmental problems in terms of levels of risk (personal, indoor, local, regional, fluvial, continental, and global).[40] He notes that, at each scale, different actors—individual, organizational, institutional—are relevant (and potentially responsible) for diminishing harmful environmental effects.[41] Addressing many environmental problems requires coordination among different actors. Problems at all scales or levels of risk involve some socio-behavioral considerations.

Recognizing these many differences, Stern and Oskamp suggest that "the best way to proceed is to study carefully the particular environmental problem of concern before trying to apply psychological theories."[42] Relevant questions, according to Stern and Oskamp, include "which actors can make an important difference by ameliorating, exacerbating, or preventing the problem? And for each type of actor, which actions have a large impact on the problem? Asking these questions requires a researcher to examine the environmental problem before applying theory, but to do so in a way that makes psychological theory relevant."[43]

A-4. Relevance, Credibility, and Perceived Legitimacy Affect Learning and the Use of Information

Substantial research concludes that the relationship between knowledge, attitudes, and behavior is neither linear nor simple. However, research also indicates that knowledge of alternative actions and their environmental consequences plays some role in activating behavior to reduce environmental impacts. This relevance underscores the significance of better understanding (a) how knowledge transfer and information content affect learning, perceived legitimacy of information, and the uses of knowledge in shaping choices and motivating action and (b) what mechanisms enhance the effectiveness of efforts to link science and decisionmaking.

Two clusters of research are particularly relevant to this understanding. The first cluster is the growing body of research on the relationship between knowledge and affect, which helps to explain

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[36] Niklas Fransson and Tommy Garling, "Environmental Concern: Conceptual Definitions, Measurement Methods, and Research Findings," *Journal of Environmental Psychology* 19 (1999): 369–382.

[37] Stern and Oskamp, "Managing Scarce Environmental Resources," 1053.

[38] Elinor Ostrom, *Governing the Commons: The Evolution of Institutions for Collective Action* (Cambridge, UK: Cambridge University Press, 1991).

[39] Charles Vlek, "Essential Psychology for Environmental Policy Making," *International Journal of Psychology* 35, no. 2 (2010): 152.

[40] Ibid., 156

[41] Ibid.

[42] Stern and Oskamp, "Managing Scarce Environmental Resources," 1049.

[43] Ibid.

attitude formation. The second cluster relates more specifically to science and decisionmaking in the context of environmental problems. This cluster addresses the design of "use-inspired" research, for example, and examines the conditions for effective communication and use of scientific and technical knowledge in decisionmaking.

Part One—Summary of Key Findings

- The link between attitudes and behavior is strongest when contextual factors don't impose high costs or constraints.

- By far the most effective strategies for influencing attitudes and behavior involve combinations of interventions.

- Drivers of behavior change vary by type of conservation action, underscoring the potential relevance of an environmental problem–oriented approach to behavior change strategies.

- Different audiences behave differently and require tailored interventions.

- Approaches that involve continuous learning are more effective than "passive audience" approaches.

- Environmental information may be more effective if it is specific rather than general.

Part Two: Social and Behavioral Research and Applications

In Part One, we provided an overview of theories, research, and brief examples that illustrate theories of behavior and knowledge formation/learning and evidence of their power to explain or change attitudes and behavior. We now apply an "individual, commercial, community, and society" organizational structure to our review and address questions directly pertinent to environmental actions and conservation. Though we organize the discussion around individuals, commerce, communities, and broader societal contexts, many of the ideas apply to all four behavioral contexts. For example, risk analysis and perception and marketing insights apply to all four categories. Although much of the discussion summarizes theories and research findings across a spectrum of disciplines, we also offer several examples to provide a richer sense of situational details that can affect attitudes and actions. In Part Three, we offer a longer case study of a Florida ecosystem services payment program that illustrates many of the broader themes of this report. Part Four provides a closer look at climate change and issues of communication, attitude formation, and associated responses.

I. How Individuals Think and Act

The incentives, motivations, information, relationships, norms, and values of individuals are important to conservation design. Examples include "working landscapes" where conservation goals are pursued in partnership with farmers or other property owners; conservation actions in relationship to commercial fishing operations; or household-level stewardship initiatives. Policies under the Endangered Species Act (ESA) initially failed to appreciate disincentives created by the ESA that reduced landowner motivations to protect and enhance habitat. Identification of the disincentives led to Safe Harbor Agreements and other policies that enhanced conservation outcomes. In China, incentive payments to households to monitor illegal wood harvesting resulted, unexpectedly, in the splitting of larger households into smaller units and increased demand for fuel, which undermined conservation goals. Other individual behavioral insights relate to conservation efforts directed at families to motivate household-level changes in landscaping, home construction, and energy use. As a

general rule, however, behavioral insights have not been systematically incorporated into conservation planning.

Individual behavior may seem limited in its potential for broad-scale influence, but in aggregate its effects are significant. Including personal transportation and home electricity use, individual households account for nearly one-third of carbon emissions in the United States.[44] Improving energy efficiency and conservation, using currently available and effective technologies, could reduce emissions in this sector by 20 percent in 10 years, equivalent to more than 7 percent of national emissions. With the application of innovative policy tools and emerging technologies, even larger reductions are within reach.

Vandenbergh and colleagues argue that adopting the most successful interventions and scaling to national coverage can be achieved only with insights from behavioral and social sciences and that laws and policies benefit from reflecting empirically grounded behavioral principles.[45] We begin our discussion by focusing on insights from psychology and social psychology in five areas that have important implications and ramifications for social and environmental outcomes. We then turn to social norms (what others in a given social context do or say), whether within one's network of family, friends, and coworkers, or in a public context of strangers or relative strangers. Finally, we examine the role of communication in framing and agenda setting.

A. Social Psychology

This section is organized around the following concepts: (a) cognition and affect; (b) heuristics, framing, and priming; (c) the role of messengers and "liking;" (d) reciprocation and commitments; (e) incentives and interacting motivations; and (f) defaults.

Social psychology insights can be categorized in a variety of ways, and semantic challenges abound. For example, in *The Social Animal*, Elliot Aronson uses the categories of conformity, communication and persuasion, social cognition, self-justification, aggression, prejudice, and liking.[46] Social psychologist Robert Cialdini relies on the concepts of reciprocation, commitment and consistency, social proof (or norms), liking, authority, and scarcity.[47] Authors of a 2010 report commissioned by the UK Institute for Government on influencing behavior through public policy use a pneumonic device, MINDSPACE (Messenger, Incentives, Norms, Defaults, Salience, Priming, Affect, Commitments, and Ego).[48] All of these categorizations, however, include the concepts described below.

Scientists and other experts have often subscribed to a knowledge or information deficit view of behavior: when people fail to behave in ways that are believed by experts to be in their own or society's best interest, the solution is to provide them with the knowledge they lack and/or persuade them to change their attitudes. However, social psychologist Elliot Aronson draws a critical distinction between informed opinions—which are primarily cognitive ("head" rather than "heart") and, therefore, open to change based on reasoning—and opinions that are both emotional and evaluative (attitudes), which are extremely difficult to change, particularly with direct communication.[49] One

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[44] M. Vandenbergh, P. Stern, G. Gardner, T. Dietz, and J. Gilligan, "Implementing the Behavioral Wedge: Designing and Adopting Effective Carbon Emissions Reduction Programs," *Environmental Law Reporter* 40 (2010): 10547–10554.

[45] Ibid.

[46] Elliot Aronson, *The Social Animal*, 9th ed. (New York: Worth Publishers, 2004), 1–514.

[47] Robert Cialdini, *Influence: The Psychology of Persuasion*, 3rd ed. (New York: HarperCollins Publishers, 2007).

[48] P. Dolan, M. Hallsworth, D. Halpern, D. King, and I. Vlaev, *MINDSPACE: Influencing Behaviour through Public Policy* (London: UK Institute for Government, 2010), http://www.instituteforgovernment.org.uk/our-work/better-policy-making/mindspace-behavioural-economics.

[49] Aronson, *Social Animal*.

meta-analysis of pro-environmental behavior found that "at least 80% of the factors influencing behavior did not result from knowledge or awareness. And insofar as the better educated, higher income, more advantaged minds are the first and easiest to change, inequalities in health and well-being may be widened by information campaigns."[50]

Research and experience indicate that people are capable of systematic and deep analysis, but the reflective mind has limited capacity. Often, decisions and actions are shaped by context, mental shortcuts (heuristics), biases, and other subconscious responses, which Cialdini refers to as "click, whirr" behaviors.[51] "Once triggered by environmental features, these preconscious automatic responses run to completion without any conscious monitoring."[52] These "automatic processes" have been relatively neglected in policy discussions, perhaps because researchers and policymakers underestimate their impact. When people are asked to predict their own sensitivity to "automatic processes," they often misjudge their own responses. When asked if a candidate's physical appearance affects their vote, or if their neighbors' actions are important to their own, people tend to answer "no," even though their actual behavior suggests that the answer is "yes."[53] Given the demonstrated role of in-built, subconscious reactions and responses, social psychology can provide insights into environmental behavior change. As sociologists Thomas Dietz, Paul Stern, and Elke Weber assert in a study on energy consumption, "We have to design programs for the ways real people make choices, not for the formally rational decision-makers of economic theory."[54] Furthermore, this research suggests that changing behavior without changing minds may often be cheaper and more effective.[55]

A-1. Cognition and Affect

"Cognition" refers to how people understand and process the world around them; through thought, experience, and senses, people gain knowledge and form beliefs. "Affect" involves the role of emotional associations in shaping decisions and actions. "Cold cognition" refers to the impacts of external conditions and fact-based appeals that allow for reasoned and logical analysis and decisionmaking, whereas "hot cognition" refers to the more charged and emotional situations and appeals that can override logical reasoning and cause people to make what may seem to be irrational judgments. Consider spot TV commercials for political issues or candidates. Some research shows that these commercials are most effective when focused on highly charged issues that arouse strong emotions. When opposing candidates fight back with facts and figures, the public gets bored, and when people are scared or angry, such factual appeals are not very convincing.[56]

Memories also tend to be governed by "peak" moments, along with final impressions of a chain of events.[57] In addition, emotional arousal has been shown to increase people's willingness to pass on information, increasing the reach of an idea.[58] Use of "gray" (recycled) water offers an illustration. Although recycled water is often treated nearly to drinking water standards and is typically used for landscaping, the mental association between what is flushed down toilets and what comes out of the

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[50] Dolan et al., *MINDSPACE*, 15.

[51] Cialdini, *Influence*.

[52] Dolan et al., *MINDSPACE*, 14.

[53] Aronson, *Social Animal*, Cialdini, *Influence*.

[54] Thomas Dietz, Paul Stern, and Elke Weber, "Reducing Carbon-Based Energy Consumption through Changes in Household Behavior," *Daedalus* 142, no. 1 (2013): 87.

[55] Dolan et al., *MINDSPACE*.

[56] Aronson, *Social Animal*.

[57] Dolan et al., *MINDSPACE*.

[58] S. Lewandowsky, U. Ecker, C. Seifert, N. Schwarz, and J. Cook, "Misinformation and Its Correction: Continued Influence and Successful Debiasing," *Psychological Science in the Public Interest* 13, no. 3 (2012): 106–131.

sprinklers has in some cases led to public resistance to its use and municipal restrictions or bans. Peter Ditto, professor of psychology and social behavior at the University of California, Irvine, explores the relationship between moral intuitions (often linked with strong emotional triggers) and factual beliefs. Ditto helped to develop www.yourmorals.org. The site has garnered over 200,000 responses to a moral foundations questionnaire. Results drawn from this site suggest that people often adjust their benefit–cost beliefs to fit basic moral intuitions. In terms of political ideology biases, some research also finds that this moral-to-factual coherence is significantly higher among conservatives.[59]

Fear is a particularly powerful emotion. Research suggests that it is unhelpful to create fear without agency. Messages that arouse fear and are linked with specific instructions on how, when, and where to take action (e.g., show bad flu symptoms, encourage people to get the flu shot, and give them information on when and where the shots are available) are far more effective than purely fear-inducing messages. Recent research indicates that people with high self-esteem are more likely than those with low self-esteem to be moved to immediate action by fear-arousing messages. However, if action can be taken later, people with low self-esteem are also more likely to be motivated by communications arousing a great deal of fear.[60] Research suggests that people can develop an expectation of being shocked about certain issues, which can make these messages less effective and require a shift to more counterintuitive messaging. These observations point to the importance of seeking out insights (for example, through focus groups) on how best to present particular issues to specific audiences.[61]

One relevant concept relating to cognition is confirmation bias or "motivated reasoning." As Aronson explains, "human cognition tends to be conservative—that is, we try to preserve that which is already established—to maintain our preexisting knowledge, beliefs, attitudes, and stereotypes."[62] "Motivated reasoning" refers to a phenomenon in which the desire to reach a certain conclusion biases the processing of information related to that conclusion. According to Dolan, "people tend to pay little attention to information that challenges an existing belief or hypothesis, and focus intently on supportive information."[63] The mechanism behind motivated reasoning has been described as follows:

> Motivated reasoners may discount, counter argue, or simply ignore new information that challenges existing evaluation and affect …. Information that is congruent with expectations is easily assimilated since it requires no effort to accept what one already knows is true. But incongruent information interrupts normal processing and instead engages a process where some effort must be expended to make sense of the world.[64]

The theory of motivated reasoning is increasingly being used to explain political discourse and affiliations.[65]

A related issue is "cognitive dissonance," in which "an inconsistency between beliefs and behavior causes an uncomfortable psychological tension, sometimes implying that people change their beliefs

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[59] Brittany Liu and Peter Ditto, "What Dilemma? Moral Evaluation Shapes Factual Belief," *Social Psychological and Personality Science* 4, no. 3 (2013): 316–323.
[60] Aronson, *Social Animal*.
[61] Ibid.
[62] Ibid., 158.
[63] Dolan et al., *MINDSPACE*.
[64] David P. Redlawsk, "Hot Cognition or Cool Consideration? Testing the Effects of Motivated Reasoning and Political Decision Making," *The Journal of Politics* 64, no. 4 (2002): 1023.
[65] Ibid.

to fit their behavior instead of changing their behavior to fit their beliefs."[66] One example of cognitive dissonance is the observation that members of Western societies that have the largest carbon footprints may be more likely to believe that climate change problems are exaggerated. In a recent meta-analysis of environmental behavior experiments, researchers found that treatments that "accessed preexisting beliefs or attitudes and attempted to make participants behave in ways that were consistent with those beliefs to reduce the dissonance" were among the most effective.[67]

In situations where people lack knowledge about a topic, studies show that they often look for an initial anchor on which to base decisions (e.g., adding a 2 percent minimum payment to credit card bills lowers the rate of repayment relative to the case where no minimum payment is specified). These anchors can seem arbitrary. Consider one experiment in which people were asked to write down the last two digits of their social security numbers before bidding in an auction. This arbitrary cue had a demonstrable impact on their bids.[68] Moreover, the influence of mental anchors can endure over long periods of time and can influence decisions well past the conditions in which those anchors were formed. This may mean that decisionmakers or others seeking to influence behavior may have added influence if they act as an initial anchor, which may be easier to do at times when people are making major life changes or entering new situations.[69]

A-2. Mental Shortcuts, Framing, and Priming

People often use mental shortcuts (heuristics) to help them make decisions. These shortcuts are both necessary and useful, but they can also reinforce biases, prejudices, and ideological divides. Three common heuristics are the representative, availability, and attitude heuristics.

The Representative Heuristic: A simple example of the representative heuristic is the belief that high-quality products are more expensive. This belief can lead people to perhaps erroneously infer that if something is expensive, it is also of high quality. Another example pertains to height: taller people are, on average, paid more in the workplace, and, in the majority of presidential campaigns, the taller candidate has won. People sometimes make the erroneous inference that people's height relates to their capabilities and their capacity for leadership. These sorts of heuristics are often used to form quick opinions and judgments about other people. The most immediate information gained when someone interacts with a new person—gender, race, attractiveness, and social status—provides a cue that often guides thought and behavior.[70] People are more likely to accept someone else's behavior as the norm, or to cooperate with them, if they exhibit even superficial similarities, such as dress. For example, research in the days of pay phones showed that when an experimenter asking for change was dressed as a student, the request would be granted more than two-thirds of the time by students who were asked. Experimenters who dressed differently or unusually were granted the request less than half the time. Similarly, requests to sign a petition meet with much higher rates of success when the petitioner and subject are similarly attired.[71]

The Availability Heuristic: The availability heuristic refers to the tendency to make judgments based on the ease of bringing specific examples to mind. The availability heuristic means that

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[66] Fredrik Carlsson and Olof Johansson-Stenman, "Behavioral Economics and Environmental Policy," *Annual Review of Resource Economics* 4 (2012): 79.

[67] Richard Osbaldiston and John Paul Schott, "Environmental Sustainability and Behavioral Science: Meta-Analysis of Proenvironmental Behavior Experiments," *Environment and Behavior* 44, no. 2 (2012): 273.

[68] Aronson, *Social Animal*.

[69] Dolan et al., *MINDSPACE*.

[70] Aronson, *Social Animal*.

[71] Cialdini, *Influence*.

emotional and vivid appeals and stories can have particularly strong and lasting effects, particularly with repeated media coverage. For example, fewer people die each year from shark attacks than from falling airplane parts, but, due to fear-arousing media coverage of shark attacks, most people would guess the opposite. Similarly, the more television people watch, and hence the more reported and fictionalized violence they see, the more they appear to significantly overestimate the amount of real crime that occurs in the United States.[72]

The Attitude Heuristic: The attitude heuristic refers to how people's underlying attitudes (or "stored evaluations") guide their decisions and beliefs. Research has found, for example, that "a person's attitudes play a major role in what he or she 'knows' to be true."[73] Furthermore, the more strongly held an attitude, the more confidence people have in their judgments and the more they overestimate the percentage of people agreeing with them. For instance, in a study exploring racial bias toward aboriginal Australians, researchers found that only a very small percentage of the population admitted strong prejudice, but those same respondents significantly overestimated the percentage of the non-aboriginal population that agreed with them (70.9 percent). Those who didn't exhibit the bias believed that less than 50 percent of their compatriots shared their view.[74]

The Use of Heuristics and Framing: People are most likely to use heuristics when (a) they don't have time to think carefully about an issue, (b) they are overloaded with information, (c) the issue(s) at stake are not particularly important to them, or (d) they have little reliable knowledge or information to use to guide their decisions.[75] It is well documented that people are made uncomfortable by ambiguity and will, in fact, pay a lot—explicitly or implicitly—to avoid ambiguity.[76] Reliance on heuristics may, in fact, be explained as a psychological strategy to minimize ambiguity's discomforts.

Because people often rely on heuristics, the ways in which issues and messages are framed can have a particularly strong effect on beliefs and behavior. The cognitive psychologists Daniel Kahneman and Amos Tversky used framing phenomena to interpret individual risk judgments and consumer choices and found that "perception is reference dependent."[77] Consider the following description:

> When you frame something … you emphasize one dimension of a complex issue over another, calling attention to certain considerations and certain arguments more so than other arguments. In the process, what you do is you communicate why an issue may or may not be a problem, who or what is responsible for that problem and then what should be done. One of the common misunderstandings about framing is that there can be something such as unframed information. Every act of communication, whether intentional or not, involves some type of framing.[78]

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[72] Aronson, *Social Animal*.
[73] Ibid., 111.
[74] Susan Watt and Chris Larkin, "Prejudiced People Perceive More Community Support for Their Views: The Role of Own, Media, and Peer Attitudes in Perceived Consensus," *Journal of Applied Social Psychology,* 40, no. 3 (2010): 710–731.
[75] Aronson, *Social Animal*.
[76] To quote Carlsson and Johansson-Stenman, most people "are willing to spend substantial amounts of money to avoid ambiguous processes in favor of processes that are equivalent in terms of expected utility." Carlsson and Johansson-Stenman, "Behavioral Economics".
[77] Quoted in Matthew Nisbet, "Communicating Climate Change: Why Frames Matter for Public Engagement," *Environment Magazine*, March–April (2009), http://www.environmentmagazine.org/Archives/Back%20Issues/March-April%202009/Nisbet-full.html.
[78] *New Public Health*, "Matthew Nisbet Q&A: Framing Public Health Issues," August 30, 2012, www.rwjf.org/en/blogs/new-public-health/2012/09/matthew_nisbet_qa.html.

Pulitzer-prize winning author E.O. Wilson has successfully applied the frame of morality and ethics to build partnerships with religious leaders who believe climate change is an urgent challenge. Attitudes toward nuclear power are likely to be different when nuclear power is presented as a path toward energy independence than when nuclear power is framed as risky technology requiring significant public oversight.[79] Because people are typically loss averse, a powerful form of framing is to emphasize loss over gain. In one experiment, researchers worked with a home energy audit company to test the behavioral effect of alternative ways of framing the benefits of an energy efficiency improvement. The auditors told one group of homeowners how much money they could *save* on energy bills each year. A second group was given otherwise identical information, except homeowners were told that without taking action they were *losing* money every day ("throwing money out the window"). The homeowners in the latter group were more than twice as likely to engage in the energy efficiency behavior.[80]

Message frames need to be carefully tailored, as there is no single "public" to influence: "On any complex problem there are a variety of publics that share common identities, information sources and different individuals or types of experts that they trust and look to for information."[81] The sophisticated messenger's task is first to understand how relevant "publics" are likely to filter communications on a given topic. Matthew Nisbet has argued that additional research is needed through in-depth interviews, focus groups, sophisticated surveys, and experiments to further explore, identify, and test frames across audiences.[82] Further discussion of the critical role of framing is provided in this report's climate change communication case example in Part Four.

At the Environmental Defense Fund's 2012 Science Day conference, the topic was "Decoding Human Behavior: How the Social Sciences Can Help Solve Environmental Problems."[83] Drew Westen, professor of psychology at Emory University and author of *The Political Brain*, spoke about shaping and activating voters' neural networks of association. He asked the audience to remember three verbal images: "the moon rose over the ocean," "the glasses sat on the chair," and "the pen is under the table." After a small digression, he asked the audience to say the first brand of laundry detergent that came to mind. Almost everyone said Tide. The "ocean–moon" image activated an unconscious network of immediate association with waves and tide. The phenomenon is known as "priming," and studies have shown that this heightened activation—whether through words, sights, or smells—can last as long as a year. For example, in one experiment, subjects were asked to unscramble anagrams and then notify the experimenter of the completed task. Some subjects were asked to unscramble words related to rudeness (such as "intrude" or "disturb"), whereas others were given more neutral words. When the participants went to notify the experimenter, they found him engaged in conversation. Those primed with rude associations were much more likely to interrupt.[84] The practical use of priming strategies remains limited because researchers don't yet have a rigorous understanding of which of the thousands of primes encountered each day have significant effects on behavior and under what conditions. The authors of the MINDSPACE report concluded that priming is perhaps the least understood of the behavioral effects they explored, but it has significant implications for communications and public policy.[85]

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[79] Nisbet, "Communicating Climate Change."
[80] Aronson, *Social Animal*.
[81] *New Public Health*, "Matthew Nisbet Q&A."
[82] Nisbet, "Communicating Climate Change."
[83] Environmental Defense Fund 2012 Science Day, Decoding Human Behavior: How the Social Sciences Can Help Solve Environmental Problems, Sentry Centers Midtown West, New York, October 3, 2012.
[84] Aronson, *Social Animal*.
[85] Dolan et al., *MINDSPACE*.

Finally, consider contrast, primacy, and scarcity effects. For example, when prospective homebuyers are searching for a home, real estate agents may first show them relatively undesirable options within their budget and then a more desirable one at the top of their price range. The expensive home is likely to be more attractive after the buyer has looked at the prior options than if it had been seen first. In other words, the sequence of comparisons can affect perceptions and choice.

Or consider the following two sentences: "Steve is intelligent, industrious, impulsive, critical, stubborn, and envious," or "Steve is envious, stubborn, critical, impulsive, industrious, and intelligent." An early experiment asking people to rate Steve's qualities provided evidence of the importance of initial impressions: Steve is ranked more positively based on the first description than the second, a primacy effect. Similarly, when people were asked to watch a test-taker answer 30 questions and then rank the test-taker's intelligence, test-takers who answered questions correctly early in the test and then showed a decline in their accuracy were perceived as more intelligent than those who answered initial questions incorrectly and then improved in accuracy, despite answering exactly the same number of questions correctly.[86]

The credibility and value attached to information can also be affected by perceptions of its availability—or "scarcity." Just as products that are scarce or limited may be more desirable, information that is perceived as difficult to acquire or exclusive tends to increase people's interest *and* increase the likelihood that they accept the information at face value. To test this theory, the owner of a successful beef-importing company asked his sales staff to phone customers—buyers for supermarkets and restaurants—and request a purchase in one of three ways: through (a) a standard sales presentation; (b) the standard presentation plus information that beef supplies were likely to be scarce in the near future; or (c) the standard presentation, the scarcity information, and a "tip" that the scarcity information was not generally available and had come from exclusive company contacts. Those who were told about impending scarcity of beef ordered twice as much as those who received only the standard sales presentation, and those who were also told that they were receiving exclusive information purchased six times as much.[87]

A-3. Messengers and "Liking"

People are more likely to cooperate with those whom they perceive as similar to themselves. People also often take one positive attribute of a person and assume that the individual has other positive characteristics as well; this effect, referred to as the "halo effect," can complicate critical decisions. A study in Pennsylvania of criminal trial verdicts found that handsome male defendants received significantly lighter sentences than those considered unattractive.[88] In an experiment in North Carolina, a set of men received comments about themselves from someone who needed a favor from them. Some got only positive comments, others only negative, and the rest a mix of the two. The person who provided only praise was liked best, even though the men recognized that the flatterer stood to gain from their positive view of him; further, the praise did not have to be accurate to work.[89]

This research is relevant to understanding the information "messenger." In particular, some people are more likely to act on information from someone perceived as an authority figure or expert.

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[86] Aronson, *Social Animal*.
[87] Cialdini, *Influence*.
[88] Ibid. In this study, researchers rated the physical attractiveness of 74 male defendants at the start of their criminal trials. Once the trials were complete the researchers reviewed the court records for the results of each of these cases and found that those rated as attractive were twice as likely to avoid jail as those rated as unattractive.
[89] Ibid.

One example involved hospital nurses in 22 different wards of three Midwestern hospitals who were unaware that they were being observed. In this experiment, a researcher called each nurse, identified himself or herself as a hospital physician, and gave identical directives to each nurse to administer a dangerous dosage of a drug to a specific ward patient. This directive should have prompted caution on the part of the nurses because (a) a prescription transmitted by phone was in violation of hospital policy; (b) the medication was unauthorized; (c) the dosage was obviously excessive, as it was double the "maximum daily dose;" and (d) the nurse had never met, seen, or talked with this "doctor." Nonetheless, 95 percent of the nurses obeyed, procured the ordered dosage, and headed toward the patients' rooms before being intercepted by the observer. While both doctors and nurses are supposed to act as a check on the safety and accuracy of medical treatment, this experiment showed that a symbol of authority—the title of "doctor"—could cause nurses to disconnect from their own professional judgment.[90] However, the question of who is an expert, and to what degree, is ambiguous and subjective. Two broad groups of experts—scientists and government experts—trigger particularly complex associations for many Americans, associations that complicate generalizations relating to the influence of expert judgment on behavior. People sometimes discard advice given by those they dislike, and these feelings can override traditional cues of authority.[91] Those people who have come to believe that scientists are elitist or that the government is too heavy-handed may, accordingly, be less likely to listen to or believe messages they perceive as coming from these groups.

People are also much more likely to be open to messages from familiar peers (regarding smoking and HIV testing, for example).[92] In the context of environmentally significant behavior, this phenomenon has led to increasing recognition of the importance of identifying community champions (both individuals and institutions) and organizing opinion-leader interventions. According to some public health researchers, "At the social-network level, there is an urgent need to identify and activate popular opinion leaders within all strata of society, including the government and commercial sectors. Personal influence, especially of community opinion leaders, is a powerful source of social change."[93] Consider an illustrative example. When US Fish and Wildlife Service (FWS) officials encouraged farmers in western Pennsylvania to install stream bank fencing and several habitat improvement measures, their efforts were more successful when they were able to identify leaders in the farming community, engage in a learning process with these leaders who ultimately adopted these practices, and then work through these leaders to expand the adoption of these practices more broadly in the community.[94]

Given the critical role of the messenger, the authors of the MINDSPACE report assert that it is important to "think more carefully about which messengers to mobilize, in which circumstances, and whether they should focus mainly on the automatic [click, whirr] or reflective ways of thinking."[95] Again, on any given subject one must consider a variety of "publics."

Findings on "liking" and messengers, paired with what is known about confirmation biases, have significant implications both for the creation of networks (cultural, informational, and so on) and for divisions between such networks that can lead to polarization. "Homophily" refers to the tendency for

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[90] Ibid.

[91] Ibid.

[92] Aronson, *Social Animal*.

[93] E. Maibach, C. Roser-Renouf, and A. Leiserowitz, "Communication and Marketing as Climate Change–Intervention Assets: A Public Health Perspective, *American Journal of Preventive Medicine* 35, no. 5 (2008): 498.

[94] This experience was recounted to Lynn Scarlett during site visits to western Pennsylvania and interviews with public-sector officials, local university researchers, and members of the farming community.

[95] Dolan et al., *MINDSPACE*, 19.

people to form a network with others who are similar to them and to rely on relatively simple cues to determine who those people are.[96] Demographic and behavioral similarities between "experts" and non-experts can increase the effectiveness of working together, whereas dissimilarities can have the opposite effect.[97] Nobel laureate Thomas Schelling developed a segregation model that tested slight preferences for homophily. He used a squared board to represent a city, with each square representing a home or lot, and used pennies and dimes to represent two groups—black or white, boy or girl, smoker or nonsmoker, and used "happiness rules" to guide the movement choices of each agent. Schelling found that the "city" quickly evolved into a strongly segregated landscape if the rules specified that colocation with "like types" was highly favored. However, Schelling also found that initially integrated "communities" tipped into full segregation even if the agents' happiness rules indicated only a mild preference for having neighbors of their own type.[98] Some sociologists posit that the current polarization of US beliefs and attitudes about climate change may be due to many seemingly small decisions based on homophily preferences.[99]

A-4. Reciprocation and Commitment

The rule of reciprocation is deeply ingrained. One type of reciprocation involves invoking mutual concessions, which can be a powerful tool in any type of cooperation or negotiation. An example is to make an initial request larger than one expects to achieve and then concede to a more reasonable outcome, or to make a small concession that induces a larger concession on the other's part. Cialdini refers to this as the "rejection-then-retreat technique."[100] Professional negotiators often use this approach, recognizing that it is important to ensure that the initial demand is not so extreme as to be immediately dismissed.[101] An illustrative study tested the behavioral effect of the two following alternatives: the first asked individuals to volunteer for two hours each week in a community mental health agency for at least two years and then retreated to a request that they commit to volunteer for two hours at least once, whereas the second made only the smaller request. The rejection-then-retreat tactic yielded a 76 percent commitment, whereas the smaller request yielded only a 29 percent commitment. Furthermore, 85 percent of those in the first group actually followed through on their commitment, whereas only 50 percent of those in the second group did so. This effect can be linked to two positive byproducts of the act of concession: enhanced feelings of both responsibility for and satisfaction with the agreement, which can serve as an inducement to fulfill an agreement and to engage in further agreements in the future.[102]

Making commitments publicly, or even simply writing them down, can also enhance the likelihood of follow-through. In one experiment, college students were asked to estimate the lengths of a set of lines. One group wrote down their estimates, signed them, and turned them in; another group wrote them down privately and then erased them; and a third group made mental estimates but did not

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[96] To quote Henry and Dietz: "Homophily may be explained in the context of trust networks by the tendency of individuals to believe that similarity in terms of certain easily observed attributes, such as educational background, policy preferences, or institutional affiliation signals similarity in terms of other difficult to observe attributes that are critical for the formation of a trust relationship." Adam Douglas Henry and Thomas Dietz, "Information, Networks, and the Complexity of Trust in Commons Governance," *International Journal of the Commons,* 5, no. 2 (2011): 202.

[97] Dolan et al., *MINDSPACE*.

[98] Thomas Schelling, "Dynamic Models of Segregation," *Journal of Mathematical Sociology* 1 (1971): 143–186.

[99] Henry and Dietz, "Information, Networks, and the Complexity of Trust."

[100] Cialdini, *Influence*, 38.

[101] To quote Cialdini: "The truly gifted negotiator, then, is one whose initial position is exaggerated enough to allow for a series of reciprocal concessions that will yield a desirable final offer from the opponent, yet is not so outlandish as to be seen as illegitimate from the start." Cialdini, *Influence*, 40.

[102] Ibid.

write them down. Those who had never written them down were least loyal to their choices and were easily influenced by new information. Those who had merely written them down were significantly more committed to their initial estimates and those who had publicly recorded their initial positions refused to shift. Studies of voter mobilization have found that turnout increases if voters are asked to sign or make a verbal pledge to vote, if this act is followed by a mailing or a call reminding them of their pledge. Telling those who pledge to vote that someone may call postelection to follow-up (a "threat" of direct social accountability) is also a significant motivator.[103]

Public recognition can also be a powerful incentive to commitment. Consider an experiment in Iowa to convince homeowners to conserve energy. One set of homeowners was contacted with energy efficiency tips and asked if they would try to save fuel, which they all agreed to do. Another set was contacted with the same tips, asked to conserve, and told that their names would be publicized in the newspaper as public-spirited, fuel-conserving citizens. After one month, the first set had achieved no real savings, but the second set had made significant reductions. Even after researchers sent letters to these homeowners saying that it was no longer possible to publicize their efforts, the second set continued to conserve—and in fact actually conserved more than in the first period—15.5 percent as opposed to 12.2 percent.[104] An explanation for this surprising result is that the newspaper incentive "had prevented the homeowners from fully owning their commitment to conservation. Of all the reasons supporting the decision to try to save fuel ... it was the only one preventing the homeowners from thinking that they were conserving gas because they believed in it."[105] This experiment was replicated in the summer with even more notable results: a 28 percent savings with the publicity and a 42 percent savings after the publicity had been withdrawn. The influence of these extrinsic versus intrinsic motivations is discussed further in the next section.

Evidence also suggests that securing a relatively small commitment can subsequently make it easier to achieve larger commitments. In one experiment, researchers asked homeowners to display a three-inch square sign in their window that read, "Be a safe driver." Two weeks later, a different researcher asked homeowners in the same neighborhood to place a large, poorly lettered sign on their lawns reading, "DRIVE CAREFULLY." Although more than 80 percent of those who had not received any prior request refused, 76 percent of those who had agreed to the prior small request agreed to have the sign in their yards.[106]

A variation of this experiment was conducted with two unrelated commitments (a petition in support of "keeping California beautiful" followed by a later request to install the same "DRIVE CAREFULLY" sign), with similar results. The hypothesis is that a small act of public service can lead people to a new civic-minded, self-image. Thus, when asked to make a larger commitment, they complied "to be consistent with their newly formed self-images."[107]

Research suggests that people like to think of themselves as self-consistent, and this desire to act consistently means that a small initial change in behavior can lead to compliance with subsequent, more consequential behaviors. An implication is that motivating small changes in behavior may be more effective than getting people to consciously change their minds. In the words of Dolan and colleagues: "Small and easy changes to behavior can lead to subsequent changes in behavior that may

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[103] Marguerite Rigoglioso, "The Psychology around Voter Turnout" Graduate School of Stanford Business, Center for Social Innovation, April 17, 2012, http://csi.gsb.stanford.edu/getting-out-vote.
[104] Cialdini, *Influence*.
[105] Ibid., 102.
[106] Ibid.
[107] Ibid., 73.

go largely unnoticed. This approach challenges the common belief that we should first seek to change attitudes in order to change behavior."[108]

A-5. Incentives and Interacting Motivations

The impact of providing incentives is not as straightforward as it may seem. It is important to distinguish between moral or intrinsic motivations (an action or behavior seen as worthy in itself) and extrinsic motivations (such as financial rewards or public recognition).[109] A preschool provided an unintended example of this trade-off. Because some parents were picking up their children late, school officials decided to implement a fee if parents arrived past a certain time. This led to the unexpected consequence of more parents actually arriving late. Prior to the fine, the majority of parents had an intrinsic motivation to pick up their kids on time, but the extrinsic attempt to provide a check on arriving late actually undermined that motivation, making parents feel that they had a right to pick up their children late.[110] One reason to draw the distinction is a hypothesis that extrinsic motivations (such as policies to pay for environmentally desirable behaviors) may undermine intrinsic motivations (such as altruism). In other words, policies to create extrinsic motivations might work, but they might work less well than expected. Of particular concern are extrinsic motivations (again, payments are an example) that cannot be made perpetually. Once the extrinsic motivation is withdrawn, will intrinsic motivations return, or are they lost? Numerous studies find that "if an individual has a preference for a self-image as a morally responsible person, economic incentives may undermine moral motivation."[111]

On the other hand, extrinsic environmental incentives can reinforce or "crowd in" intrinsic motivations in a number of ways. At any one time, a variety of motivations are likely to be in play, and motivations can interact in important ways. Consider an environmental tax that creates a financial motivation for an environmental behavior. The pure financial motivation may trigger or amplify additional motivational effects. For example, the tax may make it (relatively) cheaper to choose a green alternative, and thus lower the psychic and other costs of adopting a green self-image. Or the tax, by socially acknowledging the related environmental issue, may reduce ambiguity and cognitive dissonance arising from doubts about the environmental issue's validity. Or the tax, by altering the larger community's behavior, may also change the individual's sense of norms and affiliation.[112]

Purchasers of hybrid vehicles, for example, are likely to do so for a variety of reasons, including tax incentives, self-image, and affiliation with community norms.[113] The decision of cities such as Washington, DC, to implement disposable bag taxes provides another illustrative example. A more subtle influence than the added 5¢ cost is the fact that no one automatically gets bags anymore: one must request them in front of fellow customers. Washington, DC, implemented its bag tax in 2010; within just two quarters the use of disposable bags had declined by roughly 80 percent, from 68 million to 12 million, and volunteers for the annual Potomac River Watershed Cleanup pulled 66 percent fewer plastic bags from the river than in 2009.[114] These examples point to the need for more

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[108] Dolan et al., *MINDSPACE*, 28.

[109] For an opposing view, see T. Brennan, "A Methodological Assessment of Multiple Utility Frameworks," *Economics and Philosophy* 5, no. 2 (1989): 189–208; and T. Brennan, "The Futility of Multiple Utility," *Economics and Philosophy* 9, no. 1 (1993): 155–164.

[110] Carlsson and Johansson-Stenman, "Behavioral Economics."

[111] Ibid., 83.

[112] Ibid.

[113] Sexton, Steven and Alison Sexton. "Conspicuous conservation: the Prius effect and willingness to pay for environmental bona fides." Working paper, University of California, Berkeley (2011). This study showed that the willingness to pay for the "green halo" of driving a Toyota Prius, even given a tax incentive, varied significantly based on the environmental friendliness of one's neighbors.

[114] Stephanie Simon, "The Secret to Turning Consumers Green," *The Wall Street Journal*, October 17, 2010.

study of interactions between incentives, particularly because a given incentive may compete with or amplify other motivations.[115]

Given interacting motivations, incentives alone may not lead to widespread adoption of desired behavior. Michael Vandenbergh and his colleagues examined the potential of the "behavioral wedge" to contribute to domestic carbon mitigation and outlined six program design principles: (a) prioritize high-impact actions (both technical potential and behavioral plasticity); (b) provide sufficient financial incentives; (c) market the program effectively; (d) provide credible information at points of decision; (e) keep it simple; and (f) provide quality assurance.[116] The authors emphasize the increased effectiveness of programs designed to implement all of these principles rather than just one or a few. As with all of the potential tools for inducing environmentally significant behavior, providing incentives appears not to be a silver bullet. The authors used these principles to assess a number of programs that have already been deployed such as "cash for clunkers," energy efficiency tax credits, financial incentives for residential solar, and the Obama administration's "Recovery through Retrofit" proposals. Each program, shown in Table 1, provides incentives, but often their design overlooked other important principles. Although the "cash for clunkers" program was well implemented, particularly in terms of marketing and convenience, it wasn't very effective from the standpoint of environmental impact: that is, the cars purchased using the rebate were only marginally more fuel efficient than those purchased prior to the rebate.[117] For energy efficiency retrofits, it is difficult to determine how much energy and money can be saved, getting the credit requires paperwork, and it can take up to a year to get the return. Similarly, securing tax credits for residential solar energy is quite complex. Some of the areas with the highest uptake have had neighbors or community members join together to help each other take advantage of the incentives, including the identification of an "environmental expert." These findings, including the need to design and evaluate programs that use all six principles, are not applicable only to individual or family decisionmaking. Vandenbergh and his colleagues note, "The estimated potential for economically advantageous improvements in energy efficiency in the private sector—the so-called energy efficiency gap—is not much smaller in the private sector than among households."[118] The business sector also has significant untapped potential for implementation gains.

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[115] Dolan et al., *MINDSPACE*.
[116] Vandenbergh et al., "Implementing the Behavioral Wedge."
[117] Shanjun Li, Joshua Linn, and Elisheba Spiller, "Evaluating 'Cash-for-Clunkers': Program Effects on Auto Sales and the Environment," *Journal of Environmental Economics and Management* 65, no. 2 (2013): 175–193.
[118] Vandenbergh et al., "Implementing the Behavioral Wedge,"10552.

Table 1. Recent Emissions Reduction Programs Rated by Design Principles

Principle	Cash for Clunkers	Efficiency tax credit	Residential PV incentives
Select high-impact actions	Excellent	Excellent	Good
Provide sufficient financial incentives	Good-Excellent	Good-Excellent	Variable
Market effectively	Excellent	Fair	Poor
Intervene at point of decision	Excellent	Fair	Poor
Keep it simple	Good-Excellent	Fair to Poor	Poor
Provide quality assurance	Not an issue	Poor	Poor

Note: PV, photovoltaics (for the generation of solar energy).
Source: Vandenbergh et al., "Implementing the Behavioral Wedge."

A-6. Defaults

"Defaults" are the fallback options that are preselected if an individual does not make an active choice. The default versus active choice approach can have a significant effect on individual choices.[119] One of the most common examples involves organ donations: a shift from having the option to "opt in" to having to "opt out" has significantly increased participation in donor programs.[120] Similarly, "green" defaults significantly affect the choice of green electricity options.[121] In an effort to raise more money to maintain public parks in Washington State, decisionmakers decided to shift models. Instead of asking drivers who were renewing their licenses to make a $5 donation, the donation was automatically added to the cost unless applicants opted out of paying the fee. The previous model had less than 2 percent participation and raised just over $600,000 a year, whereas the new model generated returns of over $1 million in a single month.[122]

On the other hand, the more experienced an individual is with any given issue, the more likely that person is to make an active decision. Lofgren and colleagues did an experiment testing the choices of environmental economists registering online for a conference with the option to purchase carbon offsets.[123] The registrants were randomly offered one of three settings—opt in for offsets, opt out to forgo offsets, or the offset option was noted without a default. In this case, providing a default had no significant effect on the decision to offset, indicating that most registrants, presumably experienced travelers with a firm understanding of offsets, made an active decision.

All of these findings on default effects have implications for environmental policy. First, "economic incentives/regulation may have to be stronger if there are strong default effects on the market and

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[119] For a critique of the view that default choices are arbitrary for this reason, see note 173, below, and the accompanying text.
[120] Dolan et al., *MINDSPACE*.
[121] Daniel Pichert and Konstantinos Katsikopoulosa, "Green Defaults: Information Presentation and Pro-environmental Behavior," *Journal of Environmental Psychology* 28 (2008): 63–73.
[122] Dolan et al. *MINDSPACE*.
[123] A. Lofgren, P. Martinsson, M. Hennlock, and T. Sterner, "Are Experienced People Affected by a Pre-set Default Option? Results from a Field Experiment," *Journal of Environmental Economics and Management* 63, no. 1 (2012): 66–72.

defaults are not environmentally friendly."[124] Second, defaults are clearly a valuable tool decisionmakers can use to motivate "passive" environmentally significant choices, particularly if the actor is not very experienced or familiar with the issue. On the other hand, manipulating defaults in this way substitutes the judgment of decisionmakers (regarding what is the "right thing to do") for that of markets and individuals.

B. Social Norms and Conformity

Social norms are a frequent and influential mental "shortcut" people use to make choices and assess their own behaviors.[125] Despite the large body of evidence on the power of social norms to positively (or negatively) influence behavior, this evidence is under-recognized and underutilized by those interested in changing behaviors. Robert Cialdini, a frequently cited social psychologist who studies influence and persuasion, emphasizes that: "People frequently ignore or severely underestimate the extent to which their actions in a situation are determined by the similar actions of others [as well as] the persuasive impact that descriptive norms can have on the choices of a target audience."[126]

Many studies distinguish between two broad types of norms: descriptive and injunctive. Descriptive norms refer to "perceptions of what is commonly done in a given situation" (e.g., everyone on my block fills up their blue recycling bins, so I should recycle, too). Injunctive norms refer to "perceptions of what is commonly approved or disapproved within the culture" (e.g., being an energy saver is good and being an energy guzzler is bad).[127] Evidence suggests that presenting aligned descriptive and injunctive norms can motivate larger behavioral changes than applying them separately.[128] Although many studies demonstrate the behavioral influence of social norms on individuals or households, social norms also influence group behavior and community, organization, and business actions.

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[124] Carlsson and Johansson-Stenman, "Behavioral Economics," 86.

[125] Robert Cialdini, "Descriptive Social Norms as Underappreciated Sources of Social Control, *Psychometrika* 72, no. 2 (2007): 263–268; and V. Griskevicius, R. Cialdini, and N. Goldstein, "Social Norms: An Underestimated and Underemployed Lever for Managing Climate Change," *International Journal for Sustainability Communication* 3 (2008): 5–13.

[126] Cialdini, "Descriptive Social Norms," 264–265.

[127] P. Schultz, J. Nolan, R. Cialdini, N. Goldstein, and V. Griskevicius, "The Constructive, Destructive, and Reconstructive Power of Social Norms," *Psychological Science* 18 (2007): 429–434.

[128] Ibid.

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An Example: New Information Leads to New Norms

In the late 1980s, Dutch graduate student Jan Hanhart came up with a novel idea. The Dutch government was planning to devote significant resources to reducing nationwide natural gas consumption by 15 percent. Hanhart proposed that the government simply tell people what amount they were currently using, what amount they wanted them to use, and provide them with some suggestions regarding how they might go about reaching this national goal. The officials scoffed at the simplicity of his proposal, but he persisted.

Hanhart put an advertisement on the front page of a local weekly newspaper telling the community how much natural gas they were using and how much they should try to conserve, along with some ideas and suggestions for reducing their use. Soon, he noted that the community was engaged in an ongoing dialogue. Everywhere he went people were asking their neighbors how much they were using and what they were doing to use less. Within just six months, natural gas use had decreased by 18 percent, surpassing the goal. This success appeared to be linked both to energy feedback (providing consistent "real-time" information on energy usage) and to community dialogue that generated a perception that conservation was the new norm.

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B-1. Use of Norms

Social norms have a particularly strong impact under conditions of uncertainty or when people have limited personal experience: "In general, when we are unsure of ourselves, when the situation is unclear or ambiguous … we are most likely to look to and accept the actions of others as correct."[129] This response has been linked to negative behaviors, such as a crowd's failure to respond to a crime victim or other hazard.[130] But norms can also be harnessed by policymakers and businesses in positive ways. For example, when new environmental opportunities arise—such as when a new "green" technology goes on the market or a new environmental regulation is put into place—"the unfamiliar conditions will make people especially attentive and responsive to information about how others are dealing with it. It also means a loss of persuasive leverage if leaders don't use such information in their communications."[131]

As discussed earlier, similarity (even if superficial) affects perceptions of affiliation and the likelihood that people will follow another's lead, which is one explanation for why social norm–based campaigns tend to be highly effective at the community level.[132]

A cross-cultural study of frequent drinkers in the United States, Germany, Mexico, and Japan presented participants with comparisons between their alcohol consumption and the social norms in their countries. Participants in Mexico and Japan, which are perceived as more community oriented, acknowledged that information about norms influenced their behavior, whereas those in the United States and Germany, which are seen as more individualistic, claimed that knowledge of peer behavior had not influenced them. Nevertheless, in all four countries, participants reduced their drinking relative to the control groups.[133]

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[129] Cialdini, *Influence*, 129.
[130] Ibid.
[131] Griskevicius et al., "Social Norms," 11.
[132] Cialdini, *Influence*.
[133] Simon, "Turning Consumers Green."

Although people generally want to see themselves as responsible, they are also concerned about relative status. Olof Johansson-Stenman and Peter Martinsson asked people to share the characteristics they considered important when choosing a new car. Almost everyone claimed that environmental characteristics were very important, whereas few emphasized the status associated with specific makes and models. On the other hand, when asked to list what they saw as important purchasing factors for others, status became more important and environmental performance less important.[134]

People are more likely to invest their money, time, or other forms of influence on social and environmental goods if people who are similar or "close" to them have invested their own capital and/or if they will see or hear about one another's choices. Numerous experimental studies have shown that conformity is an important factor affecting people's charitable giving in contexts ranging from national parks to public radio fundraising and contributions to public goods.[135]

Reinforce Positive Norms, Not What's Wrong with Negative Norms

The famous 1970s "Keep America Beautiful" ad campaign featured a sorrowful Native American in a canoe rowing through trash in the water, past industrial pollution, and watching someone toss garbage from a car window. What may have stuck in people's minds—in addition to the weeping protagonist—was that many people litter. This reinforcement of a negative norm may have been counterproductive, as subsequent research has shown.

Based on this hypothesis, researchers designed a set of three public service announcements (PSAs) to encourage recycling based on reinforcement of a positive norm. Specifically, the PSAs showed neighbors engaged in recycling and disparaging a single neighbor who wasn't participating; these PSAs were aired on local stations in four Arizona communities. The researchers documented a 25 percent increase in recycling in communities receiving the PSA relative to communities that did not. Social norms information "should both validate and stimulate the desired action."

B-2. Perceived versus Actual Norms

Researchers often find a significant divergence between the actual social norm and the perceived norm. Social psychologists refer to this as "pluralistic ignorance"—a schism between the actual prevalence of a belief in a society and what people in that society think others believe.[136] Addressing this divergence can be critical in motivating desired behaviors.[137] At the Environmental Defense Fund's 2012 Science Day conference,[138] Wesley Perkins, professor of sociology at Hobart and Williams Smith Colleges, spoke about his research on social norms and behavior, much of which has focused on reducing substance abuse and other negative behaviors, but has implications for environmental choice behavior. Perkins argues that perceived peer norms are "the largest driver of behavior." When studying alcohol use and abuse on college campuses, Perkins found that the majority of youths

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[134] Olaf Johansson-Stenman and Peter Martinsson, "Honestly, Why Are You Driving a BMW?" *Journal of Economic Behavior and Organization* 60 (2006): 129–146.

[135] Carlsson and Johansson-Stenman, "Behavioral Economics."

[136] Lewandowsky et al., "Misinformation and Its Correction."

[137] Wesley Perkins and David Craig, "Student-Athletes' Misperceptions of Male and Female Peer Drinking Norms: A Multi-Site Investigation of the 'Reign of Error,'" *Journal of College Student Development* 53, no. 3 (2012): 367–382.

[138] Environmental Defense Fund 2012 Science Day.

consistently overestimated the level of drinking by peers and their acceptance of excessive drinking. On a more general level, studies have shown that norms related to social problems are commonly misperceived in the direction of overestimated norms, whereas "protective" behaviors are commonly underestimated. On issues from bullying to drinking and driving, and from secondary school– and college-age substance abuse to general promotion of healthy behaviors, Perkins and his colleagues have shown that social norm–oriented marketing campaigns to correct misperceptions are often more effective at shifting behaviors in the desired direction than direct efforts to change behaviors.[139] In cases where the perceived norm diverges significantly from the actual norm, and the actual norm is more desirable, identifying and correcting the misperception can reduce the schism and induce the desired shift toward the true norm. According to Perkins, campaigns to correct the misperception can benefit from having a clear action item and implementing "high-dosage" communications, with ongoing and intense social marketing.

B-3. Norm-Based Environmental Success Stories: Examples

Hotel Guests and Towel Reuse: In 2006, a set of psychologists and other researchers evaluated common appeals used by hotels to try to persuade guests to reuse their towels.[140] They found that the messages most commonly used focused on basic environmental protection ("Help save the environment"). Two other common appeals invoked guests' sense of social responsibility to future generations or informed them of potential energy savings to the hotel. They found that the environmental appeals and the social responsibility appeal all motivated a similar degree of desired behavior, averaging 30 percent, whereas the appeal based on reducing hotel energy expenses generated less than 16 percent participation. The researchers then decided to test the effect of a "reciprocal" norm message. The revised appeal stated: "We're doing our part for the environment. Can we count on you?" This reciprocation norm yielded a participation rate of 45.2 percent, significantly more effective than the previous cards (30.7 percent).

The researchers then communicated the norm specific to each guests' room. This final message stated: "75 percent of the guests who stayed in this room (#xxx) participated in our new resource savings program by using their towels more than once. You can join your fellow guests in this program to help save the environment by reusing your towels during your stay." This produced an even higher reuse rate of 49.3 percent. Although the rise in participation was not dramatic, the authors point out that this message provided "a nearly costless 10 percent increase in savings." Such findings and results may be familiar to those within the environmental arena, but their application remains limited by hotels and other businesses that could benefit from the proenvironmental behavior of consumers.

Household Energy Conservation: In 2007, San Diego area residents were the subjects of a study evaluating the success of different messages to motivate household energy conservation. Each household received a placard with one of four messages advocating home energy savings. Three of the messages used typical appeals to reduce household energy usage: (a) "conservation will save the environment," (b) "conservation will save you money," and (c) "conservation will preserve resources for future generations." The fourth message provided survey-based information indicating that it was

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[139] Wesley Perkins, David Craig, and Jessica Perkins, "Using Social Norms to Reduce Bullying: A Research Intervention in Five Middle Schools," *Group Processes and Intergroup Relations* 14, no. 5 (2011): 703–722; W. Perkins, J. Linkenbach, M. Lewis, and C. Neighbors, "Effectiveness of Social Norms Media Marketing In Reducing Drinking and Driving: A Statewide Campaign," *Addictive Behaviors* 35 (2010): 866–874; and Wesley Perkins, ed., *The Social Norms Approach to Preventing School and College Age Substance Abuse: A Handbook for Educators, Counselors, and Clinicians* (San Francisco: Jossey-Bass, 2003).

[140] N. Goldstein, V. Griskevicius, and R. Cialdini, "Invoking Social Norms: A Social Psychology Perspective On Improving Hotels' Linen Reuse Programs," *Cornell Hospitality Quarterly* 48, no. 2 (2007): 145–150.

the neighborhood norm to attempt to conserve energy in the home.[141] In addition, a control message urged conservation but didn't provide a reason. Meter readings revealed that the message about community norms generated significantly higher energy savings than any of the other messages (10 percent more than the control group, whereas no other group exceeded 3 percent more than the control group).

When the participants were interviewed after the study and asked to rank the reasons for energy conservation in terms of personal motivators, the "comparison with others" motivation was consistently ranked last. This result underscores the degree to which people may be unaware of the influence norms have on their behaviors.[142]
Paul Hamilton, a senior vice president at the global energy firm Schneider Electric, posits, "I would bet if you went into a residential neighborhood and put a red, green or yellow light on peoples' mailboxes to show who's an energy hog and who's not, people would start to change their behavior."[143]

Although the much-discussed example of OPower doesn't use the visibility approach, it has utilized the link between neighborhood norms and energy conservation and implemented it at a much larger scale with its Home Energy Reports. The company provides utility customers with a simple monthly visual comparing their energy use with that of "efficient neighbors" and "all neighbors" and then rank their standing as "Great" with two smiley faces (an injunctive norm intended to dissuade efficient customers from increasing their energy use), "Good" with one smiley face, or "Below Average."[144] As of July 2012, five years after launching operations, OPower's reports were reaching more than 10 million households and had shown savings of more than 1 billion kilowatt-hours of energy, which would be enough to take Arlington County, Virginia, off the grid for a year.[145]

This example illustrates the challenges of tapping the full potential of social norms. OPower is currently reaching just shy of 8 percent of American households. To reach the other 92 percent, utilities have to be motivated to buy their service and share their customer information. The pioneering utilities are driven by state Energy Portfolio Standards and other regulations that create incentives for energy efficiency improvements, and broad-scale application may require new laws and policies. This experience illustrates the need to think carefully about how to present and frame information on household energy impacts and mitigation potential to decisionmakers.[146] In addition, although OPower's energy savings are notable, the most frequently reported behavioral changes involve small day-to-day actions like turning off lights and adjusting thermostats, "behaviors that most consumers likely already knew could save them energy,"[147] whereas the largest, most lasting gains in energy efficiency involve upgrading household technologies. "The most promising targets for policies intended to shape a more sustainable energy future are those that involve the adoption of more efficient equipment rather than those that involve the use of equipment … policies directed at adoption have to work only once, while policies directed at use have to work continuously."[148] Consistent with our earlier observations on the importance of combining multiple strategies, motivating changes to household capital will require integrated treatments that combine social norm

[141] Schultz et al., "Power of Social Norms".

[142] Cialdini, "Descriptive Social Norms."

[143] Simon, "Turning Consumers Green."

[144] Hunt Allcott, "Social Norms and Energy Conservation," *Journal of Public Economics* 95, no. 9–10 (2011): 1082–1095.

[145] Kevin Redmon, "How OPower's Dan Yates Persuades People To Use Less Energy," *Washingtonian*, July 12, 2012, http://www.washingtonian.com/articles/people/how-opowers-dan-yates-persuades-people-to-use-less-energy/.

[146] Vandenbergh et al., "Implementing the Behavioral Wedge."

[147] Allcott, "Social Norms and Energy Conservation," 1088.

[148] Dietz et al., "Reducing Carbon-Based Energy Consumption," 81.

feedback with financial incentives, saturation marketing, simplified processes, and the other proven principles of program design.

An evaluation of programs to encourage home weatherization found that those that were designed effectively were able to achieve a 90 percent participation rate, but those that were not well designed achieved less than 10 percent uptake, even with the same financial incentives. One example is the Hood River Conservation Project, in which the municipal utility hired a team of sociologists to design a communications outreach strategy that ultimately relied on existing neighborhood and community organizations to spread the word. Implementation support and sizable incentives, along with other program features, led to major energy efficiency retrofits in almost 90 percent of homes.[149] Why has such a successful approach, implemented more than 30 years ago, not been widely replicated? One possibility is that decisionmakers are not well informed about the mitigation potential in this sector and their role in overcoming barriers.

Sustainable Forest Management—The Driftless Project: Recognizing the limited successes of engaging private landowners in forestry conservation in the Driftless Area of southwest Wisconsin, the American Forest Foundation and others collaborated to increase their engagement by using social marketing tools to test the effectiveness of different approaches. Approximately 40 percent of the 2.1 million–acre area is privately owned forestland. The area's forests and forest economy are threatened by encroaching development, unsustainable logging practices, and diminution of water quality and wildlife habitat. To improve forest health and sustain forestry opportunities, more than 15 state and federal agencies and nonprofit organizations formed the Driftless Forest Network, a landscape-scale collaborative effort with a goal of working with forest owners to undertake sustainable forest management practices.[150]

Using a novel strategy to promote sustainable private forestry, project designers are trying to address three questions:

1. Can they apply social marketing techniques to move interested woodland owners toward greater forestry knowledge and ability to implement sustainable forestry practices?

2. Can they help develop a collaborative landowner assistance network?

3. Can their combined strategies effect landscape-scale changes in ecosystem services and multifunctionality?[151]

The project, which is using a landowner segmentation approach based on primary uses of forest parcels and other details, is testing different networking concepts to attract and sustain landowner participation in stewardship efforts. To date, project managers have used direct mail to contact landowners and tested "different combinations of messages, offers, and delivery methods to increase landowner engagement."[152] Project managers made two different offers to landowners—a free handbook versus the offer of a free forester consultation. They then paired these offers with two types of messages, one focused on wildlife and the other on financial considerations. Project architects strived to test whether participants responded differently, depending on the offer and message by

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[149] Ibid.

[150] Jerry Greenberg, Alanna Koshollek, and Mark Rickenbach, "The Driftless Forest Network (WI, USA): Innovation, Complexity, and Evaluation in a Regional Landowner Engagement Initiative" (submitted to the IUFRO 2012 Small-Scale Forestry Conference: Science for Solutions, September 24–27, 2012, Amherst, MA).

[151] Ibid.

[152] Ibid., 5.

segment.[153] The offers of free consulting services, referred to as Woodland Advocates, represented a peer-to-peer educational approach inspired by research suggesting that such peer-to-peer education enhances learning.

Though this experiment and its results are works in progress, project architects report increased frequency of interactions among network members, which they interpret as suggesting that network interactions "may be fostering improved landowner engagement."[154] Although full results of the different outreach and messaging approaches have not been assessed, initial findings from four tests of 8,000 landowners resulted in a 12.5 percent response rate. Of the respondents, 90 percent had not had any prior engagement in sustainable forestry practices.

C. Risk Perceptions—Experts and Public Attitudes

Risk perception can affect people's behavior. In studying people's perceptions of risk, some social scientists and psychologists have found that people view hazards with which they have little personal experience as highly risky and are particularly fearful of such hazards.[155] For example, many people are particularly concerned about technologies such as nuclear power, about which they have little personal knowledge, and they perceive the risks associated with nuclear power as much greater than expert assessments of such risks.[156]

Conservation education programs often have the objective of enhancing understanding of risks and changing conservation behavior. The implied premise is that providing individuals with scientifically credible information, vetted by acknowledged experts, will help people better understand the consequences of their current choices and the benefits and costs of other choices they might make. In turn, it is hoped, this changed understanding will motivate voluntary changes in behavior.

However, much of the published literature finds that education programs have only limited influence on environmental choices and behavior.[157] As described in the social psychology discussion, individuals use two mental systems to receive, interpret, and then act on information—cognitive and affective. Affective thinking, sometimes referred to as System 1 thinking, is characterized by "intuitive" choice-making that employs decision heuristics, or mental shortcuts.[158] Individuals also have the capacity to employ cognitive, or System 2 thinking, akin to the way experts might think about a situation, in "objective" scientific and technical terms. Both types of thinking are relevant to strategies involving risk perception.

Consider, as an illustrative example, information and education about flood risks designed to change development patterns in a river's floodplain. A flood risk information program might presume that individuals will employ cognitive (System 2) thinking in making floodplain location and use decisions. If so, the objective of the program would be to convey to people (a) information that reflects the scientific and technical facts and (b) more "expert" ways of thinking related to, for example, ways to interpret probabilities and risk.

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[153] Ibid.

[154] Ibid., 6.

[155] A. Leiserowitz, "Climate Change Risk Perceptions and Policy Preferences: The Role of Affect, Imagery, and Values," *Climate Change* 77 (2006): 45–72.

[156] Paul Slovic, *The Perception of Risk* (London: Earthscan, 2000).

[157] "The Environmental Motivation Project," accessed June 23, 2013, http://environmentalmotivation.com/references/.

[158] Daniel Khaneman, *Thinking, Fast and Slow* (New York: MacMillan, 2011).

System 2 thinking, in other words, could be fostered by engaging individuals (perhaps a group of influential community leaders) in a stakeholder process. With give-and-take among citizens and risk assessment experts, and sufficient time, technical education and System 2 thinking could be improved. Indeed, System 2 thinking might yield a more complete and permanent understanding of the phenomena of interest—in this example, flood risks. The collaborative processes described elsewhere in this report might be employed toward this end.

However, expecting people to commit to such a learning process may be unrealistic, in part because it requires significant investments in time and energy. For many people, flood risks may not be worth thinking about in a System 2 manner. If this is the case, people will tend to employ more heuristic (System 1–type) thinking. Consider an example of a heuristic policy strategy. The availability heuristic suggests that flood risk information programs should persistently remind people of past flood events to motivate risk reduction measures or the purchase of flood insurance. Also, the period immediately following a flood is a particularly good time to promote learning about flood risks.[159]

It bears repeating that flood risk information programs, like any other behavioral intervention, will interact with an existing and perhaps complex choice setting that includes financial constraints, perceptions of the benefits and costs of alternatives, attitudes toward risk taking, and other factors. Even if all individuals assess flood risks "like the experts," one should expect different behavioral responses because individuals will continue to differ along other informational and psychological dimensions. Thus, the design of risk information programs requires an understanding of how to help recipients acquire new information and how new information will interact with other motivations and beliefs to affect their choices.

Risk information can also be employed by policies designed to "nudge" communities, landowners, households, and businesses toward particular decisions;[160] for example, to purchase flood insurance or to implement community building codes and zoning restrictions in flood-prone areas. Nudges work around, or take advantage of, heuristic strategies and biases. In these cases, whether or not a risk is actually understood in "correct" objective, scientific, and technical terms is of secondary concern. What matters is the impact of risk information on the choice architecture and subsequent behavior.

Accordingly, risk education can be thought of both as a way to correct heuristic biases that lead to socially or individually harmful behavior or as a way for governments and other organizations to manipulate behavior.

D. Economics and Individual Behavior

Economics—like psychology, sociology, and the other disciplines referenced in earlier sections—concerns itself with preferences, choices, and behavior. Preferences, often expressed in terms of how much people are willing to pay for something, provide the standard used by economists to evaluate the benefits and costs of market outcomes and public policies.[161] In contrast to psychology and sociology, however, economics tends to take people's preferences as given, rather than exploring the source of those preferences or ways to manipulate them (though that statement is an

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[159] Aronson, *Social Animal*.

[160] Richard Thaler and Cass Sunstein, *Nudge: Improving Decisions About Health, Wealth, and Happiness* (New York: Penguin Books, 2009).

[161] If preferences can be changed as a result of public policies, attempting to use benefit–cost analysis creates numerous paradoxes based on whether one should use pre- or postchange preferences and who gets to decide how preferences should be changed. T. Brennan, "Green Preferences as Regulatory Policy Instrument," *Ecological Economics* 56 (2006): 144–154.

overgeneralization).[162] A corollary is that economics tends not to focus on the question of whether people's preferences are "correct." Nevertheless, even when economists treat preferences as given, the way in which those preferences translate into choices and other behavior is of fundamental concern.

Neoclassical economics, the last century's dominant paradigm, tends to assume self-interest and rationality on the part of individuals, businesses, and other institutions. Economists are aware that people are not always self-interested and rational, but consider self-interest a good baseline assumption regarding people's motivations, and rationality a reasonably good predictor of behavior. Moreover, as extensively discussed above, behavioral economics is increasingly confronting the messier truths about human behavior, including our psychological biases and departures from rationality and self-interest.

D-1. Economic Perspectives on Choice: Prices and Income

Economists focus on two core factors that influence people's choices. The first is prices, usually treated in monetary terms but also potentially manifested along time, quality of life, or other nonmonetary dimensions. A fundamental truism from Economics 101 is that raising the price of something leads buyers to buy less and suppliers to supply more. If it becomes less expensive or more rewarding to undertake activities that degrade the environment, economics predicts an increase in that behavior. For example, this would explain—in part—why subdivisions and associated land development exploded in the twentieth century as cars became less expensive. Of course, price changes can also reduce environmental impacts. For example, many studies show that higher water prices lead to water conservation and do so at lower economic cost than other kinds of conservation policies.[163] The theory and evidence that relate prices to behavior change lie at the core of most formal environmental policies, including carbon taxes and other pollution taxes and fees, cap-and-trade policies, liability laws, and subsidies for technology adoption.

A second main determinant of choices is income. Oversimplifying considerably, average income is determined by trends in labor productivity and the presence or absence of macroeconomic downturns. Changes in income do not always have clear implications for behavior. For example, when incomes rise, demand for many goods will rise (houses, restaurant meals, vacations). Likewise, falling incomes can lead to increased demand for certain goods, like fast food.[164] For conservation outcomes, rising incomes may increase the demand for activities that degrade the environment (driving, homebuilding), but have also been shown to boost demand for conservation, clean air, and other environmental protections.[165]

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[162] Because they are amenable to mathematical analysis, evolutionary models of preference determination using "survival of the fittest" selection criteria to determine the relative success of people holding particular preferences have been employed. See, for example, Eddie Dekel, Jeffrey C. Ely, and Okan Yilankaya, "Evolution of Preferences," *Review of Economic Studies* 74 (2007): 685–704.

[163] Sheila Olmstead and Robert Stavins, "Comparing Price and Non-price Approaches to Urban Water Conservation" (Faculty Research Working Papers Series, RWP08-034, Harvard Kennedy School, 2008), 4. See also R. A. Collinge, "Transferable Rate Entitlements: The Overlooked Opportunity in Municipal Water Pricing," *Public Finance Quarterly* 22, no. 21 (1994), 46–64; and see K. Krause, J. M. Chermak, and D. S. Brookshire, "The Demand for Water: Consumer Response to Scarcity," *Journal of Regulatory Economics* 23, no. 2 (2003): 167–191.

[164] A recent study found that purchases at WalMart increase when incomes are falling. Emek Basker, "Does Wal-Mart Sell Inferior Goods?" *Economic Inquiry* 49 (2011): 973–981.

[165] S. Kuznets, "Economic Growth and Income Inequality," *American Economic Review* 45 (1955): 1–28.

D-2. Insights from Behavioral Economics

In recent years, economists have devoted increasing attention to psychological and cognitive factors or biases that affect choices. Behavioral economics seeks to integrate economic inquiry and prescriptions with empirically realistic psychological phenomena, both in the laboratory and the real world. Among these factors, also described in the discussion of social psychology, is framing—the idea that choices may depend on how a set of options is presented, even if the actual options available are the same regardless of the presentation.[166] A second factor is loss aversion—the idea that people will pay less to get something than they will pay to avoid losing it.[167] Economists have long been aware, for example, of a discrepancy between someone's "willingness to pay" a cost for an environmental good and their "willingness to accept" a reward for losing the environmental good. A third is salience—the notion that people tend to exaggerate the relative importance of events and effects based on visibility or immediacy.[168]

These factors may be particularly important in settings involving risk, which require an ability to assign reasonable probabilities, make appropriate calculations of expected outcome, and adjust the latter for aversion to risk—all of which may be difficult for persons to carry out accurately and consistently. Along with these challenges, Cass Sunstein[169] identifies a variety of cognitive biases affecting risk assessment, most of which are related to salience in one way or another: (a) people think a type of event is more likely if they can recall an example; (b) dangers may be more salient than benefits; (c) people underappreciate indirect effects; and (d) people may display "alarmist bias,"[170] which refers to risk assessments based on emotions rather than objective assessments of benefits and costs.

A prominent recent contribution of behavioral economics to policy discussions is the concept of policies that "nudge" behavior, briefly discussed earlier.[171] These policies are economic in that they pursue goals judged to be economically desirable. They are behavioral in that they take advantage of psychological biases to trigger behavioral changes. As noted earlier, due to the framing effect, some choices can be influenced by seemingly innocuous factors, such as default options and choice ordering. This means that policy interventions can respond to, or actively take advantage of, that framing bias. Consider the goal of getting people to adequately save for retirement—a goal considered by many to be economically advantageous for individuals and society alike. New employees are much more likely to obtain an employer-contribution pension plan if they have to "opt out" (e.g., by checking a box saying they do not want it) than if they have to "opt in" (e.g., by not getting it unless they check a box indicating their preference).[172] Thaler and Sunstein have argued that this justifies what they call "libertarian paternalism;" where it is paternalism because it requires participation in a pension plan to

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[166] A favorite example of this is a study finding that, holding characteristics of putts equal, professional golfers are more likely to make a putt if it is to avoid a bogey than it is to get a birdie, even though the benefits of avoiding an extra stroke are identical. Devin Pope and Maurice Schweitzer, "Is Tiger Woods Loss Averse? Persistent Bias in the Face of Experience, Competition, and High Stakes," *American Economic Review* 101 (2011): 129–157.

[167] This is also known as the "endowment effect." Jack L. Knetsch, "The Endowment Effect and Evidence of Nonreversible Indifference Curves," *American Economic Review* 79 (1989): 1277–1284.

[168] George Akerlof, "Procrastination and Obedience," *American Economic Review* 81 (1991): 1–19.

[169] Cass Sunstein, "Cognition and Cost–Benefit Analysis," *Journal* of *Legal Studies* 29 (2000): 1059–1103.

[170] Ibid.

[171] Thaler and Sunstein, *Nudge*.

[172] John Beshears, James Choi, David Laibson, and Brigitte Madrian, "The Importance of Default Options for Retirement Saving Outcomes: Evidence from the United States," in *Lessons from Pension Reform in the Americas*, ed. Stephen J. Kay and Tapen Sinha (New York: Oxford University Press, 2008): 59–87.

be the default so more people save, but is libertarian because those who do not want salary deductions for pensions can choose that outcome simply by checking a box.[173] A criticism of such paternalism is its presumption that policymakers (or "choice architects" in Thaler and Sunstein's terminology) know what is best for people. In fact, the original default ("opt out") may reflect the alternative that is most often preferred, especially as a result of the evolution of market processes over time.[174]

The empirical significance of these psychological biases and cognitive limitations remains a matter of some controversy. For example, some studies suggest that as people repeatedly face a particular choice setting, they learn and become less and less likely to make choices that reflect these biases.[175] Others note, however, that environmental choices are typically not repeated, unlike many choices involving market goods, like air tickets or groceries. When people do not make repeated purchases or other choices, they do not have the same opportunity to learn from "the feedback and discipline of an active exchange institution."[176]

Nonetheless, loss aversion appears to be a demonstrable empirical reality and one with particular relevance to conservation. In fact, it may explain a longstanding anomaly in the valuation of environmental goods such as habitat conservation: namely, that the amount people are willing to pay to gain protected habitat is less than the amount they must be paid to accept an identical loss in habitat. Standard economic theory predicts that the two amounts should be the same.

Although most studies finding such a disparity are based on small-scale laboratory experiments, some field studies have also found evidence of the effect. For example, Bishop and Heberlein found that in a sample of Wisconsin hunters wanting deer permits, those who had obtained such permits through a lottery required an average cash offer of $1,184 to accept the loss of a permit they already owned, whereas those who had not been successful in the initial lottery were willing to pay, on average, $23 for a permit they did not yet have.[177] This discrepancy of a factor of 40 is difficult to reconcile with standard economic models predicting little to no difference between how much one would be willing to pay for something and how much one would need to be paid to give it up.

Part Two (I: A–D)—Social Psychology, Norms, Risk Perception, and Behavioral Economics: Summary of Key Findings

- "Motivated reasoners," influenced by affect, may discount or ignore information that challenges existing evaluations and expectations.

- People use mental shortcuts, so decisions and actions are often shaped by context, biases, and other subconscious responses.

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[173] R. Thaler and C. Sunstein, "Libertarian Paternalism," *American Economic Review Papers and Proceedings* 93 (2003): 175–179.

[174] Robert Sugden, "Why Incoherent Preferences Do Not Justify Paternalism," *Constitutional Political Economy* 19 (2008): 226–248. Along these lines, one can note that default options are not randomly chosen. In many settings, people may reasonably belief that the default is the choice that most people prefer, and thus decide that, absent other information, they should follow along. This need not lead to an efficient outcome because earlier guesses can have undue influence on later decisions through "information cascades." David Easley and Jon Kleinberg, "Information Cascades" in *Networks, Crowds, and Markets: Reasoning about a Highly Connected World* (New York: Cambridge University Press, 2010): 483–508.

[175] John List, "Does Market Experience Eliminate Market Anomalies?" *Quarterly Journal of Economics* 118 (2003): 41–71; Tilman Slembeck and Jean-Robert Tyran, "Do Institutions Promote Rationality? An Experimental Study of the Three-Door Anomaly," *Journal of Economic Behavior & Organization* 54 (2004): 337–350.

[176] Jason Shogren and Laura Taylor, "On Behavioral–Environmental Economics," *Review of Environmental Economics and Policy* 2 (2008): 37.

[177] Richard Bishop and Thomas Heberlein, "Does Contingent Valuation Work?" in *Valuing Environmental Goods: An Assessment of the Contingent Valuation Method*, ed. R. Cummings, D. Brookshire, and W. Schulze (Totowa, NJ: Rowman and Allenheld, 1987), 123–147.

- The potential benefits of changing individual or household behavior are often underestimated.

- It is unhelpful to create fear without agency.

- People are more likely to cooperate with those they perceive as similar to themselves or that are perceived as peers.

- How a message or issue is framed can significantly affect responses.

- Public recognition can provide a valuable incentive to action.

- Securing even small behavioral commitments can set the stage for larger commitments.

- It may be easier to stimulate changes in behavior than changes in attitudes.

- The use of incentives is not straightforward because incentives interact with other motivations, and their effectiveness can be influenced by how they are presented and the clarity and ease of using the incentives.

- Education programs have only a limited influence on environmental choice behavior.

- Effective risk communication requires understanding how recipients assess information and the context within which they make choices.

- People have strong loss aversion, so framing issues in terms of losses can be more effective than framing them in terms of gains.

II. Collective Settings for Conservation Actions—Businesses and Communities

The preceding overview focused on individual behavior and factors that affect individual conservation choices and actions. In this section, we take a closer look at some specific decision contexts and examples in the business sector and in community action. We examine how information, social setting, and other factors affect incentives and choices; how market and policy rules, contracts, and structures affect incentives that, in turn, influence choices in the marketplace; and how processes of public engagement and collaboration affect choices and action.

A. Businesses and the Marketplace

Businesses are, of course, composed of individuals, play a significant stakeholder role in community-scale processes, and can both shape and be moved by society-wide values and messages relevant to conservation. Business behavior deserves its own examination, though, for several reasons. First, business behavior has a huge impact on natural resource use and environmental quality. Second, and a corollary to the first point, changes in business behavior present an opportunity for significant conservation gains. We address both large and small business behavior in this section. But a focus on the behavior of the world's largest corporations could have a particularly large effect on conservation outcomes. For example, 100 companies control a quarter of the world's trade in the 15 most significant resource commodities.[178] Third, business behavior, again because of its importance, has received a great deal of attention from the social sciences, both in terms of theories of behavior and empirical examinations of what drives that behavior. Finally, individual businesses can be thought of as communities unto themselves, where individual, group, and social behaviors come together to be shaped and resolved.

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[178] Jason Clay, "How Big Brands Can Help Save Biodiversity" (TED talk, 2010),
http://www.ted.com/talks/jason_clay_how_big_brands_can_save_biodiversity.html.

Not surprisingly, most theories of business behavior emphasize financial motivations. The baseline assumption is that any business behavior, including those related to the environment, is motivated by the search for profit for shareholders and other types of owners. Theories of business behavior tend to differ primarily in terms of varying degrees of emphasis on the specific ways profitability is affected by the social and economic environment.

A-1. The Foundational Theory: Profit Maximization and Externalities

A traditional, and now widely accepted, view is that businesses are not motivated to care about the environmental costs they impose on others. Because "externalized" costs do not affect a firm's profitability, there is no business incentive to reduce them via environmental stewardship. The corollary theory is that environmentally beneficial behavior can be motivated by the imposition of those costs on firms. This theory was the conceptual basis for most environmental policy reforms in the latter half of the last century. The internalization of externalities, its effect on profits, and subsequent consequences for environmental behavior justify the imposition of environmental liability and environmental taxes, fines, and other fees. Moreover, the basic incentive problem identified by this theory—that businesses will not take externalized costs and benefits into account unless motivated to do so by government—is also the justification for command-and-control regulations that specifically mandate desirable, or prohibit undesirable, environmental practices.

The justification for subsidies—to financially reward environmentally preferred behavior—is rooted in the same motivational theory. Some environmental business practices and products produce social benefits that cannot be captured (internalized) by the firm. This provides an economic justification for public subsidies in the form of tax breaks or direct payments designed to increase the supply of these environmental benefits. Advocates of solar and wind energy production, for example, justify subsidization of those technologies by pointing to reductions in air pollution.

The implications of this foundational theory for conservation interventions have, in more recent decades, been more limited, at least in the developed world. In principle, conservationists could focus their advocacy around new, reformed, or expanded government policies to internalize a broader suite of environmental costs on businesses, to regulate or prohibit activities at odds with conservation goals, or to subsidize desirable conservation behaviors. And indeed, a great deal of such advocacy is currently underway (e.g., to strengthen air pollution regulations, regulate agricultural runoff, support renewable energy sources, and designate more lands as wilderness). One could argue that many business-related environmental costs relevant to conservation are not adequately internalized or regulated.

However, the theory of change implied by the "profit maximization and externalities" perspective is limited and somewhat unrealistic.

The foundational theory is limited because it focuses on government as the primary creator of environmental business incentives. As we discuss below, profit-related environmental business incentives take a much wider variety of forms, many unrelated to government policy per se. The foundational theory also tends to focus on government policies that are explicitly targeted at environmental issues and that can be described as coercive or mandatory. But many government policies affect environmental business behavior more obliquely, either because they are voluntary in nature or because environmental behavior is not their central focus.

The foundational theory is unrealistic because it oversimplifies the relationship between business, government, and the public. The theory works cleanly as a theory of change only if one assumes that

government acts only in the broad public interest, the public interest is clear and uncontroversial, and government action is effective and itself uncontroversial. Conservation strategy in this naïve scenario would take the form of demonstrating and communicating the existence of public environmental costs or benefits associated with business activity, presenting that evidence to the government, and waiting for a corrective policy response.

Those conditions were approximated in the United States during the advent of the modern regulatory era (the 1960s and 1970s). The existence of public costs was more significant and apparent (smog, water pollution, trash, urban blight). Faith in government institutions may have been stronger, though the evidence on this is mixed.[179] Consequently, the social consensus for large-scale, coercive government intervention was relatively strong. Today, the social and political consensus for such policy changes has weakened significantly.[180]

Also, businesses are not passive participants in these social deliberations. They can influence government and play a role in shaping public attitudes and values. Their behavior can also be shaped by public attitudes and a variety of nongovernmental pressures.

These qualifications are not meant to suggest that the classic model of market failures and corrective environmental policies is not meaningful to business behavior and conservation strategy—quite the contrary. Evidence that the classic model of regulation, liability, and tax and subsidy incentives leads to environmental behavior change is vast and not worth recounting here.[181] But a much broader suite of business environmental motivations exists, and this, in turn, implies alternative or additional points of leverage for conservation behavior change.

A-2. A Broader Understanding of Business Motivations

Businesses routinely engage in environmentally beneficial behaviors that are not motivated directly by statutes or regulations. They engage in a variety of actions that go "beyond compliance" and that can loosely be described as voluntary. But though voluntary, these actions usually should not be considered altruistic. The motivation remains profit maximization; reduction of risk and liabilities takes place because of their effect on the bottom line. Businesses can be strategic and sophisticated when it comes to the richer social and political factors that affect their long-run profitability. This section describes a range of factors that can lead businesses to go beyond their legal and regulatory responsibilities.

A-2a. Consumer-Oriented Motivations: Most obviously, businesses sell their products to individual consumers who may desire—and be willing to pay for—environmentally beneficial products and services. In some cases, the products and services themselves may be less environmentally damaging (e.g., biodegradable packaging or low-emissions vehicles). In other cases, the environmental benefit may arise from the product's broader ecological footprint, related to its production processes or resource demands (e.g., shade grown coffee or energy-efficient appliances). Businesses may both

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[179] John R. Hibbing and E. Theiss, *Congress as Public Enemy: Public Attitudes toward American Political Institutions* (Cambridge, UK: Cambridge University Press, 1995).

[180] The insights of Ronald Coase provide one window into this eroded consensus. Coase points out that externalities can be corrected without government intervention, as long as property rights are clear and those bearing the costs can collectively organize to pay polluters not to pollute. For this reason, his work is credited with energizing and providing intellectual support for antiregulatory interests (an oversimplification of his insights). Nevertheless, the antiregulatory "property rights" and "takings" movements use similar reasoning to challenge the presumption that regulation is the only way to address environmental harms.

[181] For a recent summary and comparison of US regulation's benefits and costs see Office of Management and Budget, *Draft 2012 Report to Congress on the Benefits and Costs of Federal Regulations and Unfunded Mandates on State, Local, and Tribal Entities* (Washington, DC, 2012).

passively follow consumer desires for environmental products and lead those desires—for example, through branding and product differentiation—in a way that is competitively advantageous.

Consumer motives, therefore, are an important link between businesses' profit motive and the behavior, values, and psychology of individuals. We will not repeat here the Part One overview of individual-scale behavior. However, the business community clearly understands the relevance of consumer motivations and values to sales, brand loyalty, and profitability.

A canonical example of the interplay between individual values and business motives is the Toyota Prius. The vehicle possesses many desirable attributes, including high fuel mileage. But the motivations to own (and thus produce) them are more complex. According to one marketing study, 57 percent of owners cited as their main motivation for ownership that "it makes a statement about me," whereas 37 percent cited the car's fuel economy.[182] The "statements" made by the car have unclear origins, but relate to environmentalism, celebrity endorsements, concern over energy security, and political party affiliation.[183] Although hybrid manufacturers no doubt took advantage of existing environmental motivations, they also exploited those values for competitive advantage.[184]

The business management literature is increasingly looking at "micro-psychological" factors that affect business–consumer relationships. An example is an exploration of business–consumer unity, or "belongingness," which is argued to be related to consumer loyalty, positive word of mouth, and resilience to negative information about a company.[185] Though inherently "soft" concepts, consumer perceptions of firms' social and environmental sustainability and the way those perceptions resonate with consumer psychology influence consumer choices and behavior.[186]

A-2b. Consumer Information Problems and Solutions: As consumer desires are harnessed or exploited, an important factor is the degree to which consumers can themselves assess a product's environmental features. If "green" features are fairly clear (such as phosphate-free laundry detergent), companies can market those features directly to consumers. However, it is often difficult for consumers to observe and verify a product's or company's environmental features, performance, or footprint. For example, the environmental features of many products are associated with their production, byproducts, recycling, or disposal rather than anything directly experienced by the consumer. A consumer cannot identify shade-grown coffee or organic milk based on its look or taste. And many consumer products involve vast supply chains where the environmental performance of a given link is nearly impossible to observe. Information asymmetries like these can result in decisions that create negative environmental impacts.[187]

This situation can lead to consumer skepticism and doubt about green marketing claims, which reduces the price premium that a business can charge for environmentally beneficial products. In turn, this means that businesses may not be able to recoup the costs of green products or profit sufficiently to make their development worthwhile (from a business perspective). Evidence suggests that

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[182] *The New York Times*, "Say 'Hybrid' and Many People will Hear 'Prius,'" July 4, 2007.

[183] Robert J. Samuelson, "Prius Politics," *The Washington Post*, A15, July 25, 2007.

[184] A driver quoted in the *New York Times* article cited above ("Say 'Hybrid'"), said she chose the Prius *over other hybrids* because "I wanted to have the biggest impact that I could, and the Prius puts out a clearer message."

[185] C. B. Bhattacharya, Sankar Sen, and Daniel Korschun, *Leveraging Corporate Responsibility: The Stakeholder Route To Maximizing Business and Social Value* (Cambridge, UK: Cambridge University Press, 2011).

[186] Ibid.

[187] Nicole Darnall and JoAnn Carmin, "Greener and Cleaner? The Signaling Accuracy of US Voluntary Environmental Programs," *Policy Sciences* 38, no. 2–3 (2005): 71–90; and Jonathan Borck and Cary Coglianese, "Voluntary Environmental Programs: Assessing Their Effectiveness," *Annual Review of Environment and Resources* 34 (2009): 305–324.

consumers routinely discount corporate environmental messages as "green-washing" or empty self-promotion.[188]

In economic terminology, consumers' inability to verify environmental features for themselves creates a "lemons problem."[189] The lemons problem predicts that markets for certain products will not exist when consumers are uncertain about a product's quality. The classic example involves used cars whose underlying quality is difficult for buyers to observe on their own. Lacking precise information, rational consumers will purchase cars based on their understanding of a used car's average quality. This means that those selling cars of above-average quality cannot get the price they seek for their high-quality cars, and will thus withhold them from the market. Buyers anticipate this, which leads them to further reduce their expectations of average quality. In the end, some markets may provide only the lowest-quality products because of this information asymmetry between buyers and sellers. In terms of environmental claims, consumers are often rightfully skeptical of their credibility.[190]

The public, environmentalists, and businesses have a collective interest in addressing this market failure. Labeling and certification programs (e.g., shade grown or organic), if properly executed, provide consumers with an independent, and thus presumably credible, signal of the environmental quality of a product, process, or company. If consumers can rely on this independent signal, their willingness to pay a premium and the subsequent willingness to provide high quality by businesses are restored.

Thus, to harness individual consumer motivations, it can be necessary to intervene via information-based programs. These programs may be governmental or nongovernmental in nature. The economic justification for government intervention as a response to information asymmetry is well established.[191] For example, market failure associated with information asymmetry is a key motivation for truth-in-advertising laws enforced by the Federal Trade Commission and product certification by the Food and Drug Administration and the Consumer Product Safety Commission. Although these programs are regulatory, they are not environmental regulatory programs. They encourage beyond-compliance environmental behavior by strengthening the credibility of information used by profit-seeking businesses to reach environmentally motivated consumers.

A variety of voluntary information-related programs are closely linked to environmental performance. Consumers can rely on a range of green signals provided by government certification programs (e.g., Energy Star, recycled content, and fuel efficiency ratings). Programs supported by EPA's Office of Resource Conservation and Recovery provide another example and include programs such as EPA's WasteWise achievement and awards program and participation in the National Partnership for Environmental Priorities. In general, these programs operate as partnerships between government and businesses. In exchange for salutary environmental behavior, businesses are able to brand themselves as environmentally advanced, using the government program and its imprimatur as evidence.

Studies suggest that the firms most likely to participate in voluntary programs tend to be larger, those that produce final consumer goods (where public values are likely to be most influential), and

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[188] Bhattacharya et al., *Leveraging Corporate Responsibility*.

[189] George Akerlof, "The Market for Lemons: Quality Uncertainty and the Market Mechanism," *The Quarterly Journal of Economics* 84, no. 3 (1970): 488–500.

[190] See a 2007 study that found misleading environmental claims in all but one of a sample of 1,000 products sold by big-box stores. TerraChoice Environmental Marketing, "The 'Six Sins of Greenwashing:' A Study of Environmental Claims in North American Consumer Markets" (2007).

[191] See N. Gregory Mankiw, *Principles of Economics* (Cincinnati, OH: South-Western College, 2008), 485.

those that are exposed to other forms of nongovernmental organization (NGO) and public pressure.[192] Evidence also suggests that the environmental benefits of such voluntary programs are limited.[193]

In some cases, the private sector establishes its own certification and standards programs, primarily to deal with supply chain information issues. An example is the American National Standards Institute that, via the International Organization for Standardization, developed the ISO 14000 environmental certification program. The American Chemistry Council's Responsible Care program certifies facilities based on compliance with a set of best environmental and safety practices. Another example is the Underwriters Laboratories, which tests and rates product and environmental safety, primarily for the benefit of the private sector. The Forest Stewardship Council, which certifies sustainable forest products, is another example. Web-based applications are also being created by independent firms to provide consumers with easily accessible product ratings (e.g., GoodGuide.com).

Certification and Social Marketing

What is the relationship between eco-certification and social marketing? Social marketing involves the use of marketing techniques (e.g., advertisement, messaging, and branding) to achieve a broad social health, safety, or welfare goal. Commonly cited examples are pro-seatbelt, antismoking, and antilitter public education campaigns. Similarly, certification programs improve firms' ability to market environmental features and achievements in a way that is good for social welfare.

The two approaches are linked, but distinct. First, whereas social marketing is broadly defined as mass media messages targeting the general public (e.g., don't smoke), certification programs target specific subgroups of producers and consumers. Second, behavior change arising from certification programs is driven in large part by their ability to provide firms with tools to differentiate themselves for their own competitive advantage. Third, social marketing emphasizes long-term, lasting behavior change driven by a change in underlying social values. Certification programs are designed to take advantage of those underlying values, allowing consumers to make purchasing decisions based on values they already hold.

A-3. Nonprofit Organizations and Environmental Branding

Partnerships between environmental NGOs and businesses are increasingly common. Examples include the Sierra Club's endorsement of Clorox' Green Works products (biodegradable cleaners), the National Audubon Society's partnership with Monsanto to develop habitat protection plans near the company's facilities, the Wildlife Conservation Society's certification of forestry products of Congolaise Industrielle des Bois, the World Wildlife Fund's (WWF's) collaborations with Cargill and Coca-Cola on agricultural and water issues, and the environmental assessments provided to BP by Conservation International and The Nature Conservancy.[194]

The business community provides environmental groups with an important target for behavior change and beyond-compliance impacts. NGOs can provide businesses with technical assistance due to

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[192] Borck and Coglianese, "Voluntary Environmental Programs."

[193] Richard D. Morgenstern and William A. Pizer, eds., *Reality Check: The Nature and Performance of Voluntary Environmental Programs in the United States, Europe, and Japan* (Washington, DC: Resources for the Future [RFF] Press, 2007).

[194] *The Economist*, "Reaching for a Longer Spoon: The Disaster in the Gulf of Mexico Is Straining Ties Between Companies and Activists," June 3, 2010; and "Clorox Expands Green Works Line, Gives $470K to Sierra Club", GreenBiz.com, accessed August 1, 2013, http://www.greenbiz.com/news/2009/01/19/clorox-expands-green-works-line-gives-470k-sierra-club.

their expertise with environmental analysis and planning. Several of the above examples (such as the partnerships with BP) take this form. But another important element in play is that NGOs are providing businesses with powerful branding tools. As noted earlier in this section, green businesses often face a credibility problem due to consumer information constraints. NGOs, as perceived stewards of the environment, can provide businesses with a powerful signal of environmental quality. In some cases, a branding relationship can take a particularly direct form—as when Clorox placed the Sierra Club's logo on its Green Works products. But even without logo placements, the relationship itself is invariably advertised in other ways, such as through advertising campaigns, websites, and annual environmental reports.

NGO–business partnerships are controversial within the environmental community. In part, this reflects the environmental community's differences of opinion over political tactics; specifically, whether it is better to "work with" or "work against" the business community (for example, the Environmental Defense Fund and Greenpeace operate at different ends of this spectrum). But these partnerships are also associated with a signaling issue. Critics note that when money changes hands (as it did in some form for all of the examples listed above), this undermines the NGO's independence and thus its credibility as a certifier.[195] The power of the brand signal, and thus its power to induce consumers to pay more for green-branded products, is undermined by consumer perceptions that NGOs are influenced by business dollars. It is difficult to say how important such perceptions are in practice, though one recent study found that trust in government and environmental groups is an important predictor of green consumption and use of environmental labels.[196] But in principle, the financial independence of certifying institutions affects their power to influence consumer behavior.[197]

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[195] See, for example, one reaction to the Sierra Club–Clorox partnership: "Green Washing," Fast Company, accessed June 24, 2013, http://www.fastcompany.com/1042484/green-washing.

[196] Nicole Darnall, Cerys Ponting, and Diego Vazquez-Brust, "Why Consumers Buy Green," in *Green-Growth: Managing the Transition to Sustainable Capitalism*, ed. D. Vazquez-Brust and J. Sarkis (New York: Springer, 2012), 287–308.

[197] Note that this is true of government institutions as well. Perceptions that governmental certifiers are captured or otherwise influenced by business have the same undermining effect. See Rick Harbaugh, John W. Maxwell, and Beatrice Roussillon, "The Groucho Effect of Uncertain Standards" (working paper, Kelley School of Business, 2006), http://ssrn.com/abstract=948538.

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Do Certification Programs Work?

Do certification programs work? This question has two parts. First, do consumers buy certified products? And second, is that good for the environment?

The first question is easier to answer than the second. Ample evidence suggests that consumers respond to environmental messages and branding in general (though green branding is different from certification per se). Yet the evidence of a willingness to pay more for green products is mixed. According to a 2012 poll by Ipsos, an independent market research firm, roughly half of Americans are "more inclined to buy a product if it is environmentally friendly" (which means that half of Americans are not), and 40 percent would be willing to pay "a little more" for such products. Only 3 percent say they "always buy green products." Moreover, these kinds of survey responses probably overstate the willingness to pay for green features because they do not reflect real purchasing decisions.

For eco-labels and certification programs more specifically, very few credible studies of impacts have been conducted. A recent review identified a total of 46 peer-reviewed studies of certification effectiveness—associated with coffee, fish, bananas, tourism, and forest products certifications. Of these, only 11 employed statistical techniques necessary to define a scientifically defensible counterfactual outcome, and only 2 of these 11 considered environmental outcomes. In both cases, certification's environmental effect was negligible. Evidence that certified producers can charge higher prices was also weak. Even among somewhat less rigorous studies, evidence of environmental benefits is decidedly mixed.

However, a more recent and rigorously constructed assessment (of shade-grown coffee certification in Mexico) found that certification results in significant reductions in the use of pesticides, chemical fertilizers, and herbicides and increases the use of organic fertilizer. An overall lesson is that the environmental effects of certification programs remain largely unknown.

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A-4. "Political" Motivations for Over-Compliance

A variety of other motivations for companies to over-comply with environmental standards have been advanced. One strand of thinking emphasizes the interaction between profit motives and the political process.[198] Because politics can determine changes in law and regulation, businesses and other stakeholders have an incentive to influence the political process. When theories of business strategy are combined with insights into the political economy of laws, regulations, and influence, one can think of a variety of reasons why firms might go beyond the letter of the law. Most of these insights follow basic intuition: how a company behaves environmentally today can influence the behavior and incentives of politicians, regulators, and stakeholders in the future.

For example, some firms or whole industries may position themselves as environmental leaders (over-comply) to reduce the incentive of environmental interests to organize and lobby for tighter regulatory standards.[199] The idea is that lobbying by environmental interests is costly and advocacy resources are limited. Accordingly, pressure groups may steer away from firms or industries perceived to be self-regulating, over-compliant, or otherwise environmentally proactive.

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[198] Thomas Lyon and John Maxwell, "Corporate Social Responsibility and the Environment: A Theoretical Perspective," *Review of Environmental Economics and Policy*, 2, no. 2 (2008): 240–260.

[199] John W. Maxwell, Thomas P. Lyon, and Steven C. Hackett, "Self-Regulation and Social Welfare: The Political Economy of Corporate Environmentalism. *Journal of Law and Economics* 43, no. 2 (2000): 583–618.

For similar reasons, firms may use proactive environmental behavior to steer government monitoring and enforcement actions toward other firms and competitors and away from their own activities.[200] Because monitoring and enforcement resources are limited and regulators lack compliance information prior to monitoring, they may target firms considered more likely to be noncompliant. A firm's environmental reputation may affect that targeting.

In addition, firms often require contentious local approvals, such as zoning permits, to site their facilities. Corporate reputation can be important to the success or failure of these political deliberations, as well;[201] therefore, the need for local approvals provides an incentive for proactive environmental behavior. This is also true in a developing world context, where engagement with conservation organizations is considered by many a way to gain access and rights to strategic natural resources.[202] Environmental performance can also matter in competitions for government procurement contracts that are, in part, politically determined.[203]

Some have suggested that – while counter-intuitive – firms may make proactive environmental investments today to raise the costs of complying with future regulations (and thereby deter such regulations).[204] This rationale assumes that higher future costs will deter politicians and regulators from imposing those future regulations.[205]

In another set of situations, firms may over-comply, as a condition of a regulatory permit, in exchange for some compliance flexibility. For example, a small number of regulatory programs have allowed firms to "over-pollute" in terms of one waste stream, but only under the condition that they overcomply in aggregate across a larger portfolio of waste streams.[206]

Firms also understand that regulation can have a differential effect on competitors in an industry. For example, DuPont supported a ban on chlorofluorocarbons, at least in part because it had developed a substitute, a non-ozone–depleting chemical that would be in demand once the ban was in place.[207] The regulatory ban, in effect, gave it a competitive advantage over technologically lagging rivals. Or consider another example: in the 1980s, a variety of US statutes imposed financial responsibility, or minimum capital requirements, on firms in certain industries (waste disposal, oil vessels and pipeline operators, gas stations with underground fuel storage tanks, and mine operators). These rules, which led polluters to internalize pollution costs rather than go bankrupt or dissolve prior

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[200] Winston Harrington, "Enforcement Leverage When Penalties Are Restricted," *Journal of Public Economics* 37 (1988): 29–53.

[201] R. Kasperson, D. Golding, and S. Tuler, "Social Distrust as a Factor in Siting Hazardous Facilities and Communicating Risks," *Journal of Social Issues* 48 (1992): 161–187; and Michael Barclay, "Hazardous Waste Management Facility Siting," in *Hazardous Waste Management Engineering*, ed. Edward Martin (New York: Van Nostrand Reinhold, 1987), 469–506.

[202] K. I. MacDonald, "The Devil is in the (Bio)Diversity: Private Sector "Engagement" and the Restructuring of Biodiversity Conservation, *Antipode* 42 (2010): 513–550.

[203] Christopher McCrudden, "Corporate Social Responsibility and Public Procurement," in *The New Corporate Accountability: Corporate Social Responsibility and The Law*, ed. Doreen McBarnet, Aurora Voiculescu, and Tom Campbell (Cambridge, UK: Cambridge University Press, 2007), 93-118; Darren Ford, "Public-Sector Procurement and Corporate Social Responsibility," in *The Sustainable Enterprise: Profiting from Best Practice*, ed. Christopher Stephen Brown (London: Kogan Page, 2005), 49.

[204] Investments made today can raise future costs of regulation if, for example, regulations make previous investments obsolete or require costly retrofitting.

[205] Stefan Lutz, Thomas P. Lyon, and John W. Maxwell, "Quality Leadership When Regulatory Standards Are Forthcoming, *Journal of Industrial Economics* 48, no. 3 (2000): 331–348.

[206] James Boyd, Janice Mazurek, Alan Krupnick, and Allen Blackman, "The Competitive Implications of Facility-Specific Environmental Agreements: The Intel Corporation and Project XL," in *Environmental Regulation and Market Power: Competition, Time Consistency, and International Trade*, ed. E. Petrakis, E. S. Sartzetakis, and A. Xepapadeas (Cheltenham, UK: Edward Elgar, 2000), 95-115.

[207] Paul Portney, "The (Not So) New Corporate Social Responsibility: An Empirical Perspective," *Review of Environmental Economics and Policy* 2, no. 2 (2008): 261–275.

to the payment of environmental claims, served an important policy purpose. But they also had important competitive effects, favoring large firms over small firms (because it was easier for large firms to demonstrate adequate capital reserves). Accordingly, large firms tended to be less resistant to the new regulations than small firms and, in fact, may have privately supported the new regulations because of their expected effect on smaller competitors.[208] Finally, regulations that impose environmental requirements on new firms but grandfather existing firms can be used to deter entry and protect incumbents from competition.

A-5. Employee, Manager, and Director Motivations

Businesses also may be motivated to pursue beyond-compliance environmental objectives because they can positively affect employee morale, productivity, and success in hiring.[209] Some evidence even suggests that sustainability practices, by positively influencing various aspects of corporate culture, translate into greater profitability.[210] Also, some evidence suggests that employees of "green businesses" are willing to accept below-market wages, the theory being that they are informally "compensated" by being associated with such employers.[211] Other studies, however, have found little or no such wage effects.[212]

Some analysts have suggested that chief executive officers and other managers may have some ability to divert corporate resources to their own personal philanthropic goals, and that therefore the personal values of managers, rather than profit motives, may drive environmental behavior.[213]

Some evidence also suggests that the composition of a business's board of directors is related to its environmental practices and performance.[214] For example, larger boards and those with a higher proportion of active chief executive officers and legal experts exhibit more proenvironmental behaviors. This suggests that the expertise and values of directors may play an important role in affecting firm behavior.

A-6. Supply Chain, "Business-to-Business" Motivations

Up to this point, we have discussed environmental behaviors motivated by a business's interactions with consumers, NGOs, employees and directors, and political actors. But increasingly, business-to-business interactions can also drive beyond-compliance environmental action. The

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[208] James Boyd, "Financial Responsibility for Environmental Obligations: Are Bonding and Assurance Rules Fulfilling Their Promise?" *Research in Law and Economics* 20 (2002): 417-486.

[209] D. W. Greening and D. B. Turban, "Corporate Social Performance as a Competitive Advantage in Attracting a Quality Workforce," *Business & Society* 39, no. 3 (2000): 254–280.; Tara Behrend, Becca Baker, and Lori Thompson, "Effects of Pro-Environmental Recruiting Messages: The Role of Organizational Reputation," *Journal of Business and Psychology* 24, no. 3 (2009): 341–350.

[210] Robert Eccles, Ioannis Ioannou, and George Serafeim, "The Impact of a Corporate Culture of Sustainability on Corporate Behavior and Performance" (Working Paper 12-035, Harvard Business School, 2011).

[211] Robert Frank, "Can Socially Responsible Firms Survive in a Competitive Market?" in *Codes of Conduct: Behavioral Research into Business Ethics*, ed. David Messick and Ann Tenbrunsel (New York: Russel Sage Foundation, 1996), 214–227; and Robert Frank, *What Price the Moral High Ground? Ethical Dilemmas in Competitive Environments* (Princeton, NJ: Princeton University Press, 2003).

[212] Patrick Francois, "Making a Difference: Labor Donations in the Production of Public Goods" (Working Paper Series no. 04/093, CMPO, University of Bristol, 2004).

[213] Michael C. Jensen, "Value Maximization, Stake-holder Theory, and the Corporate Objective Function," *Business Ethics Quarterly* 12, no. 2 (2002): 235–256.; and J. H. Choper, J. C. Coffee, and R. J. Gilson, *Cases and Materials on Corporations*, 6th ed. (London: Little, Brown & Co., 2004).

[214] Corrinne Post, Noushi Rahman, and Emily Rubow, "Green Governance: Boards of Directors' Composition and Environmental Corporate Social Responsibility," *Business and Society* 50, no. 1 (2011): 189–223; and Charl De Villiers, Vic Nalker, and Chris van Staden, "The Effect of Board Characteristics on Firm Environmental Performance," *Journal of Management* 37, no. 6 (2011): 1636–1663.

production of almost all consumer goods and services involves "chained" business relationships between suppliers, manufacturers, distributors, and retailers. Wal-Mart is estimated to have 57,000 suppliers in the United States alone, with tens of thousands more internationally.[215] The average automobile is composed of 20,000 different parts, produced by thousands of different suppliers.[216] Apple, a far more vertically integrated company, has supplier relationships with 156 different companies (and each of those has its own supplier relationships). Supply chain relationships are extremely important, both to a descriptive understanding of business behavior and as entry points for strategies to change business behavior.

Large global brands, particularly those selling directly to individual consumers, are increasingly concerned, not only with their own reputations and environmental performance, but also with the reputation and practices of their suppliers. Apple doesn't make its own logic boards; Tiffany & Co. doesn't mine its own diamonds; Wal-Mart doesn't make its own t-shirts; and Starbucks doesn't grow its own coffee. But consumers understand that when they purchase from those firms they are, indirectly, supporting those firms' supply chains. For example, consumer reaction to the labor practices of Nike suppliers in the 1990s created a crisis for the company, as its brand became associated with "slave wages" and abusive factory conditions in the developing world. Consumers also understand that, even when not in direct control over labor or environmental performance, the companies from which they purchase goods and services have a potentially large influence over the choices and behavior of their suppliers.

Business incentives related to supplier relationships mirror all of the motivations and behaviors described earlier in this section. First consider motivations related to what we earlier referred to as the "foundational theory" of business behavior: namely, the incentives created by formal social interventions via law and regulation. In this realm, businesses concern themselves with supply chain behavior primarily out of fear of legal liability.

Liability laws are designed, in part, to internalize the social costs created by firms—costs that are due to inadequate product safety or environmental damage, for example. Liability laws not only compensate victims, they also create a powerful incentive for risks and damages to be avoided in the first place. Environmental liability generally seeks to make the "polluter" pay for the damages it causes, where the polluter is the company or individual whose behavior is directly responsible for the damage—typically, the operator of a polluting facility or other operation. However, in the United States and some other countries, liability can be extended from this polluter to a wide variety of entities, including parent corporations and business partners in a chain of supply and distribution relationships.[217] Extended liability addresses several public policy problems. First, it helps address problems created by the bankruptcy or dissolution of polluting firms.[218] Extended liability broadens the pool of private capital available to compensate victims and finance remediation. Second, when a

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[215] Emily Schmitt, "The Profits and Perils of Supplying to Wal-Mart," *Bloomberg BusinessWeek*, July 14, 2009, http://www.businessweek.com/smallbiz/content/jul2009/sb20090714_270767.htm; and Paul Baier, "Why Walmart's Better Supplier Scorecard Is a Big Deal," *GreenBiz.com*, April 19, 2012, http://www.greenbiz.com/blog/2012/04/19/why-walmarts-better-supplier-scorecard-big-deal.

[216] Nick Bunkley, "Lacking Parts, GM Will Close Plant," *The New York Times*, March 17, 2011, http://www.nytimes.com/2011/03/18/business/global/18auto.html.

[217] For example, the US Comprehensive Environmental Response, Compensation, and Liability Act imposes what is called joint and several liability on firms involved in business relationships generating environmental harm.

[218] Steven Shavell, "The Judgment-Proof Problem," *International Review of Law and Economics* 6 (1986): 45; William Landes and Richard Posner, "Joint and Multiple Tortfeasors: An Economic Analysis," *Journal of Legal Studies* 9 (1980): 517–555; and Lewis Kornhauser and Richard Revesz, "Apportioning Damages among Potentially Insolvent Actors," *Journal of Legal Studies* 19 (1990): 617–651.

business is jointly liable it has a strong incentive to monitor the safety of the firms with which it does business. Accordingly, extended liability generates private-sector self-monitoring and ostracism of firms that cannot produce or signal adequate environmental performance.

In this context, we see formal, regulatory motivations for businesses to worry about the environmental behavior of suppliers and other business partners. However, even in the United States, where liability law is particularly well established and aggressively applied, there are significant limits to the ability of liability law to incentivize behavior change through a supply chain. For example, brand leverage over a supplier may not be sufficient to make a retailer liable for environmental damages caused by a supplier.[219] Moreover, many supply chain impacts of greatest concern involve suppliers in different countries and, in particular, in the developing world. In general, it is very difficult—if not impossible—for a US corporation to be held liable for damages caused by an international supplier.

Supply chain incentives are therefore more likely to be driven by more "informal" profit motives. Again, these mirror the motivations highlighted earlier, such as consumer demand for green products, political incentives, and the importance of corporate reputation to employees.

Consider, for example, the discussion of certification as a signaling device. Earlier, we discussed this in the context of signaling to consumers. But certification is arguably of greater importance between business partners. Firms wishing to purchase green inputs from suppliers and other business partners may, like end-product consumers, find it difficult to judge the environmental quality or impacts of their suppliers' products. The certification of wood products is a good example. Lumber retailers are far removed (geographically and contractually) from the forest managers and landowners, many of them in the developing world, responsible for harvesting practices. A firm whose reputation is vulnerable to charges of poor environmental stewardship therefore benefits greatly from an intermediary, certifying institution (such as the Forest Stewardship Council).

A related strategy is for firms to audit supplier conduct and transparently disclose supplier information. For example, this year, Apple Computer joined a small, but growing set of corporations (Nike, Intel, and Hewlett-Packard), in publicly disclosing a list of its suppliers.[220] Alone, such disclosure is no guarantee of environmental performance. But it makes identification (and oversight) of these companies easier for stakeholders. This in itself is an important signaling device because it increases Apple's incentive to make sure those suppliers are good actors. Apple has also significantly increased its auditing of suppliers.[221] These audits are conducted in part in reference to "supplier codes of conduct" that formally establish the company's expectations for supplier behavior and practices. Although Apple is mostly self-auditing, it is also opening those audits to independent auditing institutions.

These kinds of supply chain initiatives are fairly recent, not particularly widespread, and often the result of external pressure (e.g., boycotts and bad publicity) rather than more proactive strategies.[222] It is also not a coincidence that supply chain behaviors tend to be associated with large, well-known brands. Branding is a competitive strategy to generate consumer loyalty, awareness, and publicity. The flip side of this strategy is that valuable brands are particularly sensitive to stakeholder pressure and negative publicity; they have more to lose if that brand is tarnished, and popular brands inherently

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[219] See for example, *Shell Oil v. Meyer Ind.*, No. 79S04-9801-CV-43, Supreme Court of Indiana, (1998).

[220] Apple, Inc., "Apple Suppliers 2011" (2012), http://images.apple.com/supplierresponsibility/pdf/Apple_Supplier_List_2011.pdf.

[221] Apple audited 39 suppliers in 2007, and 239 in 2011.

[222] For example, Apple's sustainability efforts can be interpreted as a response to unfavorable media coverage over the last five years.

draw more public attention. Therefore, all else being equal, supply chain motivations for beyond-compliance behavior are most likely to be associated with the most valuable brands.

These same factors also make valuable brands particularly desirable targets for advocacy pressure. Knowing the power of "brand fear," sustainability NGOs will rationally pursue valuable brands to maximize their leverage and achieve the greatest possible environmental improvements. Supply chain strategies are also a compelling opportunity for sustainability advocates to change the behavior of small firms and behavior in the developing world—precisely because large western brands can be linked via supply chains to this larger universe of businesses. However, caution is also warranted. Although "top-of-the-chain" incentives to promote green supply may be clear, there are inevitably incentives "down the chain" to continue to exploit cheaper products and practices with potentially greater environmental impacts. Monitoring and certification of practices through the supply chain is therefore important and should not be entirely left to the company itself.

A-7. The "Responsible Investment" Community

Companies, particularly those that are publicly traded, rely on individuals, portfolio managers, and institutional investors to raise and price their capital. Is environmental behavior motivated in part by companies' desires to attract investment? Clearly, if environmental performance is related to profitability, one will see a correlation between that performance and investment. But might investors be interested in more than profitability? Or might they use environmental performance as a signal of future profitability?

Corporate social responsibility (CSR) is a generic term used to describe many of the business behaviors described above. Over the last several decades, so-called "socially responsible" investment vehicles have grown significantly. As of 2012, 11 percent of dollars under professional management in the United States were in such funds ($3.31 trillion, compared to $639 billion in 1995). Environmental responsibility specifically is now incorporated into the management of 551 investment vehicles with $240 billion in assets under management.[223]

What explains the growth in such funds? One explanation is that some investors do not invest for profits alone, but rather for a combination of profits and philanthropic benefits. If a business is providing social benefits, investors may view their investment as, in part, a charitable contribution.[224]

However, the most obvious explanation for such funds is that they identify portfolios that outperform comparable investments that are not socially responsible. Given the various profit motivations for beyond-compliance products, investments, and practices described above, a reasonable hypothesis is that firms adopting them, particularly in aggregate, would see above-average market performance. In other words, socially and environmentally responsible firms may signal high-quality products, processes, and management that translate into greater long-run profitability. In fact, the ultimate test of whether the environmental motivations described above do, in fact, explain business behavior is whether they can be related to a firm's profitability.

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[223] There has also been a corresponding trend in shareholder activism relating to environmental performance, even though most environmental resolutions are not accepted. Specifically, shareholder vote percentages favoring environmental and social resolutions have been steadily increasing over recent years. See US SIF, *Report on Sustainable and Responsible Investing Trends in the United States with Reflections on Sustainable and Responsible Investment* (Washington, DC, 2012).

[224] J. Graff Zivin and Arthur Small, "A Modigliani-Miller Theory of Altruistic Corporate Social Responsibility," *B.E. Journals in Economic Analysis and Policy: Topics in Economic Analysis and Policy* 5, no. 1 (2005): 1–19.

Are Environmentally Responsible Firms More Profitable?

If the profit motives described in this section are real—and therefore of relevance to the conservation community—we should see evidence that environmentally proactive businesses are more profitable. So what does the evidence show?

Numerous studies have addressed this question using different statistical methods and looking at different categories of investment. In general, they show that socially responsible investments underperform or are statistically indistinguishable from conventional investments, particularly when adjusted for the risks of particular stocks and portfolios. Similarly, a meta-analysis of firms focused on firm-specific measures of corporate social responsibility (CSR; as opposed to socially responsible investment vehicles) found that, for a significant majority of firms, the relationship between CSR and profitability was not statistically significant. However, a more positive spin on that study's findings is that CSR reduced profitability in less than 2 percent of the companies in the sample. Another general statement is that little empirical evidence supports the idea that firms engage in CSR out of altruism—that is, a willingness to sacrifice profits to satisfy social goals.

This broader literature usually examines investments that are socially responsible in a very broad set of ways, including those that focus on social justice, worker conditions, and open governance in addition to environmental responsibility. In addition, the definitions of "environmental responsibility" used by investment funds are varied and often vague. One problem is that CSR is often defined and quantified in ways that are more cosmetic than substantive. For these reasons, the findings of the literature on social responsibility financial market performance leave something to be desired as far as our more specific question is concerned.

Against that background, one should pay particular attention to a recent study that looks more concretely at firm-specific practices. The study stratified firms into two samples based on fairly specific managerial and environmental practices, such as compensation policies tied to environmental performance, independent auditing of performance, formal stakeholder engagement practices, policies to reduce emissions and improve energy or water efficiency, and environmental criteria used to select suppliers. In addition to the study's methodological rigor, what is notable is the inclusion of these specific variables (rather than vague indicators of social responsibility). Interestingly, the study found that "high-sustainability" firms, defined as those exhibiting such practices, significantly outperformed their "low-sustainability" counterparts over an 18-year period ending in 2010. Specifically, $1 invested in the former portfolio would have grown to $22.60 over the period, as opposed to $15.40.

A-8. Organizational Failure Hypothesis

To this point, we have emphasized theories of business behavior that assume firms are motivated by a desire to maximize profits and are able to identify and act on profit-making opportunities. A competing school of thought holds that firms are not always rational, profit-maximizing "machines." Some argue, for example, that environmental investments and innovation can often save or make money, but that firms nevertheless fail to take advantage of these opportunities.

Some have suggested that strict environmental regulations in the long run improve firm profitability by stimulating early adoption of innovations that ultimately become competitively

advantageous, otherwise known as the "Porter hypothesis."[225] The corporate failure embedded in this hypothesis is that firms require government regulation to get them to do things that are in their economic interest, even without regulation.

As it may be inconsistent with profit-maximizing behavior, the Porter hypothesis has come under substantial criticism.[226] The explanations for why firms might not act in their own self-interest are various and include information barriers, accounting-based distortions, or inappropriate managerial incentive schemes. As an example, Porter suggests that assignment of environmental issues to corporate departments that lack full profit responsibility leads to excessively narrow and incremental decisions.[227] He also suggests that firms use inappropriately high hurdle rates to screen environmental investments. A related observation is that firms may tend to overestimate the costs of improved environmental performance. For example, an analysis of waste reduction at chemical plants concluded that waste reduction occurred in some cases only in response to regulation, though plants found it to be cost-effective once in practice.[228] At the same time, behavioral economics increasingly emphasizes the importance of psychological realities that may conflict with purely rational profit-maximizing behavior.[229]

To interpret this literature requires one to distinguish between "organizational failure" and "organizational irrationality." That businesses (and people) guess wrong, make mistakes, and fail to manage themselves in a conceptually ideal way is not evidence of irrationality. What would evidence of business irrationality look like? An irrational business would be one that knowingly acts against its own financial interests. But to our knowledge, no empirical evidence suggests that businesses systematically behave in this way. As argued earlier, business behaviors that appear altruistic (e.g., beyond-compliance behaviors) may be entirely rational and profit motivated.

One can make a much stronger case that organizational barriers, mismanagement, and inadequate information can inhibit environmental investments. For example, since the 1990s, an expanding literature has documented problematic accounting practices with the potential to bias environmental decisionmaking.[230] Frequent targets for criticism are the allocation of environmental costs to general overhead accounts, the failure to account for future liabilities, and the failure to measure the impact of environmental decisions on corporate image and customer and supplier relationships. Imperfect environmental accounting can lead businesses to "miss" investment, procurement, process, and product design opportunities that have both financial and environmental benefits.

This perspective has motivated efforts and best practices to improve so-called environmental accounting.[231] But the failure to adopt improved accounting practices is not evidence of corporate irrationality. Within the private sector, one would be hard pressed to find a manager uninterested in more accurate, detailed environmental information. After all, better information leads to better (i.e., more profitable) decisions. Rather, firms' imperfect accounting practices can be better explained by

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[225] Michael Porter and Claas van der Linde, "Toward a New Conception of the Environment–Competitiveness Relationship," *Journal of Economic Perspectives*, 9, no. 4 (1995): 97–118.

[226] Karen Palmer, Wallace E. Oates, and Paul R. Portney, "Tightening Environmental Standards: The Benefit–Cost or the No-Cost Paradigm?" *Journal of Economic Perspectives* 9 (1995): 119–132.

[227] Michael Porter, "Green and Competitive: Ending the Stalemate," *Harvard Business Review*, Sept.–Oct. (1995): 120–134.

[228] David Sarokin, Warren Muir, Catherine Miller, and Sebastian Spurber, *Cutting Chemical Wastes: What 29 Organic Chemical Plants Are Doing To Reduce Hazardous Wastes* (New York: Inform, 1985).

[229] See, for example, Thaler and Sunstein, *Nudge*.

[230] EPA, *Environmental Cost Accounting for Capital Budgeting: A Benchmark Survey of Management Accountants* (EPA 742-R-95-005, Office of Pollution Prevention and Toxics, Washington, DC, 1995).

[231] Tuula Moilanen and Christopher Martin, *Financial Evaluation of Environmental Investments* (Houston: Gulf Publishing, 1996); and Marc Epstein, *Measuring Corporate Environmental Performance* (Montvale, NJ: Institute of Management Accountants, 1996).

the fact that better information, tools, and management are costly. Most studies that explore corporate environmental decisions in close detail find that managers rationally, if imperfectly, weigh the private benefits, costs, and risks of those investments.[232]

Case Study: Development of a "Beyond-Compliance" Green Business Program

Collaboration among government agencies can be an important boon to pro-environment business behavior. Collaboration across agencies can be difficult, because of their silo-like segregation of legal, regulatory, and programmatic responsibilities. But communication, trust, and coordination among agencies is particularly important to the business community. For example, business owners may get a fragmented, or even contradictory, sense of compliance responsibilities when agencies are not coordinated. Silo-like inspection, monitoring, and compliance activities also represent a missed opportunity to share information, avoid duplication, and identify mutually beneficial compliance strategies.

Innovative, integrated compliance initiatives can be good for business, good at changing business behavior, and good for the environment. Consider the case of the Bay Area Green Business Program.

John Garn is a sustainability consultant based in Sonoma County, California. A friend of his, who has long owned an auto repair shop, shared an interesting story in 1993. A wastewater inspector had visited his facility and told him he could no longer pour solvents down the drain. Instead, he was told to collect them in a container and allow them to evaporate. Roughly six months later, an air quality inspector came through and fined him $1,000 for air quality violations. John reached out to the City of Santa Rosa and discovered that the city was facing significant noncompliance costs for violating Bay Area Air Quality Management District standards due to high levels of volatile organic compounds (VOCs) from the water entering the regional wastewater treatment plant and then off-gassing. The problem's technical solution had a $40 million–plus price tag; fines for not addressing the violation were also steep. The city's other option was to develop an educational program to reduce the VOC load coming to the plant. John was asked to undertake this effort.

Phase I: County Auto Industry. John used his connections with Santa Rosa wastewater inspectors to identify and reach out to all of the regulatory agencies with jurisdiction over auto shops. This group included city, county, and state agencies (specifically the Department of Toxic Substances Control [DTSC]) as well as federal agencies, including the US Environmental Protection Agency (EPA) and the Occupational Safety and Health Administration. Representatives from the agencies were invited to a meeting, and asked to bring their relevant inspection forms. The group discovered that, to be in full compliance, an auto shop owner had to fill out 48 pages of inspection forms. The group then looked for overlaps and other opportunities to consolidate the forms. Within a few meetings, they had reduced the forms to just eight pages and were able to quickly achieve full agency sign-off on this new streamlined compliance process. The Sonoma Environmental Quality Assurance Council was created to carry forward this cross-agency collaboration and communication.

Several positives of this new compliance approach were quickly identified. First, once the agencies started communicating and sharing information, they were able to identify a set of particularly responsible businesses that they could put on a lower-scrutiny inspection track. For the first time ever, businesses started volunteering for and requesting inspections. This was linked to the fact that inspection sign-off came with a window seal telling customers that the business was in compliance as well as a 10 percent reduction in permit fees. This customer "eco-feedback" gave businesses the ability to differentiate themselves, and it gave regulators a positive tool in what were previously more adversarial relationships. It also gave regulators a very visible tool for reprimanding businesses that developed compliance violations. As opposed to the lengthy administrative processes needed to fine a business, the

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[232] James Boyd, *Searching for the Profit in Pollution Prevention: Case Studies in the Corporate Evaluation of Environmental Opportunities* (EPA 742-R-98-005, Washington, DC: EPA, 1998).

seal could immediately be pulled off the window. The inspectors reported that this often motivated business owners to ask how they could immediately address the problem. In 1994, just one year after implementing the new process, 88 of the 275 auto shops were certified as in full environmental compliance and the percentage of VOCs entering the wastewater plant had decreased by 87 percent, implying a huge savings to the City of Santa Rosa. Through the monthly Sonoma Environmental Quality Assurance Council meetings, additional opportunities for collaboration emerged. The agencies developed joint training programs and, by sharing some of the red flags for each of the regulatory sectors, they were able to create "super inspectors"—those with broad regulatory knowledge beyond their specific agencies.

Phase II: EPA and DTSC Support for Bay Area Green Business Program. Around this same time, EPA Region 9 was launching its Pollution Prevention and Awareness program. However, its organizational structure hadn't required any cross-department communication between inspectors and compliance assistance officers. This led to a negative cycle in which the officers would visit businesses and encourage them to join the pollution prevention program and then a few weeks or months later an inspector would visit some of these same businesses and fine them for violations. Some of the businesses formed the false assumption that the pollution prevention staff was actually doing reconnaissance and reporting violations to regulators. Participation in the pollution prevention program plummeted. EPA's Office of Enforcement and Compliance Assurance learned about the Sonoma County auto industry experiment and commissioned John to write up the Sonoma experience, followed by a request that the Sonoma program be used as a model for a larger "beyond-compliance" initiative. EPA envisioned a multi-industry Green Business program for the Bay Area, focused on water, waste, energy, and pollution prevention.

The DTSC partnered with EPA Region 9 to support the rollout, financed through the collection of enforcement fines. Representatives from the Association of Bay Area Governments, DTSC, and EPA worked in consultation with John to develop a three-page assessment form to determine which of the nine Bay Area counties were best positioned to implement this type of program. The program leads interfaced with industry associations and held monthly meetings, with seven of the nine counties participating, to get feedback and vetting for a beyond-compliance program. In 1997, the Bay Area Green Business Program was formally launched in Alameda, Sonoma, Marin, Contra Costa, and Santa Clara counties. San Francisco followed, and by 2002 all nine Bay Area counties were participating. Today, there are Green Business certification programs tailored to the auto industry, printers, wineries, vineyards, hotels, and general offices throughout the entire state of California. The initial DTSC representative, Matt McCarron, now serves as the program's state director and EPA has used the program as a model for other state programs.

Part Two—(II: A) Business Behaviors: Summary of Key Findings

- Most theories of business behavior emphasize financial motivations.

- Traditional approaches to environmental regulation, such as product and process standards, taxes, subsidies, and liability laws, can be thought of as sticks and carrots that use the profit motive to alter business behavior.

- Government policy is not the only source of pro-environment business incentives.

- Voluntary, "beyond-compliance" environmental business actions are more likely to be driven by profit motivations than by altruism.

- Pro-environment business behaviors are driven by a range of consumer, employee, business partner, and community factors.

- Businesses react to a range of social factors, but they can also shape individual, community, and public attitudes through, for example, marketing and lobbying.

- Marketing, labeling, and certification programs have been shown to influence consumer behavior (and thus the features of products sold by businesses), but the environmental benefits of labeling and certification programs are poorly understood.

- Supply chain motivations for beyond-compliance behavior are most likely to be associated with large companies and valuable brands.

- Because large companies typically rely on many small businesses as suppliers, the brand concerns of large businesses can be leveraged into more pro-environment small business behavior.

- Employee, manager, and director attitudes appear to have an impact on the environmental behavior, though the size of the effect is unclear.

- Many studies of the relationship between corporate social responsibility (CSR) and profitability; most of which show that socially responsible investments underperform or are statistically indistinguishable from conventional investments.

- Recent research focused on more specific environmental practices shows that more sustainable firms financially outperform less sustainable firms.

- Pro-environment business behaviors can be encouraged by government reforms that streamline permitting, monitoring, and enforcement programs.

B. Communities and Collective Action

As noted in our brief discussion of economic theory and environmentally significant behavior, natural resource management decisions often involve common pool resources in which access to resources is unrestricted or difficult to restrict.[233] Increasingly, resource management decisions also involve large landscapes and interconnected environmental issues. These decision contexts involve multiple governing jurisdictions, many agencies at different levels of government, and public and private lands and resources. Consider a set of water management examples: water quality management in the Chesapeake Bay requires cooperation among 128 municipalities and multiple states. Klamath Basin discussions that attempted to resolve longstanding water supply–demand imbalances involved 50 different signatories representing 50 federal, state, tribal, local, and private-sector entities.[234] Discussions about the Apalachicola–Chattahoochee–Flint watersheds, relevant to addressing water constraints in the Southeast, involve three states, dozens of municipalities, and multiple water users who tap water for multiple purposes.[235] Management of the Colorado River involves seven states; dozens of municipalities; multiple federal, state, tribal, and local governments and agencies; and Mexico, all linked through various compacts, treaties, laws, regulations, and local

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[233] Elinor Ostrom, *Governing the Commons: The Evolution of Institutions of Collective Action* (Cambridge, UK: Cambridge University Press, 1990). See also E. Ostrom, R. Gardner, and J. Walker, eds., *Rules, Games, and Common Pool Resources* (Ann Arbor, MI: University of Michigan Press, 1994).

[234] See *Klamath Basin Restoration Agreement for the Sustainability of Public and Trust Resources and Affected Communities* (2010), http://klamathrestoration.gov/sites/klamathrestoration.gov/files/Klamath-Agreements/Klamath-Basin-Restoration-Agreement-2-18-10signed.pdf.

[235] For brief descriptions see, for example, "Alabama Coosa Tallapoosa Apalachicola Chattahoochee Flint River Basins Comprehensive Water Resources Study," Northwest Florida Water Management District, accessed April 9, 2012, www.nwfwmd.state.fl.us/rmd/acfcomp/cstudy.htm; and G. Loeffler and J. L. Meyer, "Chattahoochee–Flint River Basin," University of Georgia River Basin Center, accessed April 9, 2012, www.rivercenter.uga.edu/education/k12resources/basinsofga2.htm. For a discussion of water management conflicts and efforts to address them through multijurisdictional initiatives, see C. I. Lin, "Apalachicola–Chattahoochee–Flint Tri-State Negotiation," AquaPedia, Tufts University, February 2009, https://wikis.uit.tufts.edu/confluence/display/aquapedia/Apalachicola-Chattahoochee-Flint+Tri-State+Negotiation.

ordinances.[236] Complexity also characterizes land management decisions regarding traditional and renewable energy facility siting, biodiversity management, natural hazards management, coastal restoration, wildland fire management, and other natural resource management issues.

These decision contexts involve questions such as how much water should flow across hundreds of thousands of acres to restore the Everglades "River of Grass?" Should dams be constructed or removed in the northwestern United States? How can the United States access energy on land and offshore while sustaining ecosystems and wildlife? How can fish populations be sustained while providing sustenance to growing populations? These questions involve matters of science, values, and policy. They also arouse conflict. Transcending such conflict is often necessary to secure conservation action and sustain it over time.

Successful conservation in these settings requires the actions of multiple public-sector, nonprofit, and private-sector participants working in concert toward common goals and with coordinated actions. Conservation, like a growing number of public-sector activities, "entails producing services with the public more than delivering services to the public."[237] Community engagement becomes, thus, an important aspect of addressing these issues.[238]

Although there are many definitions of community, we draw on the approach suggested by Agrawal and Gibson as particularly relevant to examining conservation and natural resource management challenges. They suggest that "community must be examined in the context of development and conservation by focusing on multiple interests and actors within communities, on how these actors influence decisionmaking, and on the internal and external institutions that shape the decisionmaking process."[239] In other words, they suggest a focus more on institutions and decisionmaking processes than on the social, cultural, or other descriptive characteristics of communities.

In this section, we examine community-level behavioral insights regarding how collections of interests and stakeholders engage, collaborate, build legitimacy, and resolve conflicts around conservation issues. As noted above, most conservation goals and projects require multiparty coordination and acceptance. In some cases, formal processes imposed by law and regulation frame these multiparty interactions. In other cases, stakeholder interactions are less formal but no less important to conservation success. In both formal and less formal settings, perceptions, norms, and knowledge—and how they vary across individuals and groups—can drive the success or failure of establishing and achieving conservation objectives. A growing body of research in political science, organization theory, the sociology of scientific knowledge, and social anthropology provides insights into participatory processes, collaborative institutions, and organization design. This research informs public perceptions, knowledge flows, the perceived legitimacy of decisions, and corresponding actions.

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[236] One example of the multistate complexity of Colorado River management is evident in the 2007 "shortage sharing" agreement. See Secretary of the Interior, *Record of Decision: Colorado River Interim Guidelines for Lower Basin Shortages and the Coordinated Operations for Lake Powel and Lake Mead* (Washington, DC: US Department of the Interior, 2007), www.usbr.gov/lc/region/programs/strategies/RecordofDecision.pdf.

[237] John Clayton Thomas, *Citizen, Customer, Partner: Engaging the Public in Public Management* (Armonk, NY: M. E. Sharpe, 2012), 86.

[238] Arun Agrawal and Clark Gibson, "Enchantment and Disenchantment: The Role of Community in Natural Resource Conservation," *World Development* 27, no. 4 (1999): 629–649.

[239] Ibid., 629 (Abstract).

B-1. The Community Context—Insights from Economics

In many, if not most, cases, significant conservation efforts go beyond what individuals can do on their own. An important context is the community level, where individuals come together to achieve some goal or set of goals. Here we first examine economic insights regarding environmental choices in a community context and then turn to collaborative decisionmaking settings in a conservation context.

B-1a. The Free Rider Problem: One fundamental impediment to collective action, as described by economists, is the incentive to be a "free rider." In essence, each person decides to let others carry the burden of providing a public good, with the result that the good is underprovided or under-supported. Free riding is a concern in collective bargaining (creating a justification for unionization), support for public television and radio, provision of defense and security, and a variety of conservation contexts. One familiar form of this problem, known in fields from game theory and economics to psychology and philosophy, is the "prisoners' dilemma." The idea is that even though people are better off cooperating, individually, we may be better off not cooperating, so cooperation does not occur. The name comes from the standard allegory of two people arrested for a crime and separately faced with a choice of confessing or not confessing. They could both secure light sentences by not confessing (i.e., by cooperating with each other), but each can secure a lighter sentence by confessing and testifying against the other one.

The version of the allegory most familiar in environmental and conservation circles is Garrett Hardin's "tragedy of the commons."[240] Hardin's example involves a community of herdsmen who graze their cattle on a common pasture. At some point, the pasture can no longer sustain all of the cattle that each herdsman wants to graze, and the pasture dies off. This reflects a "prisoners' dilemma": each herdsman would be better off with limits on grazing, but no one wants restrictions on their own cattle. Conservation commons problems abound because many environmental resources are shared, public goods (many forests, most fisheries) or involve contributions to collective benefits (reduced air or water pollution or carbon sequestration).

At the community level, economics identifies some potential solutions to the problem. In some cases, one can have a single owner over a small area who can set rules for how that area is used—owning the pasture and renting it out, in Hardin's example. A second conservation-related example might be a housing developer preserving open space or setting noise limits in covenants that individual homeowners would have to follow. Economists call this "internalizing the externality." In principle, however, these results apply only to settings where one or a small number of owners are feasible.

B-1b. Responses to the Free Rider Problem: Rules and Governance Responses: In free rider contexts, affected parties may be able to reach an agreement. In one of the most cited articles in economics and law, Ronald Coase argues that if all affected parties could agree, they could achieve any mutually beneficial outcome, including conservation of natural resources.[241] Coase's work spawned an analysis of how legal rules can either facilitate such agreement (e.g., via clearly defined property rights) or promote outcomes people would have agreed to had they been able to do so (e.g., via liability rules that create incentives for risk reduction). These solutions have limits, though, in that formal agreements or legal rules involving a large number of people may not be something that can be "left to

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[240] Garrett Hardin, "The Tragedy of the Commons," *Science* 162 (1968): 1243–1248.

[241] Ronald Coase, "The Problem of Social Cost," *Journal of Law and Economics* 3 (1940): 1–44. Fred Shapiro and Michelle Pearse, "The Most Cited Law Review Articles of All Time," *Michigan Law Review* 110 (2012): 1483–1520. Shapiro and Pearse found Coase's article to be the most cited, by a large margin over the second-place contender.

the market" because of the costs of arriving at and enforcing mutually acceptable bargains when many have to agree.[242] For example, policies to control pollutants that affect a broad region or nation typically require a government solution because the private costs of negotiating an agreement with all potential polluters and victims, contractually enforcing limits on emissions, and compensating victims would be prohibitive.

Another resolution to prisoners' dilemma and cooperation problems can arise when people enter into negotiations repeatedly. Repetition allows for the punishment of non-cooperative behavior, for example, or for other types of feedback and response that can enhance cooperation. However, "repeat play" is no guarantee of a cooperative outcome.[243]

Elinor Ostrom and others have described the emergence of co-managed common pool resources in a variety of settings in which communities craft complex governing networks.[244] Describing these efforts, Michael McGinnis notes that such governing networks: (a) can enhance legitimacy, (b) create and use the social capital of local knowledge of local conditions, (c) tailor responses to local conditions, and (d) offer flexibility in the context of changing conditions.[245]

The extensive descriptions of the efforts of farmers, fishers, and forest resource users to manage common pool resources suggest that, despite the lack of an optimal design for such institutions, certain characteristics are important.[246] Ostrom identifies some principles that seem relevant.[247] Highlights of these principles include:

- clear decision boundaries;

- congruence with local and cumulative institutional conditions;

- clear decision rules and the delineation of the rights, roles, and responsibilities of participants;

- monitoring of users and resources;

- sanctions for improper action; and

- linkages to the larger governance context.

Although economists describe co-management in terms of its role in overcoming common pool resource problems, others examine these efforts from a political science perspective, applying social network analysis. For example, Carlsson and Sandstrom note that, behind the emergence of co-management practices is the idea that "to cope with complexity of natural resource systems, institutional arrangements and related management systems should incorporate different actors from different areas of society."[248] They describe these endeavors in terms of social networks, or "social structures made up by nodes (actors), which are connected via a multitude of links" (for example, in

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[242] Guido Calabresi, "Transaction Costs, Resource Allocation and Liability Rules: A Comment," *Journal of Law and Economics* 11 (1968): 67–73.

[243] Reinhard Selten, "The Chain Store Paradox," *Theory and Decision* 9 (1978): 127–159; and Robert Axelrod, *The Evolution of Cooperation* (New York: Basic Books, 1984).

[244] Vincent Ostrom, Charles Tiebout, and Robert Warren, "The Organization of Government in Metropolitan Areas: A Theoretical Inquiry," *American Political Science Review* 55 (1961): 831–842.

[245] Michael D. McGinnis, "Costs and Challenges of Polycentric Governance" (paper prepared for discussion at Workshop on Analyzing Problems of Polycentric Governance in the Growing EU, June 16–17, 2005, Berlin).

[246] Ibid.

[247] Elinor Ostrom, *Governing the Commons: The Evolution of Institutions for Collective Action* (Cambridge, UK: Cambridge University Press, 1991).

[248] Lars Carlsson and Annica Sandstrom, "Network Governance of the Commons," *International Journal of the Commons* 2, no. 1 (2008): 34.

the form of information flows, exchanges of goods, legal relations, and so on).[249] Carlsson and Sandstrom describe six features that are supported by many empirical studies and are associated with high-functioning co-management. These include the ability to: (a) contribute to improved exchange of resources, (b) link different levels of organizations, (c) generate access to various skills and competencies, (d) reduce transactions costs, (e) enhance opportunities for risk sharing, and (f) establish conflict resolution mechanisms.[250]

We discuss in more detail various aspects of public engagement, collaboration, and network governance and their relationship to conservation and common pool resource management later in this report.

B-2. Communities as Conservation Participants

Many conservation endeavors involve a blend of public- and private-sector resources and participants. Such collective action, as noted above, is especially relevant to addressing challenges of common pool resource management and actions on large landscapes that involve multiple jurisdictions, agencies, and types of participants and many land parcels and water resources.

Public participation in decisions guided by or involving the public sector varies from relatively passive roles of commenting on public-sector decisions to active roles in framing issues and participating in the selection and implementation of conservation actions.[251] The literature on this array of roles is vast; we do not intend to summarize it here.[252] Instead, our focus is more specifically on the growing role of active citizen (stakeholder) engagement in collaborative conservation decisionmaking and how such participation affects attitudes and actions.

Kirsten Leong and others describe an evolution toward public-engagement approaches to decisionmaking in natural resource management and view this trend as reflecting the increasing complexity of wildlife management problems.[253] They note that, "with wicked problems, the process of problem formulation and resulting outcome often *is* the problem. As such, negotiation over the way the problem is defined, or framed, plays an important role in identifying potential solutions and determining the relative success of management interventions,"[254] a point illustrated in the case study presented later in this report on a Florida ecosystem services payment program. Leong and her colleagues point to research showing that failure to recognize differences in ways stakeholders and agencies conceptualize wildlife problems can deter problem-solving.[255] However, the authors suggest that solving a particular environmental problem is not, in itself, the central purpose of the public-engagement (collaborative governance) paradigm. Instead, such approaches fundamentally are directed at developing and sustaining "a social foundation that is capable of responding to problems that may be poorly understood and defined, such as wicked problems .... By emphasizing two-way

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[249] Ibid.

[250] Ibid., 37.

[251] Kirsten M. Leong, John F. Forester, and Daniel J. Decker, "Moving Public Participation beyond Compliance: Uncommon Approaches To Finding Common Ground," *The George Wright Forum* 26, no. 3 (2009): 24.

[252] Thomas, *Citizen, Customer, Partner*.

[253] Kirsten Leong, Daniel J. Decker, T. Bruce Lauber, Daniela B. Raik, and William F. Siemer, "Overcoming Jurisdictional Boundaries through Stakeholder Engagement and Collaborative Governance: Lessons Learned from White-Tailed Deer Management in the US," in *Beyond the Rural–Urban Divide: Cross-Continental Perspectives on the Differentiated Countryside and Its Regulation*, ed. Kjell Anderson, Minna Lehtola, Erlund Eklund, and Pekka Salmi, Research in Rural Sociology and Development, vol. 14, Beyond the Rural-Urban Divide (Bingley, UK: Emerald Group, 2009), Chapter 9.

[254] Ibid., 235.

[255] Ibid., 242.

symmetric communication and mutual learning about how each party views the problem and its associated knowledge base, common goals, and potential solutions, can be identified."[256]

Clark Gibson and Arun Agrawal note that "conservationist norms cannot be easily introduced into a community by external actors …. We hardly know which strategies successfully alter the norms people hold about conservation, especially when the resources in question are a critical part of the family income."[257] They underscore that, within communities, "individuals negotiate the use, management, and conservation of resources. They attempt to implement the agreed-upon rules resulting from their negotiations. And they try to resolve disputes that arise in the processes of implementation of rules."[258] Many factors can affect negotiations and decisions, including some, like commodity prices, that may be entirely beyond the control of a community and individuals within that community.

Some discussion in Part One summarizes research relevant to this consideration. In Part Three, we provide a case study on a Florida ecosystem services payment program that illuminates the context-specific nature of the factors that must be included in the design of market-like conservation programs and how collaborative processes are essential to such design. Here, we turn our attention to collaboration processes and decisionmaking institutions of co-management and networks. The relevance of such institutions and their design in collaborative or community conservation decisionmaking introduces a central question: How does the collective or community decision context itself affect norms and behavior? A related question is: How do collaborative and participatory decisionmaking institutions and processes affect conservation actions and outcomes?

B-2a. Collaboration—Relevance to Norms, Actions, and Outcomes: Much of the literature on collaborative, community-based decisionmaking makes a connection between these processes and the achievement of measurable environmental or social outcomes. For example, an empirical study of community-based planning and implementation focused on addressing homelessness found that such efforts were positively correlated with increased effectiveness.[259] Similarly, a number of empirical studies on collaborative and community-based conservation efforts show evidence of outcomes that successfully meet established goals, though other studies have more mixed results. For example, one study of deer population management contrasting collaborative and more traditional public-input processes finds that the "public input approaches appear better suited to addressing complex problems and communities of interest, while public engagement approaches may better resolve wicked problems that affect communities of place."[260]

Institutional designs vary widely, perhaps accounting for the mixed results of empirical evaluations of such processes. As O'Leary and Nidhi underscore, "not all networks are created equal."[261] The same can be said of public-engagement processes and collaboration in general. O'Leary and Nidhi note several dimensions along which networks vary. For example, they vary in the composition, organizational missions, and cultures of participants; their modes of operation; their

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[256] Ibid.

[257] Agrawal and Gibson, "Enchantment and Disenchantment," 636.

[258] Ibid., 637

[259] Evan M. Berman, "Local Government and Community-Based Strategies: Evidence from a National Survey of a Social Problem," *American Review of Public Administration* 26, no. 1 (1996): 71–90.

[260] Leong et al., "Overcoming Jurisdictional Boundaries," Abstract.

[261] Rosemary O'Leary and Nidhi Vij, "Collaborative Public Management: Where Have We Been and Where Are We Going?" *American Review of Public Administration* 42, no. 5 (2012): 507–522.

funding; degrees of power; issues of focus; organizational and personal relationships; the decision forums with which they intersect; and their governance and networking structures.[262]

A growing literature examines the ecological outcomes of collaborative conservation processes and networks[263] and the relationship between these processes and norms, changes in norms or attitudes, and conservation action. A number of studies suggest that collaborative decision processes can influence norms and actions. Two aspects of this research are particularly relevant. First, research on the role of cognitive processes and heuristics contributes to an understanding of how collaborative processes, particularly those involving face-to-face engagement, can influence choices and decisions. Second, some research on collaborative processes has explored their relationship to trust-building and the role of trust in influencing actions. Trust, as Henry and Dietz point out, "is an important determinant of sustainability outcomes because it influences strategic interaction between actors whose individual incentives are not necessarily in alignment with that of the collective."[264]

Dietz and Stern note that values themselves are relatively stable by adulthood and that any evolution or change in values occurs only gradually over long time periods.[265] However, "the link between values and choices can be dynamic on a much shorter time scale."[266] Cognitive processing that determines choices is influenced by "rules of thumb" and biases, including biases associated with how one categorizes and perceives particular social, political, and other groups. Individuals both obtain information from others and process that information using filtering categories through which they classify people and interactions.[267] Their research suggests that decisionmaking is "socially embedded in the sense that social cues provide guidance and can help simplify the decision process."[268] Dietz and Stern note:

> Consultation with peers and other information sources serves to frame the issue so as to focus individual attention on a limited subset of all possible links between actions, outcomes, and values. In this way, social processes define the problem and help construct individual preferences. The process of consultation allows individuals to tap into a broader body of experience and calculation than they possess alone. But it also subjects them to influences, some of them quite subtle, to focus attention in particular directions.[269]

On the one hand, these cognitive processes help explain why people may mistrust some sources of information or resist undertaking certain actions—such as, for example, embracing different agricultural or fishing practices—if the information or proposed actions are presented by social or political groups viewed with suspicion. On the other hand, the prevalence of this sort of social

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[262] Ibid., 511–512.

[263] See, for example, J. M. Wondolleck and S. Yaffee, *Making Collaboration Work: Lessons from Innovation in Natural Resource Management* (Washington, DC: Island Press, 2000); T. M. Koontz and C. W. Thomas, "What Do We Know and Need To Know about the Environmental Outcomes of Collaborative Management?" *Public Administration Review* 66, no. 1 (2006): 111–121; R. O'Leary and L. B. Bingham, eds., *The Promise and Performance of Environmental Conflict Resolution* (Washington, DC: RFF Press, 2003); and C. Ansell and A. Gash, "Collaborative Governance in Theory and Practice," *Journal of Public Administration Research and Theory* 8, no. 1 (2007): 67–91.

[264] Henry and Dietz, "Information, Networks, and the Complexity of Trust," 189. See also M. Olson, *The Logic of Collective Action: Public Goods and the Theory of Groups* (Cambridge, MA: Harvard University Press, 1965).

[265] Thomas Dietz and Paul C. Stern, "Toward a Theory of Choice: Socially Embedded Preference Construction," *Journal of Socio-Economics* 24, no. 2 (1995): 265.

[266] Ibid., 265.

[267] Ibid., 266.

[268] Ibid., 270.

[269] Ibid., 271.

processing suggests why collaborative processes may play a positive role in framing issues and influencing choices as participants begin to view one another differently.

Case Example—The Blackfoot Challenge: The 1.5 million-acre Blackfoot Watershed of western Montana covers diverse habitats and supports ranching, logging, and outdoor recreation on a mix of public and private lands. On this landscape, a collaborative conservation and management effort emerged in the 1990s that was formalized in 1993 with the creation of the nonprofit organization, The Blackfoot Challenge. Its mission is to use a consensus approach that engages public and private stakeholders to coordinate "efforts to conserve and enhance the natural resources and rural way of life in the Blackfoot Watershed."[270]

The Blackfoot Challenge describes its approach to conservation as "partner-centric" rather than "biologist-centric," underscoring the organizers' perspective that trust-building and coordination are precursors to effective action. They define biologist-centric conservation as prioritizing conservation actions based on science, with the resource of concern driving the decision-making focus.[271] In contrast, they describe partner-centric conservation as emerging through social processes and stakeholder collaboration in ways that bring together local knowledge, technical expertise, biological, and socioeconomic values.[272] They describe their collaborative and partner-driven focus as having four key elements: (a) inclusivity of stakeholders, (b) agenda-setting through articulation of community values, (c) a coordinating framework, and (d) use of relevant science.[273]

Through their collaborative efforts, they have gained the participation of most landowners in the Blackfoot Valley. They have established conservation restrictions on 70,000 acres; developed agreed-upon drought management policies; engaged participants in enhancing irrigation efficiency; and developed grizzly bear protection strategies, among other actions. These efforts were launched and have been sustained over a two-decade timeframe. Consistent with research on collaborative processes, participants describe the efforts as having significantly enhanced trust among landowners and public-sector agencies, which participants view as the critical element to engaging landowners and motivating action. The costs of some Blackfoot Challenge initiatives have been borne directly by participants, a testament to trust-building and peer-to-peer influence. At the same time, government and philanthropic financial support also provided some economic incentives for participation in some activities.

B-2b. Trust-Building: A central element of the research literature on collaboration focuses on changing relationships and, in particular, on trust—its creation, persistence, and, sometimes, its destruction.[274] Adam Henry and Thomas Dietz summarize four factors that influence trust. These include an individual's (a) general willingness to take risks, (b) responses to betrayal, (c) sense of altruism, and (d) assessment of the likelihood that others in a particular setting will act in a trustworthy fashion.[275] They note that, whereas the first three elements are relatively stable personal attributes, the fourth is subject to change and can be altered "quite readily by evidence."[276]

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[270] Gary Burnett, "Community-Based Approach to Conservation for the 21st Century," in *Conservation & the Environment: Conservative Values, New Solutions*, ed. P. Lynn Scarlett (Washington, DC: Conservation Leadership Council, 2012), I-2.

[271] Greg Neudecker, A. Duvall, and J. Stutzman, in *Energy Development and Wildlife Conservation in Western North America*, ed. D. Naugle (Washington, DC: Island Press, 2001), Chapter 12.

[272] Burnett, "Community-Based Approach," 3.

[273] Ibid., 5.

[274] Elinor Ostrom, "A Behavioral Approach to the Rational Choice Theory of Collective Action: Presidential Address, American Political Science Association, 1997," *American Political Science Review* 92, no. 1 (1998): 1–22.

[275] Henry and Dietz, "Information, Networks, and the Complexity of Trust," 193.

[276] Ibid., 192.

Much of the literature on collaboration focuses on its role in altering participants' perceptions of how likely others engaged in these processes are to follow through on implementing actions agreed upon in the collaborative process. Emerson, Nabatchi, and Balogh, for example, note that "trust forms the basis of mutual understanding; generates a sense of interpersonal validation and cognitive legitimacy;" and "leads to creating bonds of shared commitment."[277] They view the development of trust as "the *sine qua non* of collaboration,"[278] a perspective affirmed in the experience of the Florida ecosystem services payment program described in this report.

A common proposition in the literature on collaboration is that "repeated, quality interactions through principled engagement will help foster trust, mutual understanding, internal legitimacy, and shared commitment, thereby generating and sustaining shared motivation."[279] This shared motivation will "enhance and help sustain principled engagement and vice versa."[280]

Much of the research on trust-building has focused on relatively small community settings or experimental settings.[281] However, building on Elinor Ostrom's work on managing common pool resources, others have broadened their examination of trust within much more complex collaborative settings. The focus of this broader work is on the "types of institutions—conceptualized as combinations of various types of rules—that are more likely or less likely to support cooperative behavior in the face of CPR [common pool resources] dilemmas, conditional on contextual factors such as the resource system, the resource units, the governance system, and the users."[282] Even this work, however, may not sufficiently explain how trust-building might occur in settings where the scale of action is so large that face-to-face interactions are impossible.

This research has a second limitation: much of it has focused on what Henry and Dietz refer to as "trust in action"—that is, how trust-building in collaborative settings leads to agreement on shared actions. But Henry and Dietz suggest that many sustainability challenges involve problems of "trust in information."[283] We turn to these issues of trust in information in discussing the nexus of science and decisionmaking in collaborative settings as well as in our discussions of communications approaches.

B-2c. Collaborative Processes and Improved Outcomes: A collaborative process often concludes when there is an implementable and lasting agreement among the agencies, individuals, organizations, and coalitions that are engaged in, or defer to, the process. Agreement is what we can observe, and a

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[277] Kirk Emerson, Tina Nabatchi, Stephen Balogh, "An Integrative Framework for Collaborative Governance," *Journal of Public Administration Research and Theory* 22, no. 1 (2012): 14.

[278] Emerson et al., "Integrative Framework for Collaborative Governance," 13. Also see C. Huxham and S. Vangen, *Managing To Collaborate: The Theory and Practice of Collaborative Advantage* (New York: Routledge, 2005); J. Koppenjan and E. H. Klijn, *Managing Uncertainty in Networks: A Network Approach to Problem Solving and Decision Making* (New York: Routledge, 2004); and W. D. Leach and P. Sabatier, "To Trust an Adversary: Integrating Rational and Psychological Models of Collaborative Policy Making," *American Political Science Review* 99, no. 4 (2005): 491–503.

[279] Emerson et al., "Integrative Framework for Collaborative Governance," 14.

[280] Ibid.

[281] See, for example, T. Hahn, P. Olsson, C. Folke, and K. Johansson, "Trust-Building, Knowledge Generation and Organizational Innovations: The Role of a Bridging Organization for Adaptive Comanagement of a Wetland Landscape around Kristianstad, Sweden," *Human Ecology* 34, no. 4 (2006): 573–592. See also L. M. Ruttan, "Sociocultural Heterogeneity and the Commons," *Current Anthropology* 47, no. 5 (2006): 843–853.

[282] Henry and Dietz, "Information, Networks, and the Complexity of Trust," 189. See also E. Ostrom, "A General Framework for Analyzing Sustainability of Socio-Ecological Systems," *Science* 325, 5939 (2009): 419–422.

[283] Henry and Dietz, "Information, Networks, and the Complexity of Trust," 191.

lasting agreement can be achieved only if a selected path forward makes all participants better off.[284] By this logic, a collaborative process that secures agreement must have created joint net benefits and then distributed the net benefits so all participants' judge themselves to be better off. If all participants, in their own judgment, are better off as a result of the selected alternative, and if the process included all appropriate participants, that alternative might be deemed a "preferred outcome," or an outcome that serves the "public interest."[285]

Whether negotiated solutions serve the broader public interest can be a source of debate. Some criticism will almost always be raised.

The first criticism typically relates to the representativeness of the collaboration's participants. Participants typically include those who have the authority and ability (or power) to go outside the collaborative process to get a decision that differs from what the collaboration might agree to.[286] However, inviting participants based solely on their power or authority can create equity and fairness issues. Also, the likelihood of reaching agreement decreases as group size increases. Any collaboration process must balance concern over representativeness and power with the decisionmaking and financial costs associated with increased participation. The public choice literature in economics, discussed briefly later in the report, as well as the literature on environmental negotiation and alternative dispute resolution (ADR), includes numerous studies and recommendations about how this dilemma might be addressed through different approaches to structuring group participation.

A second, related criticism of collaborative processes is that they can shift costs to unrepresented parties, usually the general taxpayer or "the environment." For instance, a recreational fishing group may accept a series of recreational enhancements (e.g., boat landings and access points) as compensation for water management practices that would alter downstream flow. However, the changes in downstream flows could impose costs on third parties. Therefore, the implication that social welfare is increased because collaboration is successful hinges on the degree to which participants internalize the agreement's costs.

Critics of negotiation and collaboration often argue for broader application of "objective" analysis to overcome these issues. Edith Stokey and Richard Zeckhauser reflect the belief that benefit–cost analysis can more comprehensively and completely indicate individual preferences than can negotiation processes when they write:

> One of the great virtues of the benefit–cost approach is that the interests of individuals who are poorly organized or less closely involved are counted. Even when pushed by powerful

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[284] One can use success measures for a process other than the substance of an agreement, such as improvements in relationships (e.g., increased trust) that allow for constructive dialogue during and after the process or aspects of the design and conduct of the process itself (e.g., transparency and efficiency). Dietz and Stern, *Public Participation in Environmental Assessment* (see note 3). These include shared learning as opposed to simply providing people with data and development of respect for other decision participants' values and interests. These other measures of success are often preconditions for agreement for the issues at hand (when such agreement is possible) and can help build a foundation for tackling other issues in the future.

[285] Initial agreement on a plan is not sufficient for a success definition. Implementation of the plan should be accompanied by monitoring of the expected outcomes, using indicators for the same performance measures that were used to agree on a jointly preferred alternative. The learning about the outcomes of implementation should result in a renegotiation loop, if necessary, to ensure that agreement is maintained during implementation. The persistence of agreement during implementation is the true indicator of whether agreement is a reflection of the public interest.

[286] Defining who has power can be difficult. For example, a local canoe club may have no formal power alone to affect a decision, but it can have influence when it acts in coordination with other groups, such as those that are adept at using the press to affect public opinion. Roger Fisher and William Ury coined the acronym BATNA (Best Alternative to a Negotiated Agreement) to refer to the best outcome that is possible if another party will not negotiate. Roger Fisher and William Ury, *Getting to Yes: Negotiating without Giving In*, third ed. (New York: Penguin Books, 2011).

interest groups, projects whose benefits do not outweigh their costs will be shown to be undesirable. The benefits and costs accruing to all—to the highway builders, the environmentalists, the "little" people, the users and providers of services, the taxpaying public—will be counted on a dollar-for-dollar basis. Benefit–cost analysis is a methodology with which we pursue efficiency and which has the effect of limiting the vagaries of the political process.[287]

Similar reservations and suspicions on the efficacy of representative democratic processes remain decades after these authors expressed their concern.[288]

Yet reliance on collaborative processes is based on a different set of behavioral, and perhaps conceptual, premises. Advocates of such processes stress that preferences will be revised, created, and, indeed, discovered through collaborative learning and the process of choosing. Measuring the preferences of people distant or removed from the process through the nonmarket valuation techniques sometimes used in benefit–cost analysis assumes informed and stable preferences. Indeed, the very act of participation in a collaborative process is an expression of a commitment and responsibility to discover and refine preferences and interests.[289] Differences in opinion on the efficacy of collaborative approaches to natural resources decisionmaking are ultimately deeply rooted in differences in beliefs in how people form and express preferences, the efficacy and operation of representative democratic processes in reflecting these preferences, and the ability and limits of analysts to know individually held preferences.[290]

B-2d. Collaborative Action and Stakeholder Engagement—Institutional Designs: The general literature on cognition, values, collaboration, and trust points to the importance of both institutional structures and the design of collaborative processes.[291] These structures and processes are:

> [T]he primary mechanisms available to mediate, soften, attenuate, structure, moderate, accentuate, and facilitate particular outcomes and actions—whether change is radical, moderate, or incremental …. When goals are not shared, institutions are significant for two reasons: they embody power relations that define the interactions among actors who created the institutions, and they help to structure the interactions that take place around resources—institutions are provisional agreements on how to accomplish tasks.[292]

Carlsson and Sandstrom suggest, "To achieve sustainability—in environmental, economic, and social development—finding appropriate institutions and management systems is vital."[293] We examine the research on these collaborative and network processes and decisionmaking institutions with a particular focus on whether and how they facilitate collective conservation action.

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[287] Edith Stokey and Richard Zeckhauser, *A Primer for Policy Analysis* (New York: W. W. Norton, 1978), 151.

[288] Paul Portney, "Benefit–Cost Analysis," in *Concise Encyclopedia of Economics* (Library of Economics and Liberty, 1st edition, 2002), http://www.econlib.org/library/Enc/BenefitCostAnalysis.html; J. Loomis, "Use of Nonmarket Valuation Studies in Water Resource Management Assessments," *Water Resources Update* 109 (1997): 5–9.

[289] Mark Sagoff, "Should Preferences Count?" *Land Economics* 70, no. 2 (1994): 127–144.

[290] Leonard Shabman and Kurt Stephenson, "Environmental Valuation and Its Economic Critics," *Journal of Water Resources Planning and Management* 126, no. 6 (2000): 382–388.

[291] Lawrence Susskind, Sarah McKearnen, and Jennifer Thomas-Larmer, *The Consensus-Building Handbook* (Thousand Oaks, CA: Sage Publications, 1999).

[292] Agrawal and Gibson, "Enchantment and Disenchantment," 638.

[293] Lars Carlsson and Annica Sandstrom, "Network Governance of the Commons," *International Journal of the Commons* 2, no. 1 (2008): 34.

Although they vary in their forms, collaborative efforts generally involve "problem-setting, direction- setting, and structuring" for implementation actions.[294] Governance models patterned around networks and the sharing of responsibilities have begun to emerge alongside more traditional hierarchical forms of federalism.[295] As noted earlier, these trends are a response to three factors: (a) the scale and complexities of conservation challenges that require working across jurisdictions, agencies, and land ownership; (b) the desire to move beyond conflict to action; and (c) a recognition of the relevance of practitioner, or experiential, knowledge as well as scientific and technical knowledge.

The literature on collaboration is extensive. Network governance, a more recent phenomenon, has received less scholarly attention, though it is a subject of growing academic and conservation practitioner interest. We do not intend to examine the spectrum of research in the fields of public administration, political science, sociology, geography, and organization theory related to these topics. Instead, our focus here is to highlight what is known about these three trends in relationship to conservation actions and outcomes.

Conservation governance and management reveal a long evolution in governance structures, rule sets, tools, and forums to enhance coordination across jurisdictions, resource managers, and resource users.[296] These governing forms have varied in their durability and effectiveness. But trends that now reinforce the need for coordinated action are prompting what might be called an institutional discovery process—new governance arrangements, both formal and informal, to enhance cross-jurisdictional, public–private, and collaborative planning and decisionmaking.

Experience in successful institutional innovation is often one of incremental experimentation, problem-solving, and sustained dialogue, often among multiple participants.[297] Nobel laureate Elinor Ostrom has reminded us that "complexity is not the same as chaos."[298] Through her empirical work on managing common pool resources, she shows that the momentum for change often arises through the creativity of those within a situation who strive to modify patterns of interaction to address resource management problems. Such change also often requires a forward-looking reframing of the problem statement to open the door for new management concepts and the incorporation of broader value sets into decisionmaking. For example, over the past 100 years along the Colorado River, the problem framework has gradually evolved from a focus on the development of water resources to a broadened focus on sustainability.[299] Increasingly, accompanying this evolution has been a reframing of decision boundaries to extend beyond the river to ecosystems, a focus evident in the decision context of the *Glen Canyon Dam Adaptive Management Plan*.[300]

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[294] Steve Selin and Debbie Chavez, "Developing a Collaborative Model for Environmental Planning and Management," *Environmental Management* 19, no. 2: 190.

[295] Matthew McKinney, Lynn Scarlett, and Daniel Kemmis, *Large Landscape Conservation: A Strategic Framework for Policy and Action* (Cambridge, MA: Lincoln Institute for Land Policy, 2010).

[296] We use the term "governance" rather than "government" to encompass the range of formal (government) rules and structures, along with quasi-governmental and nonprofit institutions and decision rules through which decisions about resource management, including water resources, are made.

[297] Selin and Chavez, "Developing a Collaborative Model," 4.

[298] Elinor Ostrom, "Beyond Markets and States: Polycentric Governance of Complex Economic Systems" (Nobel Prize lecture, December 8, 2009, Stockholm University), 412, www.nobelprize.org/nobel_prizes/economics/laureates/2009/ostrom-lecture.html.

[299] Although "sustainability" is a broad term used for varying purposes and with varying definitions, for our purposes in this paper in the context of water management, we use the term to refer to a decision framework in which decisionmakers seek to pursue and maintain environmental, social, and economic outcomes that endure over time.

[300] Robert W. Adler, *Restoring Ecosystems: A Troubled Sense of Immensity* (Washington, DC: Island Press, 2007).

These institutional innovations continue to unfold in the United States and elsewhere. These efforts range from relatively small-scale initiatives to more complex organizational partnerships that involve large ecosystems.[301]

B-2e. Collaboration and Problem-Solving: Although collaboration has many definitions, we use the term to refer to processes "in which autonomous or semi-autonomous actors interact through formal and informal negotiation, jointly creating rules and structures governing their relationships and ways to act or decide on the issues that brought them together; [these processes involve] shared norms and mutually beneficial interactions."[302] As Ann Marie Thomson and colleagues note, the term is multidimensional, including structural elements (governance and administration), social capital (mutuality and norms), and agency (organizational autonomy).[303] Much of the literature on collaboration focuses on the set up and design of collaborative processes, but critical to their relevance to conservation is how these processes result in decision rules to actually govern behavior and relationships.[304] The process-oriented focus of collaboration "infers that public involvement methods must be tailored to the unique demands of the situation rather than using the same approach for all issues."[305]

Several scholars note that, although collaborative efforts are intended to result in shared actions and outcomes, such efforts are not synonymous with setting consensus itself as a goal. Andranovich, for example, suggests that conflict and cooperation are not at polar ends of a continuum; rather, they coexist.[306] The focus, thus, should be on "problem solving and dispute resolution rather than the promotion of cooperative relations."[307]

Other scholars reinforce the notion that collaboration and collaborative governance are not ends in themselves but means of facilitating relationship-building and collective action in pursuit of shared goals. Mark Imperial notes that:

> Although collaboration can be an effective strategy for improving policy outcomes or enhancing governance, it is important to remember that it is only one strategy and is unlikely to be appropriate for all problems (e.g., zero sum games). Unilateral action, litigation, legislative intervention, markets, and hierarchical control remain alternative strategies. Some conflict can and should occur because it is an important component of a federal system that promotes competition of ideas and stimulates policy change and learning.[308]

Collaboration is particularly relevant where there is a need for multijurisdictional leadership, strategic planning, and resource mobilization and when "issues have broad political, social, and economic implications; broad public participation is desired from the beginning; educating the public

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[301] Lynn Scarlett, *Managing Water: Governance Innovations to Enhance Coordination* (Issue Brief 12-04, Washington, DC: RFF, 2012).

[302] Ann Marie Thomson, James L. Perry, and Theodore K. Miller, "Conceptualizing and Measuring Collaboration," *Journal of Public Administration Research and Theory* (December 1, 2007): 25.

[303] Ibid.

[304] Ibid.

[305] Selin and Chavez, "Developing a Collaborative Model," 4.

[306] Greg Andranovich, "Achieving Consensus in Public Decision Making: Applying Interest-Based Problem Solving to the Challenges of Intergovernmental Collaboration," *Journal of Applied Behavioral Science* 31 (1995): 429–445

[307] Ibid., 432.

[308] Mark Imperial, "Using Collaboration as a Governance Strategy: Lessons from Six Watershed Management Programs," *Administration & Society* 37 (2005): 311.

is desired; similar issues need to be processed in parallel tracks; and broad community consensus is a desired outcome."[309]

In the earlier discussion of norms, actions, and outcomes, we summarize research identifying collaborative processes as important to trust-building. But conservation requires actions. Thus, a critical question is the relationship between trust-building, motivation, and action. Ultimately, the purpose of collaboration "is to generate desired outcomes together that could not be accomplished separately."[310] Collaboration can be viewed as processes to enable joint action, described by Saint-Onge and Armstrong as "a collection of cross-functional elements that come together to create the potential for taking effective action" and serve "as the link between strategy and performance."[311]

With this in mind, much of the literature on collaboration explores rule structures and processes that build capacity for joint decisionmaking and actions.[312] Collaborative efforts, as Thomson and others note, are not self-executing; they require "coordinating communication, organizing and disseminating information, and keeping partners alert to jointly determined rules made for governing relationships (social coordination) …. A key challenge is to manage tensions between self and collective interests."[313] Collaboration should not be mistaken for "forging commonalities from differences."[314] Rather, it involves identifying shared interests and collectively developing actions to address them, again a point illustrated in our case study on the Florida ecosystem services payment program.

Although much of the literature on collaboration examines various rule structures and processes, a central empirical question is what factors influence the determinants and outcomes of collaboration. Foster and Meinard examine various variables, including organizational characteristics, environmental pressures, and organizational attitudes, to better understand these factors.[315]

Others look at institutional design choices, particularly for practices pertaining to stages of inclusion of various participants in collaboration efforts, to assess how to affect the outcomes of collaborative processes in the context of health programs.[316] Johnston and colleagues note that collaborative processes embody "what procedural justice literature calls the 'voice effect': the strong tendency for people to see processes as more legitimate if they have a reasonable opportunity to influence them before a final decision is made."[317] Although "inclusion" is a fundamental tenet of collaboration, these authors ask, should all relevant stakeholders "be included at once, or should there be a slower method of inclusion, beginning with key agents and extending out slowly to all community members?"[318] They demonstrate:

> … strong experimental evidence that a trade-off between inclusion and building shared commitment exists. If all stakeholders are included all at once, for instance, it may be very difficult to build the trust necessary for shared commitment to the process and to generate the

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[309] Andranovich, "Consensus in Public Decision Making," 435.

[310] Emerson et al., "Integrative Framework for Collaborative Governance," 14.

[311] H. Saint-Onge and C. Armstrong, *The Conductive Organization Building beyond Sustainability* (New York: Elsevier, 2004), 19.

[312] Thomson et al., "Conceptualizing and Measuring Collaboration."

[313] Ibid., 26.

[314] Ibid., 42.

[315] Mary K. Foster and Agnes G. Meinard, "A Regression Model Explaining Predisposition To Collaborate," *Nonprofit and Voluntary Sector Quarterly* 31 (2002): 550.

[316] Erik W. Johnston, Darrin Hicks, Ning Nan, and Jennifer C. Auer, "Managing the Inclusion Process in Collaborative Governance," *Journal of Public Administration Research* 21 (2010): 699–721.

[317] Ibid., 700.

[318] Ibid.

desired outcomes. On the other hand, if the inclusion process is too slow, resources may be stretched thin, momentum may be lost, and legitimation problems may arise.[319]

They find serious consequences in balancing the tension between inclusion speed and process commitment.

In another empirical assessment, Ansell and Gash examine the complex conditions necessary to initiate and sustain collaboration. They undertake a meta-analysis of 137 cases of collaboration to identify the critical variables that facilitate or discourage successful collaboration.[320] These conditions include an assessment of the prior history of working relationships, the incentives designed to encourage stakeholder participation, power distributions, the availability of facilitative leadership, and the institutional safeguards for including necessary stakeholders in an open and credible process.[321] Ansell and Gash also look at processes for establishing trust, shared understanding of problems and the values their solution engenders, and that create opportunities for participants to cultivate a shared commitment to preserving the integrity of the process.[322] Their model looks at relationships between management practices, collaboration processes, and outcomes; it distinguishes design features from collaborative processes and reveals trade-offs between the timing of inclusion and the strength of trust and commitment to the process.[323] With these findings, they suggest that the issue of inclusion should be viewed not as a requirement to be obtained but, rather, as a process that must be managed.[324]

Lab experiments on cooperation, for example, show cooperation early in the process, succeeded by failure that often results from adding new participants.[325] Therefore, determining how and when to include participants in collaborative efforts may be critical to enhancing participants' commitment to the process.[326]

Whereas Gash and Ansell focus on stakeholder inclusion processes and their timing, others have examined the structural properties of organization form and how they change and persist over time. The durability of these collaborative organizational forms is important for conservation initiatives because many conservation activities take a long time to produce results or require ongoing actions over long periods of time. Imperial and Koontz, who define collaboration as a type of network relationship,[327] note that these collaborative organizations often are described as moving through four states: a formative stage; development and maintenance of internal relationships; institutionalization of organization procedures and structures; and, finally, a "shift toward domain or boundary expansion by expanding on organization goals, strategies, or processes."[328] The focus of their research is on the structural properties of collaborative organizations and how they influence the ability of these efforts to continue over time. They point to the potential relevance of mechanisms to provide for

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[319] Ibid.

[320] C. Ansell and A. Gash, "Collaborative Governance in Theory and Practice, *Journal of Public Administration Research and Theory* 1 (2007): 543–571.

[321] Johnston et al., "Managing the Inclusion Process."

[322] Ibid.

[323] Ibid.

[324] Ibid.

[325] Ibid., 714 (referring to findings of Ansell and Gash, "Collaborative Governance").

[326] Johnston et al., "Managing the Inclusion Process."

[327] Mark Imperial and Tomas Koontz, "Evolution of Collaborative Organizations for Watershed Governance: Structural Properties, Life-Cycles, and Factors Contributing to the Longevity of Watershed Partnerships" (paper presented at 29th annual Association for Public Policy Analysis and Management research conference, November 8–10, 2007, Washington, DC), 4.

[328] Ibid., 7–8.

accountability and institutionalized rules, routines, and procedures as potentially contributing to the durability of collaborative efforts.

Empirical assessments of how different attributes of collaborative governance affect outcomes are relatively scarce.[329] In one study, Nicolas Gutierrez and colleagues evaluate 130 collaboratively managed fisheries across multiple nations with different types of ecosystems, resources, and fisheries.[330] They review data from multiple sources and undertake a statistical evaluation of the relationship between co-management attributes and successful fisheries.[331] They find that success is more strongly correlated with the number of governance attributes present than with community attributes.[332]

Other studies have looked at collective decisionmaking processes—the substance of the resource being managed, the processes through which participants interact, and the relationships among the participants in the actual decision. Leong and colleagues examine how public-engagement processes affect the framing of options for addressing resource management challenges.[333] They look at several case studies involving National Environmental Policy Act (NEPA) decisions in which collaborative processes were used to identify management alternatives. In each of these cases, the resulting management alternatives led to options that extended beyond the agency's jurisdictional boundaries to include a broader tableau. The options:

> … included a co-managerial aspect that would have been outside the jurisdiction of the agency—the agency could not have developed that alternative on its own. In one case, the agency was planning a visitor facility and had identified a number of sites, all on agency property. A neighboring municipality looking to revitalize the area was interested in the economic benefits the facility could bring. [The collaborative group] identified two sites on land owned by the municipality, but adjacent to agency land, and submitted these sites in the NEPA comment phase. The agency included these sites in its final analysis and chose one as the preferred alternative.[334]

In a second case regarding a recreation management plan, 17 local recreation groups with different (sometimes competing) recreational interests organized into an outdoor recreation association. The association identified a management alternative that met their needs while also achieving agency goals and reducing development sprawl. Leong and her coauthors note that the public-engagement process serves as a "discovery process" of identifying solutions that might otherwise be overlooked.[335] Moreover, the authors note that this sort of public engagement results in "lasting engagements" among people, and "not just episodes" of action.[336]

B-2f. Network Governance: All of the collaborative processes described above represent what Daniel Kemmis and Matthew McKinney refer to as forms of democracy.[337] Nonetheless, we single out what we call "network governance" for particular focus. Collaborative conservation, as referred to earlier, applies to place-based processes of citizen engagement that can occur at many scales and with

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[329] Nicolas L. Gutierrez, Ray Hilborn, and Omar Defeo, "Leadership, Social Capital and Incentives Promote Successful Fisheries," *Nature* 470 (2010): 386–389.

[330] Ibid.

[331] Ibid.

[332] Ibid.

[333] Leong et al., "Moving Public Participation beyond Compliance," 24.

[334] Ibid., 30.

[335] Ibid.

[336] Ibid., 32.

[337] Daniel Kemmis and Matthew McKinney, *Collaboration and the Ecology of Democracy* (Dayton, OH: Kettering Foundation, 2011).

a broad or issue-specific focus. Network governance refers to a subset of such collaboration—a subset specifically centered on the interactions of multiple governing nodes that can include public-sector and private-sector participants.[338] In such networks, participating organizations maintain control over their own resources; however, they coordinate the uses of their resources.

The concept of network governance builds on ideas of polycentric governance developed by Elinor Ostrom and others in the 1960s.[339] Vincent Ostrom used the term "polycentric" to describe:

> … many centers of decisionmaking that are formally independent of each other …. To the extent that they take each other into account in competitive relationships, enter into various contractual and cooperative undertakings or have recourse to central mechanisms to resolve conflicts, the various political jurisdictions … may function in a coherent manner with consistent and predictable patterns of interacting behavior. To the extent that this is so, they may be said to function as a 'system.'[340]

Petr Vymetal describes the many classifications of networks, which vary in organizational structure as well as in process design.[341] Regarding the accumulating examples of network governance, Goldsmith and Eggers note, "[r]igid bureaucratic systems that operate with command-and-control procedures, narrow work restrictions, and inward-looking cultures and operational models are particularly ill-suited to addressing problems that often transcend organizational boundaries."[342] These systems, they suggest, are not well-suited to addressing management challenges in which relevant knowledge is dispersed, the interests of multiple resource owners and users intersect, and coordination among multiple legal authorities is required.

Others note that similar challenges of coordination among multiple institutions arise also in the nonprofit sector. Lester Salamon has analyzed the structures and functioning of nonprofit organizations. In describing current governance challenges, he notes that "what exists in most spheres of policy is a dense mosaic of policy tools, many of them placing public agencies in complex, interdependent relationships with a host of third-party partners."[343]

Resource managers increasingly flag similar governance challenges as significant hurdles to achieving effective, integrated natural resource management. But examining emergent models of network governance requires some sense of the governance criteria against which one might evaluate their effectiveness. McKinney and Kemmis indicate their significance in a natural resource management context by noting that "formal legal and institutional boundaries delineate ownership and management authority" but "they also act as dividers between disparate cultures, attitudes, goals, and values."[344] Consequently, they continue, these divisions "can stymie efforts to address shared challenges."[345] Relevant to understanding conservation actions, Margaret Wheatley and Deborah Frieze argue that:

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[338] See Stephen Goldsmith and William Eggers, *Governing by Network: The New Shape of the Public Sector* (Washington, DC: Brookings Institution Press, 2004), 7.

[339] McGinnis, "Polycentric Governance."

[340] Ostrom et al., "Organization of Government in Metropolitan Areas, 851."

[341] Petr Vymetal, "Networked Governance" (research plan of the Faculty of International Relations, University of Economics, Prague, no date).

[342] Ibid.

[343] Lester Salamon, "The New Governance and the Tools of Public Action: An Introduction," in *The Tools of Government: A Guide to the New Governance*, ed. Lester Salamon (Oxford, UK: Oxford University Press, 2002), 3.

[344] Kemmis and McKinney, *Collaboration and the Ecology of Democracy*, 45.

[345] Ibid.

The world does not change one person at a time. It changes as networks of relationships that form among people who discover they share a common cause and vision of what's possible …. We don't need to convince large numbers of people to change; instead, we need to connect with kindred spirits.[346]

For purposes of understanding conservation attitudes and the effectiveness of conservation actions, McKinney and Kemmis identify several questions: (a) What challenges present themselves as one moves up the geographic scale? (b) Is the practice of collaborative democracy limited in some way by geographic scale and by the corresponding sense of place or of belonging? (c) How (if at all) does collaborative democracy address the issue of mobilizing and engaging unaffiliated citizens? (d) What kind of leadership skills are needed for collaborative democracy?[347] Research on these questions is limited. However, some research points to characteristics that appear to be necessary to sustain the credibility, legitimacy, and effectiveness of network governance arrangements.

Four characteristics, in particular, are important to sustaining the structures, processes, and networks through which agencies, communities, landowners, and resource users can set shared goals and undertake shared conservation actions across jurisdictions, ownership boundaries, and common pool resource contexts.[348]

- First, governance—both formal and informal—must provide accountability and flexibility. How can decisions and actions adjust to new circumstances? Adaptive management offers one technical tool intended to enable managers to adjust actions based on the establishment of clear goals, selection of management interventions, monitoring of those actions to assess their achievement of the established goals, and making course corrections where needed. But the policy context within which adaptive management is practiced often limits the ability to make substantive course corrections. And there is a second conundrum: the public (and sometimes legal) requisites of accountability for clear outcomes produce some tensions with the pursuit of adaptability.

- Second, governance must be characterized by inclusivity in collaboration, accompanied by shared agreement on the processes and rules that will guide decisionmaking. Who is at the decisionmaking table? In what capacity? How much consensus is enough? When can an idea become a decision?

- Third, governance must allow for ongoing learning, including ways to identify information gaps, frame questions, and generate relevant knowledge. Relevant knowledge includes not only scientific and technical knowledge, but also local and experiential knowledge that is tied to the time, place, experience, and situation.

- A final characteristic of successful network governance pertains to the broader policy context in which regulations and other decision rules shape how well participants can coordinate actions and strengthen connections. Do existing rules and authorities allow for and facilitate coordination? Federal agency rules are often not well aligned with the facilitation of partnerships, collaboration, and cross-jurisdictional actions. (Consider, for example, Federal Advisory Committee Act provisions that limit spontaneous engagement by federal agencies in certain kinds of collaborative endeavors; other policies that constrain uses of cooperative

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[346] Margaret Wheatley and Deborah Frieze, "Using Emergence To Take Social Innovations to Scale," *Kettering Review* 27, no. 2 (2009): 34.

[347] Kemmis and McKinney, *Collaboration and the Ecology of Democracy.*

[348] For a discussion of landscape-scale conservation and collaboration, see McKinney et al., *Large Landscape Conservation*.

agreements; and even budgets, which are often formulated by agency rather than by resource management and restoration initiative.)

Regarding this final characteristic (coordination), many researchers[349] have looked at the formation of network governing institutions and processes, but few have examined the ways in which networks support the goals of the whole network.[350] Saz-Carranza and Ospina turn to this issue, examining the behavioral dimension of network governance and identifying the need to effectively govern the tension between unity and distinctiveness of network participants as essential to network performance, a need that they suggest requires "strategic action at the whole-network level."[351] They study what they refer to as the network administrative organization, the mechanisms within a network governing context that focus on "fostering of concerted decisionmaking and joint action among autonomous entities with distinctive aspirations, operational goals, and organizational characteristics."[352] They conclude that network administration organizations "are key players in generating conditions for joint action by network members," as one of their critical functions is to manage the unity–diversity tension.[353] They find that network administration organizations play three key roles. These organizations (a) serve a "bridging" role, mediating and actively promoting member interaction; (b) provide "framing work" that sets the stage for concerted action by creating the foundations of appropriate behavior among network members; and (c) perform "capacitating work" that includes strategic recruitment, training, and resource transfers.[354]

B-3. Integrating Science into Collaborative Action

Informing complex conservation decisions with scientific insights and information is relevant to conservation attitudes, actions, and outcomes. Yet the interface of science, attitudes, and decisionmaking presents challenges. It is useful to think of the interface of science and decisionmaking as involving issues of how:

- problem sets are defined and priorities developed;

- relevant information is identified and generated;

- the science and decisionmaking discussion is conducted;

- information is used, tested, and augmented; and

- decisions are adjusted as information evolves.

These are partly institutional and procedural questions, thus giving rise to the analytical–deliberative (A–D) approach to integrating science and decisionmaking that is discussed below. These questions involve considerations of how dialogues are initiated, structured, and sustained and how the results of such discussions can be affirmed as public policy and formal management decisions. These questions arise from recognizing that many resource management and other policy decisions involve

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[349] In the context of the private sector, see, for example, A. Shipilov, H. Greve, and T. Rowley, "When Do Interlocks Matter: Institutional Logics and the Diffusion of Multiple Corporate Governance Practices," *Strategic Organization* 11, no. 2: 156-179.

[350] Angel Saz-Carranza and Sonia M. Ospina, "The Behavioral Dimension of Governing Interorganizational Goal-Directed Networks—Managing the Unity–Diversity Tension," *Journal of Public Administration Research and Theory* 21, no. 2 (2011): 327–365, http://jpart.oxfordjournals.org/content/21/2/327.

[351] Ibid., 327.

[352] Ibid., 328.

[353] Ibid.

[354] Ibid.

what Tijs van Maasakkers describes as distributional disputes.[355] Many of these decisions involve debates about the distribution of funds and other benefits, the development of regulatory standards, allocation of liabilities, or the siting and design of facilities.[356] To this list, one might also add that such decisions involve debates about who uses natural resources and how and for what purposes they are managed—questions that also may have significant distributional effects.

Thus, framing the problem and defining decision boundaries involves values, and such framing can introduce significant policy issues. These concerns are not matters exclusively of technical and scientific determination. Resource and other policy challenges do not present themselves in predefined problem sets. Defining the scope and scale of the relevant problem set—the "compass" of a decision—can raise both scientific and social questions:

> Is the relevant boundary for accumulating and applying information regarding infrastructure siting a backyard, a stream, a watershed, a continent, or a world? Through what processes might appropriate boundaries for a problem set and decision focus be drawn? Answering these questions demands scientific insights. But these are as much questions of human communities, values, and social constructs as they are matters of scientific distinctions and categories.[357]

This observation points to the relevance of public engagement with technical experts and decisionmakers in framing environmental problems and defining decision boundaries. It suggests that the metaphor for science and decisionmaking is not one of two separate realms linked only through a handover of information. Rather, a more useful metaphor is one in which multiple participants engage in shared identification of goals, mutual learning, and coproduction of relevant knowledge. Within this mutual learning framework, the science and decisionmaking nexus is not simply about information transfers, nor is that nexus simply about the translation of technical data into publicly accessible terms.

Even when participants agree on a conservation problem, decisionmaking may stall when they try to reach agreement on the best solution to that problem.[358] A failure to reach agreement is especially likely when there are competing decision authorities between and within levels of government and when a wide range of stakeholder values and interests must—by law, administrative procedure, or judicial fiat—be accommodated before a decision can be made.

Within this decision context, Beatrice Crona and John Parker describe two models of knowledge transfer—what they call the engineering model and the socio-organizational model.[359] The engineering model essentially views knowledge transfer as one in which generators of knowledge and users of knowledge operate in separate contexts, with the focus and findings of research determined by the researcher and then communicated to others, including the public, stakeholders interested in an issue, and other decisionmakers. The socio-organizational model emphasizes that knowledge and its potential relevance to users emerges within a context of organizations and social settings through

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[355] Tijs van Maasakkers, "How Can Practitioners Analyze and Engage Science-Intensive Public Disputes?" (unpublished manuscript, Massachusetts Institute of Technology, 2009), http://web.mit.edu/dusp/epp/music/pdf/tijstnopaper.pdf.
[356] Ibid.
[357] Lynn Scarlett, "Climate Change Effects: The Intersection of Science, Policy, and Resource Management in the USA," *Journal of the North American Benthological Society* 29, no. 3 (2010): 895.
[358] Environmental decisionmaking at the larger watershed or ecosystem scale will be illustrated in this section with examples from water resources decisionmaking.
[359] Beatrice Crona and John Parker, "Network Determinants of Knowledge Utilization: Preliminary Lessons from Boundary Organizations," *Science Communication* 33, no. 4 (2011): 448–471.

which issue framing occurs, goals are articulated, and options to address issues are developed. Others refer to this model as an A–D approach to linking science and decisionmaking.[360]

Research on the sociology of science, cognition, and related fields has focused increasingly on socio-organizational models in the context of decisionmaking on environmental issues. In part, this focus arises from the recognition that many environmental problems are complex and involve the intersection of scientific considerations with individual, community, and broad social values and behaviors. For example, reflecting on US Department of Agriculture (USDA) Forest Service planning practices in the 1990s, a forest service commentator notes that experts such as agency officials cannot simply sum up available technical and scientific research to develop the "right" answers to forest management questions.[361] The commentator notes that policymaking is both complex and politically wicked and that these are not the same qualities.[362] Complexity refers to multiple, interconnected ecosystem variables and often nonlinear processes relevant to understanding forest (or other ecosystem and natural resources) dynamics. The politically wicked nature of many environmental problems refers to the fundamental interplay of human values and behaviors with environmental conditions such that decisions to manage or alter these conditions potentially involve priority-setting and value trade-offs. These wicked problems "cannot be solved by any multi-step planning process designed to 'collect more data, build bigger models, and crunch more numbers … [expecting that] surely the right answer would be forthcoming.'"[363] Such efforts to collect more data, undertake fancier analysis, and add more computing power "reflect a naïve hope that science can eliminate politics."[364]

Given complexity and the science–values nexus, substantial empirical research validates the importance of three attributes of effective linkage between science and decisionmaking—credibility, relevance, and legitimacy.[365] Credibility refers to the extent to which the science is perceived as meeting technical standards; relevance refers to user perceptions of the appropriateness of the science for addressing their information needs; and legitimacy relates to perceptions that the processes for generating and using the information are procedurally fair. The importance of credibility, relevance, and legitimacy has turned attention to the role of collaborative processes in bringing together scientists, stakeholders, and decisionmakers. For example, Larry Susskind refers to collaborative rational processes in which participants "engage with other members of a community to jointly learn and work out how to generate improvements in the face of conflict, changing conditions, and conflicting sources of information."[366]

A 2012 review of research on the intersection between science and decisionmaking in the environmental context describes a broad consensus on the need for ongoing interactions between scientists and users of scientific information.[367] Moreover, numerous studies support the proposition that the effectiveness of such interactions depends on credibility, relevance, and legitimacy, as noted above. Dietz suggests that A–D approaches for linking science and decisionmaking (such as the

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[360] Thomas Dietz, no title (PowerPoint presentation, no date).

[361] Dave Iverson, "The Forest Service as a 'Learning Challenges' Organization," Eco-Watch Dialogues, February 1999, http://www.fs.fed.us/eco/eco-watch/cos_greenplans.html.

[362] Ibid.

[363] G. M. Allen and E. M. Gould, "Complexity, Wickedness, and Public Forests," *Journal of Forestry* 84, no. 4 (1986): 22.

[364] Iverson, "Forest Service as a 'Learning Challenges' Organization."

[365] D. W. Cash, W. C. Clark, F. Alcock, N. M. Dickson, N. Eckley, D. H. Guston, J. Jäger, and R. B. Mitchell, "Knowledge Systems for Sustainable Development," *Proceedings of the National Academy of Sciences of the USA* 100, no. 14 (2003): 8086–8091.

[366] L. Susskind and J. L. Cruickshank, *Beyond Impasse: Consensual Approaches to Resolving Public Disputes* (New York: Basic Books, 1987), 369.

[367] Kalle Matso, "Producing Science That Gets Used by Coastal Communities: What Funders Should Do To Link More Science with Decisions" (Ph.D. dissertation, University of New Hampshire, December 2012), 14.

boundary processes described earlier) contribute to perceptions of the legitimacy of decisions through improved transparency. But Dietz also notes that such processes may also play a role in changing attitudes and behavior and may facilitate collective action.[368]

However, the literature does not focus on how to operationalize these interactions or on whether the details are significant.[369] If ongoing interactions are important, what is known about the effective structuring of such interactions?

A 2006 report of the National Research Council identifies six principles for programs attempting to better link science and decisions. These include defining the problem with users, defining clear project goals and accountability, using boundary-spanning organizations, placing work in a decision chain, experimenting with and incentivizing innovation in program management, and ensuring continuity and flexibility.[370] Others have underscored the importance of engagement among scientists, stakeholders, and decisionmakers early in the process to enhance the prospects that scientific products will be perceived as relevant to stakeholder and decisionmaker needs and increase perceptions of legitimacy. Significant empirical research affirms that early involvement of intended users may correlate with a greater link between science and decisions after project completion.[371] However, through an empirical review of four case studies, Kalle Matso illustrates that effective structuring of these interactions is not simple to orchestrate. Matso notes that, despite an increased emphasis on the need to link scientists more directly with decisionmakers in ongoing relationships and processes, the scientific community has shown a general "failure to see design and implementation of participatory processes as an explicit skill or discipline."[372] On the other hand, political scientists, organization theorists, and others within the social sciences have focused on these design considerations as they relate to collaborative processes and collective governance. Here we describe some of the tools that link scientists with stakeholders and decisionmakers. Later in this paper, we discuss some of the social science insights regarding the design characteristics of these processes and governance structures.

B-4. Tools and Processes for Linking Science and Decisionmaking

Conservation and environmental management decisions increasingly occur within collaborative decisionmaking processes. Public participation and collaboration are not new, but they are broadening in extent, form, and purpose. In particular, natural resource management settings are evolving to include processes that bring citizens together with scientists. Some analysts have described a need for

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[368] Thomas Dietz, no title (PowerPoint presentation, no date).

[369] E. M. Rogers, "The Nature of Technology Transfer," *Science Communication* 23, no. 3 (2002). Rogers points to the importance of the agriculture extension model in calling out some ingredients of success, such as adequate funding; the importance of relationships; and the role of boundary-spanning organizations between technical experts and users of information.

[370] National Research Council, *Linking Knowledge with Action for Sustainable Development: The Role of Program Management— Summary of a Workshop. Report to the Roundtable of Science and Technology for Sustainability* (Washington, DC: National Academies Press, 2006).

[371] See, for example, T. C. Beierle and J. Cayfor, 2002. *Democracy in Practice: Public Participation in Environmental Decisions* (Washington, DC: RFF Press, 2002); Cash et al., "Knowledge Systems for Sustainable Development"; K. Jacobs, *Connecting Science, Policy and Decision Making: A Handbook for Researchers and Science Agencies* (Silver Spring, MD: National Oceanic and Atmospheric Administration, Office of Global Programs, 2002), http://www.climas.arizona.edu/files/climas/pubs/jacobs-2002.pdf; E. A. Dreelin and J. B. Rose, "Creating a Dialogue for Effective Collaborative Decision Making: A Case Study with Michigan Stakeholders," *Journal of Great Lakes Research* 34 (2008): 12–22. National Research Council, *Informing Decisions in a Changing Climate* (Washington, DC: The National Academies Press, 2009).

[372] Kalle Matso, "Challenge of Integrating Natural and Social Sciences To Better Inform Decisions: A Novel Proposal Review Process," in *Restoring Lands: Coordinating Science, Politics, and Action*, ed. H. Karl, M. Flaxman, J. C. Vargas-Moreno, and P. L. Scarlett (Dordrecht, the Netherlands: Springer Publishing, 2012), 107.

"boundary processes" to facilitate mutual learning and knowledge transfers. Others emphasize the importance of boundary processes that are collaborative and iterative.

Many public policy and resource management questions are technical and complex, but also affect a variety of communities, interests, and locations and involve trade-offs. What are the respective roles of scientists, technical experts, and the public in addressing such questions? Complexity and disagreements about what information is relevant or how to interpret it often lead to data and analytical debates. Debates over "what is relevant or valid" have sometimes steered efforts away from problem-solving and have deterred action.

To address these challenges and enhance linkages between scientists and decisionmakers, a number of structures and processes have emerged, often referred to as analytic-deliberative (A-D) processes, as contexts for collaborative learning among scientists, decisionmakers, and the public.[373]

Although such processes have no "ideal" form, as noted by Matso, several emerging decision frameworks reflect the A–D approach to science and decisionmaking that links scientists, stakeholders, and decisionmakers in ongoing dialogue and relationships. These include joint fact-finding, collaborative values assessment, collaborative adaptive management, and computer-aided dispute resolution processes. Many of these processes involve science–decisionmaking boundary organizations.

These tools are all intended to bridge the conversation between those engaged in the policy questions—"what goals are we pursuing" and "how can we fulfill them"—and those who have insights regarding "what we know that might help us decide." Consistent with an A–D approach to science and decisionmaking, these tools involve ongoing discussion processes and not simply the assembly and translation of information. The processes themselves are important to enhancing relevance, credibility, and legitimacy—the key elements of effective science–decisionmaking interactions we identified in our earlier discussion.

Some research—for example, on decisions to site hazardous facilities—shows that decision sequence, setting, and the type of public engagement matter. If local authorities first select, say, a landfill site and then present the public with scientific and engineering information on its suitability, conflict, data disputes, and stalemate often ensue. If, instead, local authorities first describe a need— say, for managing waste—along with desired features of a site, they are better able to engage interested constituents in evaluating options, the relevant science, and engineering information.[374]

B-4a. Joint Fact-Finding: Joint fact-finding involves dialogue and mutual learning among scientists, the public, and decisionmakers. Scientists, decisionmakers, and citizens collaborate in the scoping, conduct, and employment of technical and scientific studies to improve decisionmaking.[375] The central purpose of joint fact-finding is to develop shared scoping of the problem set and a shared understanding of relevant technical and scientific issues and to build a collective understanding of the implications of known information for policy options and actions.[376]

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[373] Harvey Fineberg and Paul Stern, eds., *Understanding Risk: Informing Decisions in a Democratic Society* (Washington, DC: National Academies Press, 1996).

[374] Rodney Fort and Lynn Scarlett, *Too Little, Too Late? Host-Community Benefits and Siting Solid Waste Facilities* (Los Angeles: Reason Foundation, 1993).

[375] Larry Susskind and Herman Karl, "A Dialogue, Not a Diatribe: Effective Integration of Science and Policy through Joint Fact Finding," *Environment* 49, no. 1 (2007): 20–34.

[376] Scott McCreary, John Gamman, and Bennett Brooks, "Refining and Testing Joint Fact-Finding for Environmental Dispute Resolution: Ten Years of Success," *Conflict Resolution Quarterly* 18, no. 4 (2001): 329–348.

Joint fact-finding processes have been used to engage scientists, stakeholders, and decisionmakers in numerous resource management contexts over the past two decades.[377] For example, a process of joint fact-finding was used to address water quality issues in the Tomales Bay in California, 40 miles north of San Francisco. Sedimentation has reduced the size of the bay, which is impaired with mercury, nutrients, and pathogens. The area has commercial oyster-growing activities, and in the 1990s, water quality testing led to health advisories for water contact and fish consumption. Outbreaks of illness presumed to be associated with water quality sparked local action and debates about what was causing the poor water quality. Years of data disputes ensued, as different interests presented different information about the potential causes of poor water quality. Eventually, to move beyond these disputes, a joint fact-finding collaborative process was launched. The process was used to identify what information was lacking and what was needed to better understand the causes of water quality problems. That information became the basis for a collaboratively developed watershed plan for the bay. In the case of Tomales Bay, a key challenge was one of debates over data and the analysis of data to understand the water quality problem and its causes.

Other conservation and resource management contexts present different needs and challenges. One is a context in which goals and/or priorities are unclear. The second involves contexts of uncertainty about what management actions or options will provide the hoped-for results. Several different boundary processes are described briefly below.

B-4b. Collaborative Values Assessment: Offshore oil and gas exploration presents risks of oil spills. One central decisionmaking challenge is how to focus emergency responses in the case of such spills. Such circumstances can involve numerous impacts and potential response options that exceed the operational capacity to address them simultaneously. The selection of priorities and performance measures at the strategic level affects tactics and actions. Collaborative values assessments have been used to engage stakeholders in interactive processes with scientists to identify stakeholder values and public concerns and to assess priorities. Collaborative values assessments link scientific information about risks and resources with processes to assess public values and concerns.[378]

B-4c. Collaborative Adaptive Management: The US Department of the Interior *Adaptive Management Technical Guidance* refers to adaptive management as involving the exploration of "alternative ways to meet management objectives, predicting the outcomes of alternatives based on the current state of knowledge, implementing one or more of these alternatives, monitoring to learn about the impacts of management actions, and then using the results to update knowledge and adjust management actions."[379] The National Research Council has defined adaptive management as:

> … a decision process that promotes flexible decisionmaking that can be adjusted in the face of uncertainties as outcomes from management actions and other events become better understood. Careful monitoring of these outcomes both advances scientific understanding and

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[377] Ibid.

[378] Igor Linkov, F. Kyle Satterstrom, Gregory A. Kiker, Todd Bridges, Sally L. Benjamin, and David Belluck, "From Optimization to Adaptation: Shifting Paradigms in Environmental Management and Their Application to Remedial Decisions," *Integrated Environmental Assessment and Management* 2, no. 1 (2006): 92–98; and I. Linkov et al., "From Comparative Risk Assessment to Multi-criteria Decision Analysis and Adaptive Management: Recent Developments and Applications, *Environment International* 32 (year): 1072–1093.

[379] B. K. Williams, R. C. Szaro, and C. D. Shapiro, *Adaptive Management: The US Department of the Interior Technical Guide* (Washington, DC: Adaptive Management Working Group, US Department of the Interior, 2009), 4, http://www.doi.gov/initiatives/AdaptiveManagement/TechGuide.pdf.

helps adjust policies or operations as part of an iterative learning process … it is not a "trial and error" process, but rather emphasizes learning while doing.[380]

Some researchers have examined the effectiveness of adaptive management in improving conservation and resource management outcomes.[381] The record, generally, has fallen short of expectations.[382] More recently, in part to address limitations identified in previous adaptive management processes, some conservation and ecosystem restoration managers have used adaptive management as a more collaborative, iterative process to engage scientists, stakeholders, and decisionmakers. Such efforts are distinguished from joint fact-finding and collaborative values assessments primarily in terms of their purposes. Joint fact-finding may occur in contexts in which a general problem has already been defined, but disagreements about causation—and therefore resolution—of the problem impede action. Collaborative values assessments may occur when multiple stakeholder values exist, yet priority-setting is necessary, and scientific information may be relevant to better understand risks and opportunities in order to effectively to address them. Collaborative adaptive management is often relevant in situations involving an entire continuum of decisions that include problem specification; priority-setting; option evaluation and selection within a dynamic, complex context involving uncertainties; monitoring; and adjustments in actions based on mutual learning.

Participants in the Platte River Recovery Implementation Plan, a basin-wide initiative that includes federal and state agencies, local landowners, the agricultural community, and others, designed a collaborative adaptive management plan to enhance knowledge in a context of stakeholder and decisionmaker disagreements and scientific uncertainties while using the process itself to help set goals, select action options, and develop new information on the effectiveness of actions. The initiating focus of the Platte River Recovery Program is on the protection of four endangered species and involves coordination of groundwater and surface water management and land management, including water use to support agricultural production. A central element of the planning processes includes development of a "depletion plan" to mitigate, offset, or prevent new depletion to the river's target flows. Participants disagree significantly regarding what the at-risk species need, in terms of water management, for their protection.

To move beyond disagreements, the program uses a collaborative adaptive management framework. Participants agree to certain goals and actions but then monitor and evaluate program benefits based on emerging information. The process provides a way to transcend data disagreements and move to action. In effect, the collaborative adaptive management approach frames conflicts "not as a legal violation but as a divergence of interests and a competition of interests among parties. The goal of the process is to find a way to meet the interests of the parties, rather than just to meet the needs of the law …. The model recognizes that knowledge is always incomplete."[383]

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[380] National Research Council, *Adaptive Management for Water Resources Planning,* National Academies Press, 2004: 13.

[381] K. Lee, "Appraising Adaptive Management," *Conservation Ecology* 3, no. 2 (1999): 3, http://www.consecol.org/vol3/iss2/art3; and Larry Susskind, A. E. Camacho, and T. Schenk, "A Critical Assessment of Collaborative Adaptive Management in Practice," *Journal of Applied Ecology* 49 (2012): 47–51.

[382] J. Walter Milon, Clyde F. Kiker, and Donna J. Lee, "Adaptive Ecosystem Management and the Florida Everglades: More Than Trial-and-Error?" (updated working paper, initially published in *Journal of Agricultural and Applied Economics* 29 (1997): 99–107), 37.

[383] Curt Brown, "Handling Confrontation: Negotiated Adaptive Management" (Working Paper 93-13, Conflict Resolution Consortium, Boulder, Colorado, 1993, edited transcript of talk by Curt Brown for the Intractable Conflict/Constructive Confrontation Project on April 10, 1993).

But participants in the Platte River collaborative adaptive management process note challenges. These include: (a) financial needs; (b) institutional difficulties, including diffusion of responsibilities for implementing actions; (c) the need to devote resources to building trust, which can actually illuminate areas of conflict; (d) difficulties in getting all parties involved before crisis stages; (e) the presence of issues that serve as symbols for much larger issues that are hard to negotiate; (f) the imperatives of constant adjustment in a context of expectations for "final solutions;" and (g) challenges of motivating interest groups to be involved in quiet negotiation.[384]

B-4d. Analytical–Deliberative Processes[385]:Dispute resolution refers to well-established processes of negotiation and bargaining as a means for making natural resources and environmental decisions. Various processes, sometimes referred to collectively as ADR, environmental dispute resolution, or collaborative problem-solving, have been endorsed and promoted by government agencies.[386] A key goal of these approaches is to identify alternatives that increase the benefits to all decision participants—popularly characterized as "win–win" solutions—achieved through "integrative bargaining" or interest-based bargaining.[387]

One noteworthy form of ADR is A–D processes that integrate computer simulation modeling into dispute resolution as a method for group problem-solving. A–D processes help disputing parties discover win–win agreements by communicating through a mutually developed and accepted computer simulation model. Computer simulation refers to models, built and vetted by the parties to the dispute, that are used to provide answers to "what-if" questions prior to taking action. That is, the models are used to predict the conservation outcomes of different policy interventions (alternatives) taken in a complex system.

Simulation modeling serves shared learning and helps chart a path to agreement. Blending models and negotiation in A–D takes a particular form that has implications for the way models are constructed and used. In brief:

- Computer simulation models must represent system complexity in ways that might be useful and credible for participants in a negotiation.

- The computational algorithms in simulation model(s) must be transparent to the parties to the negotiation and must admit to and report on model prediction uncertainty.

- The A–D model incorporates, and is not supposed to replace, competing models of the same phenomena.

- Simulation models can be of high or low resolution and can be expensive and time consuming to build or inexpensive to develop. Simulation models can also vary in terms of the level of geographic scale and disciplinary integration. A–D models have only the level of detail needed to gain model acceptance by the negotiating parties.

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[384] Ibid.

[385] The text that follows draws heavily from Chapters 2, 3, and 10 previously published by Shabman and Stephenson in *Converging Waters*, ed. L. Bourget (Alexandria, VA: Institute for Water Resources Press, 2011).

[386] Council on Environmental Quality, "Collaboration in NEPA: A Handbook for Practitioners," October 2007; Federal Interagency Alternative Dispute Resolution Working Group Steering Committee, "Report for the President on the Use and Results of Alternative Dispute Resolution in the Executive Branch of the Federal Government," April 2007; Office of Management and Budget and Council on Environmental Quality, "Memorandum on Environmental Conflict Resolution: Letter to Agency Secretaries/Administrators," November 2005.

[387] Brad Spangler, "Integrative or Interest-Based Bargaining," *Beyond Intractability*, June 2003, http://www.beyondintractability.org/bi-essay/interest-based-bargaining.

Because A–D decision participants rely on a common model (or models), these technical models serve a role analogous to the single text negotiation tool from which decision participants can organize their collective deliberations. Within an A–D process, models will be explicitly designed in conjunction with the negotiation participants. First, the convener of the negotiation organizes the participants to facilitate joint discussions based on the principles and practices described in the collaborative process literature. The A–D modeling can then begin from an appreciation of the values, interests, and analytical needs of the multiple participants to the negotiation.

A–D modeling does not assume technical knowledge and models provided by outside experts or even agreement by experts on "the science." A–D processes integrate the development of computer-based models of the natural resources system into the negotiation process and become a basis for resolving disagreement over "the facts." Indeed, A–D begins from the premise that decision participants often have difficulty separating arguments about "what should be" from arguments about "what is" and so the process is designed to organize negotiations to reach agreement on what is, and then focus attention on what should be.[388] The joint modeling process also provides a means to examine the consequences of different data assumptions, disputed technical relationships, and scientific and physical uncertainties.

Stakeholders come to an ADR process with their own interests; values regarding the preferred state of the ecosystem; and particular analytical understandings of the current social, biological, hydrologic, and economic conditions, the technical, political, and legal options for change, and the consequences of alternatives. These initial interests, values, and analytical understandings, can all be sources of dispute, but all can be addressed and potentially resolved by ADR methods.

Interest disputes arise when alternatives have unequal distributional effects, as is often the case. For example, a proposed water supply project for one local community may reduce future water supply development and community growth opportunities for a downstream community. Or interest disputes may arise when an existing benefit (e.g., water for irrigation or navigation) is threatened by the new emphasis on mimicking historic flow regimes on a river in the service of ecological restoration or river recreation enhancement. The resolution of interest disputes can be achieved by identifying alternatives that all participants believe make them better off. A–D increases the chances of finding alternatives that have mutually beneficial outcomes and can identify and perhaps quantify stakeholder losses that require compensation.

Value disputes arise from different opinions regarding the desirability of a given alternative, even when interests are aligned. Water resource value disputes, for example, often center on the relative importance of environmental conditions versus economic and social development goals.

Analytical disputes arise from conflicts over the data, theories, and models used to characterize problems and solutions. Analytical disputes are the initial focus of an A–D process, given A–D's emphasis on shared simulation model building. The traditional approach to the resolution of analytical disputes is to rely on technical experts. However, as the number of disciplines (and sub-disciplines)

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[388] Model development coordinated with the needs of the negotiation separates analytical–deliberative modeling processes from a significant portion of the technical water resources modeling literature. It resists the tendency to let technical analysis proceed with its own problem definitions, alternatives, and solutions. Science and technical analysis is critical to aid in the understanding of biological, chemical, physical, and economic consequences of different alternatives; but this analysis must be responsive to the needs of decision participants. Models and technical analysts should not presuppose what information participants need or dictate (intentionally or unintentionally) the selection of alternatives. Models should be at the service of decisionmaking, not the means of deciding. However, although models are explicitly designed in conjunction with stakeholder negotiations, the models also meet the technical and professional standards of constructing a logically consistent and valid model.

and "experts" have grown, differences among experts within and between disciplines have become common. A–D processes help illuminate differences between expert judgments and the value judgment implicit in differing expert approaches to a decision. Parties with a stake in an outcome may not accept the technical arguments of government or other experts without some form of external verification. Nevertheless, claims to have expertise and "sound science" on the side of an argument is still an advantage in most deliberations.[389]

A–D processes directly address such analytical disputes. The collective development, ownership, and use of common analytical simulation models provide decision participants a structure and forum with which to identify and debate sources of analytical disputes. The joint modeling process also provides a means to examine the consequences of different data assumptions, disputed technical relationships, and scientific uncertainties.

An A–D process involves mutual learning. These processes result in learning of technical "facts," but also help illuminate the values, beliefs, and interests of affected parties. Ideally an A–D process helps groups discover and create alternatives that may not have been imagined by any single participant. The A–D process means that preferences for, and willingness to consider, different alternatives changes as the simulation model describes the consequences of different alternatives.[390]

B-5. Boundary Organizations.

The focus on the intersection of scientific knowledge and decisionmaking has shifted from perceiving such intersections in terms of linear transfers from knowledge producers to potential users to emphasizing mutual learning, dialogue, feedback, and other iterative and ongoing relationships. This shift has generated appeals for the creation of "boundary organizations" that create the context for mutual learning and dialogue. Parker and Crona describe these organizations as facilitating communication and collaboration between research and policy organizations.[391] They describe these organizations as sharing three features: first, "they provide opportunities and incentives for creating and using boundary objects—conceptual models, classification systems, etc.; second, they involve participation by policymakers and researchers; third, they exist at the frontier of science and policy communities but are accountable to both."[392]

However, relatively little empirical research has examined boundary organizations and their effectiveness, including their effectiveness in contributing to adaptive resource governance.[393] Crona and Parker, drawing from research on knowledge utilization, boundary organizations, and stakeholder theory, attempt to better understand these organizations and their effectiveness, including how knowledge utilization is shaped by social interactions, sociopolitical environments, and power relationships.[394] They note that the extent of types of interactions between those generating scientific information and those using it vary. Their research suggests that "policy makers with greater numbers of contacts with academics participating in the bridging organization were more likely to utilize the information, as were those who discussed bridging organization research with other policy

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[389] D. Tarlock, "Who Owns Science?" *Penn State Environmental Law Review* 135 (2002): 10.

[390] Individual and group learning and shared experiences also can build social relationships between people. The development of social capital among multiple and competing decision participants facilitates integrative bargaining.

[391] John Parker and Beatrice Crona, "On Being All Things to All People: Boundary Organizations and the Contemporary Research University," *Social Studies of Science* 42 (2012): 264.

[392] Ibid.

[393] Beatrice J. Crona and John Parker, "Learning in Support of Governance: Theories, Methods and a Framework To Assess How Bridging Organizations Contribute to Adaptive Resource Governance," *Ecology and Society* 17, no. 1 (2012): 32.

[394] Ibid.

makers."[395] Crona and Parker find that boundary management involves coordinating relations among stakeholders and adjusting the social composition, structure, and research focus of the organization; conclude that "boundary management should not be viewed as an achievement but as an ongoing process of negotiations between the org and its stakeholders."[396] They suggest that effective boundary management must meet the demands of specific stakeholders, often in circumstances where the issues and relevant knowledge are complex and tensions exist. Identifying these tensions, they conclude, is a key part of effective boundary management.[397]

Part Two—(II: B) Collective Settings: Summary of Key Findings

- Conservation, like a growing number of public-sector activities, "entails producing services with the public more than delivering services to the public."[398]

- Governing networks and co-management of common pool resources can (a) enhance legitimacy, (b) create and utilize the social capital of local knowledge of local conditions, (c) tailor responses to local conditions, and (d) offer flexibility in the context of changing conditions.[399]

- The trend toward public-engagement approaches to natural resource management and decisionmaking reflects "the increasing complexity and 'wickedness' of wildlife management problems …. Negotiation over the way the problem is defined … plays an important role in identifying potential solutions and determining the relative success of management interventions."[400]

- Collaborative processes can influence norms and actions, build trust, and enhance perceptions of legitimacy of information and actions.

- People see processes as more legitimate if they have had an opportunity to influence them before final decisions are made.

- There are trade-offs between the timing of broad inclusion of stakeholders and stakeholder commitment to collaborative processes.

- Early and ongoing interactions between scientists and users of scientific information improve the effectiveness of such interactions.

- Public-input approaches may be most useful in addressing complex problems and communities of interest, whereas public-engagement approaches may be more valuable for "wicked" problems that affect communities of place.

- Four factors influence individual trust: (a) a general willingness to take risks, (b) responses to betrayal, (c) a sense of altruism, and (d) an assessment of the likelihood that others in a particular setting will act in a trustworthy fashion. Whereas the first three elements are relatively stable personal attributes, the fourth is subject to change and can be altered "quite readily by evidence."[401]

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[395] Ibid.
[396] Ibid.
[397] Ibid.
[398] Thomas, *Citizen, Customer, Partner*, 86.
[399] McGinnis, "Polycentric Governance."
[400] Leong et al., "Overcoming Jurisdictional Boundaries," 235.
[401] Henry and Dietz, "Information, Networks, and the Complexity of Trust," 192.

- Momentum for change often arises through the creativity of those within a situation who strive to modify patterns of interaction to address resource management problems. Such change also often requires a forward-looking reframing of the problem statement to open the door for new management concepts and the incorporation of broader value sets into decisionmaking.

- Collaborative and network governance—both formal and informal—must (a) provide accountability and flexibility; (b) be characterized by inclusivity in collaboration, accompanied by shared agreement on the processes and rules that will guide decisionmaking; (c) allow for ongoing learning; and (d) attend to the broader policy context and ensure that existing rules and authorities allow for and facilitate coordination.

- Significant empirical research affirms that early involvement of intended users may correlate with a greater linking of science to decisions after project completion. However, effectively structuring these interactions is challenging, and there has been a general "failure to see design and implementation of participatory processes as an explicit skill or discipline."[402]

- Relatively little empirical research has examined boundary organizations and their effectiveness, including their effectiveness in contributing to adaptive resource governance.

III. Broad Social, Cultural, and Political Settings

Cultural and social insights relate to the knowledge flows, information agents, perceptions, and values of broader publics. These matter because they describe shared or distinct languages, motivations, and paradigms that frame cultural conversations about conservation. Here, it is important to understand how different cultures frame conservation goals and interventions as a means to better harness intrinsic motivations and barriers to conservation messages. It is also important to experiment proactively with new ways to frame and communicate conservation goals. Relevant social and behavioral science disciplines include political science, social psychology and cognition, communications and marketing, and learning theory. Research on cultural cognition, strategic communication, and organizational and social learning provides insights potentially relevant to understanding how different cultural and social groups perceive and respond to concepts such as climate change or resource efficiency and natural resource preservation more generally. These responses affect behavior and willingness to participate in conservation endeavors. As has been emphasized throughout this report, how information is presented and framed; how it is communicated among "experts," decisionmakers, and "publics"; and how different audiences filter or process information based on presentation play a critical role in attitude formation and actions. When it comes to critical natural resource challenges and significant investments in both community and landscape conservation efforts around the globe, "communication can no longer remain a guessing game."[403]

A. The Policy Context—Insights from Economics

When hurdles to conservation arising from free riding, bargaining difficulties, and market barriers to conservation cannot be overcome through community action and corporate responsibility, another alternative is action through government—what we refer to here as the "policy context." An obvious way to promote conservation through public policy is to build support for conservation in the

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[402] Matso, "Integrating Natural and Social Sciences," 107.
[403] Nisbet, "Communicating Climate Change."

electorate, so that public officials give conservation prominence on their agendas. But even if that support exists, barriers can impede its translation into policy action.

Moving beyond voting, economists have raised concerns about the processes governments use to make specific policy determinations. Chief among these is the "capture theory," suggesting that policies will be biased toward concentrated interests rather than reflecting a choice taking all of the public's values into account. This may occur because concentrated interests have a greater ability to organize and generate political support that facilitates legislators or regulators remaining in office.[404]

As an illustration, imagine a policy choice about whether to preserve a wetland, and assume preservation is favored by a large majority of the public. Further suppose that preservation's proponents exceed opponents in number by 1 million, and that each voter would be willing to give up $5 to protect the wetland (implying that the social value of preservation is $5 million). However, suppose a small group of developers who oppose preservation are willing to pay $3 million to build on the wetland. The developers will find it relatively easy to organize and lobby on behalf of development because they are so few in number, whereas it will be much harder for the million conservationists to organize and coordinate. Because the wetland is worth only $5 to any one individual, they may choose to not get involved and free ride on the activism of others. Thus, it is not difficult to imagine the developers winning, despite the fact that development creates a net economic loss of $2 million.

Even if the policy process can, in principle, give equal weight to all interests, say via dispassionate cost–benefit analysis, measuring people's preferences—particularly their preferences for public goods—can be extremely difficult. In many conservation contexts, we cannot look to prices or behavior to determine how much a natural resource is worth to people. One can imagine people willing to spend tax dollars to ensure that areas like panda habitats or the Grand Canyon remain pollution-free, or more specifically, that areas such as Prince William Sound in Alaska or the Gulf of Mexico are protected from oil spills. However, in these cases, the people who value them may not leave a trail of evidence as to how much they value them—for example, if they don't actually visit these places, they do not incur expenses to travel to those places that gives some indication of their willingness to pay to enjoy those places.

If we want to incorporate these conservation values into public choices, it can be useful to translate them into a willingness-to-pay number, but getting that number requires surveys. These surveys, known as "contingent valuation" or "stated preference" surveys, require care in their administration. Such surveys start from the premise that if people do not have to put their money where their mouths are, what they say may not be connected to how much something is really worth to them.[405] This challenge leads to a number of difficulties where the estimates can vary significantly, and potentially inconsistently, depending on how questions are framed.[406]

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[404] Mancur Olson, *The Logic of Collective Action: Public Goods and the Theory of Groups* (Cambridge, MA: Harvard University Press, 1965); George Stigler, "The Theory of Economic Regulation," *Bell Journal of Economics and Management Science* 2 (1971): 3–21; and Sam Peltzman, "Toward a More General Theory of Regulation," *Journal of Law and Economics* 19 (1976): 211–240. The approach spawned by these works assumes that policymakers are like other agents, with an interest in their own political standing.

[405] For overviews of the methodological difficulties in applying these methods, see Raymond Kopp and V. Kerry Smith, eds., *Valuing Natural Assets: The Economics of Natural Resource Damage Assessment* (Washington, DC: RFF Press, 1995); and Richard Carson and W. Michael Hanemann, "Contingent Valuation," in *Handbook of Environmental Economics* no. 2, ed. K.-G. Mäler and J. R. Vincent (Amsterdam: Elsevier, 2005), 821–936.

[406] See also Shogren and Taylor, "On Behavioral–Environmental Economics," 29–30 (see note 176 and the text accompanying that note).

B. Communication and Social Marketing

"We live in an age characterized by attempts at mass persuasion."[407]

Based on 2007 statistics on daily individual advertising exposure (about 5,000 ad messages per day), the average American will be exposed to 14 million advertisements in his or her lifetime.[408] Given that 30 years ago, Americans took in around 2,000 ad messages per day, future exposure is likely to be even greater. In 2010, the 12 biggest spenders on advertising spent between $1.9 and $3.3 billion dollars each on ads, and that is during a recession. Collectively, companies in the United States devoted more than $130 billion to marketing in 2010.[409] But what percentage of the current marketing space is aimed at social and/or environmental benefits versus purely commercial marketing? Because the percentage is so small, it is difficult to find in-depth analyses of such advertising.

Based on estimates from the Federal Procurement Data System, the federal government spent less than $1 billion on "advertising" in FY 2010 and less than $750 million in FY 2011, but estimating government advertising expenditures is complicated by the absence of an agreed-upon definition by agencies of what constitutes advertising.[410] These expenditures go toward advertising job openings, military recruitment, competition for government contracts, and the sale of surplus government property in addition to promoting social services and public health messaging. The 2012 Congressional Research Service report, *Advertising by the Federal Government*,[411] does not provide any details on environment-specific messaging.

The Ad Council is the largest producer of public service announcements (PSAs)—messages that have the objective of raising awareness or changing "behaviors and attitudes on a social issue."[412] Leading national advertising agencies donate pro-bono time to help design and plan PSA campaigns, and government agencies and nonprofit organizations sponsor production and distribution costs. Currently, the media donates approximately $1.8 billion annually in print and airtime for PSAs. Again, no breakdown of environment-specific campaigns is available, but one simple observation is that investments in social marketing of environmental issues represent an extremely small percentage of overall marketing expenditures.

The entire annual operating budget of the nonprofit environmental organization, Natural Resources Defense Council (labeled "the most effective lobbying and litigating group on environmental issues" by *The Wall Street Journal*) is just over $100 million, and less than 10 percent of that amount is spent on "fundraising and member development"[413] that involves public outreach and marketing. Not only are financial resources for environmental marketing limited, but communicating and facilitating uptake of scientific information is difficult given that just 20 percent of US citizens are "scientifically literate," defined by the ability to read and understand science news in *The New York Times*.[414]

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[407] Aronson, *Social Animal*, 48.

[408] Louise Story, "Anywhere That the Eye Can See, It's Likely To See an Ad," *The New York Times*, January 15, 2007, http://www.nytimes.com/2007/01/15/business/media/15everywhere.html?pagewanted=all&_r=0.

[409] Kim Bhasin, "The 12 Companies That Spend the Most on Advertising," *Business Insider*, June 22, 2011, http://www.businessinsider.com/companies-that-spend-the-most-on-advertising-2011-6?op=1.

[410] Kevin Kozar, *Advertising by the Federal Government: An Overview* (Washington, DC: Congressional Research Service, 2012), http://www.fas.org/sgp/crs/misc/R41681.pdf.

[411] Ibid.

[412] "Frequently Asked Questions," The Ad Council, accessed June 25, 2013, http://www.adcouncil.org/About-Us/Frequently-Asked-Questions.

[413] "About Us, See for Yourself," Natural Resources Defense Council, accessed June 25, 2013, http://www.nrdc.org/about/.

[414] D. Ding, E. Maibach, X. Zhao, C. Roser-Renouf, and A. Leiserowitz, "Support for Climate Policy and Societal Action Are Linked to Perceptions about Scientific Agreement," *Nature Climate Change* 1 (2011): 462–466.

Similarly, a 2009 survey by the California Academy of Sciences found that "more than two-thirds of Americans don't clearly understand science or the scientific process, and fewer are able to pass even a basic scientific literacy test."[415] Nonetheless, a growing body of research is available on how people process and internalize information, methods to engage audiences (including on scientific or technical topics), and how to address or circumvent belief in misinformation.

B-1. Selective Exposure and Trust in Information

Messages that are consistent with a person's worldview are processed more fluently than inconsistent messages. The proliferation of media and information sources has enabled people to selectively seek out like-minded channels, shows, news sources, and blogs. The emergence of the Internet, in particular, has facilitated an information landscape of echo chambers—news and opinion sources that link primarily to sources with similar viewpoints. These "cyber ghettoes" have been linked to the increasing polarization of political discourse.[416] When people are exposed to arguments that challenge their beliefs, they may actively avoid those arguments, particularly if they begin to create doubt. "Thus, the very people you most want to convince, and whose opinions might be the most susceptible to change, are the ones least likely to continue to expose themselves to a communication designed for that purpose."[417]

One critical element in such communications is the perceived credibility of the communicator. The opinions of trusted sources provide a shortcut for making judgments about complex issues. Messages from unknown or untrusted communicators, on the other hand, can be more easily dismissed. This raises the question of how to generate or facilitate trust. As Henry and Dietz point out, "[m]ost research on trust concerns trust in actions, whereas many sustainability challenges also involve trust in information."[418]

> Individual perceptions of environmental and technological risk are strongly influenced by trust in the institutions and organizations that manage that risk .... But most citizens have little direct interactions with [these] organizations .... As a result, they must establish their level of trust based on other cues and indirect sources of information such as the media where the troubled dynamics of trust in information comes into play. This makes trust in abstract groups something that can be manipulated ....[419]

Many social or environmental regulations (e.g., bans on DDT, smoking, emissions of nitrogen oxides and sulfur oxides that cause acid rain, and ozone-depleting substances) have overcome opposition and information campaigns arguing that the science wasn't settled, albeit often after protracted and expensive battles.[420] Policy discussions and public communications on climate change remain entrenched in the same discourse, with opposition being led and funded by many of the same groups that resisted earlier public health and environmental regulations.[421] One approach that has been used to misconstrue scientific consensus is to take advantage of the media tendency to portray perspectives using a "balance frame," even when one viewpoint might lack credibility or represent a fringe opinion. Research has shown that mass media make certain issues and concepts readily

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[415] Andrew Hoffman, "Climate Science as Culture War," *Stanford Social Innovation Review* 19 (2012).

[416] Lewandowsky et al., "Misinformation and Its Correction."

[417] Aronson, *Social Animal*, 86.

[418] Henry and Dietz, "Information, Networks, and the Complexity of Trust," 191.

[419] Ibid., 199.

[420] Naomi Oreskes and Erik Conway, *Merchants of Doubt: How a Handful of Scientists Obscured the Truth on Issues from Tobacco Smoke to Global Warming* (New York: Bloomsbury Press, 2010).

[421] Ibid.

accessible (and give little or no coverage to others), thereby setting the public's political and social agenda.[422] Charlton McIlwain studied the quadrupling of media coverage and emphasis on immigration in 2005 over the 2000–2004 baseline and established a clear link between media influence and public priorities and, in turn, passage of legislation.[423] McIlwain describes this cyclical process as rhetoric, framing the public agenda, and framing the policy agenda, or the "three Ps" – press, public, and politicians.

Several studies have shown that how well informed the public is on any given issue varies dramatically based on the preferred news type or source.[424] In some cases, it is not the source of the news that matters, but simply the familiarity or repetition of a message that can create perceived social consensus. In a 2007 study, Kimberlee Weaver and colleagues exposed participants to multiple versions of the same statement from the same source. When the participants were later asked to estimate how widely shared the stated belief was, they estimated greater consensus the more often they had read the identical statement from the same source.[425] "In a very real sense, a single repetitive voice can sound like a chorus."[426] Strong adherence to misinformation can be more problematic than lack of knowledge; when individuals do not feel knowledgeable about a topic, they typically fall back on heuristics and often lack conviction, whereas beliefs based on misinformation can be strongly held and possibly infectious within a network.

B-2. Challenging Misinformation

Stories people recognize as fiction can cause illusory beliefs of prior knowledge. For example, in a 2003 study, participants were given a set of clearly fictitious stories to read. The researchers showed that when participants later responded to a series of quiz questions, they relied on misinformation from the stories, despite the fact that it contradicted common knowledge. The respondents were aware that their answers were based on information from the stories, but reading the stories had subconsciously caused many to believe they had previously acquired similar knowledge.[427] Related to this, public awareness of politically motivated misinformation does not prevent such misinformation from creating widespread confusion, as many people are unable to differentiate "false" from "true." It is difficult to build widespread awareness about misinformation and demand for change when government agents withhold or misrepresent scientific findings and special interests fund research with results favorable to their interests. For instance, the National Aeronautics and Space Administration's Inspector General found that in 2007 the agency's Office of Public Affairs intentionally reduced, marginalized, or mischaracterized climate change science released to the

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[422] Aronson, *Social Animal*.

[423] Charles McIlwain and Stephen Caliendo, *Race Appeal: How Candidates Invoke Race in US Political Campaigns* (Philadelphia: Temple University Press, 2011).

[424] Farleigh Dickinson University PublicMind Poll, "What You Know Depends on What You Watch: Current Events Knowledge across Popular News Sources," news release, May 3, 2012, http://publicmind.fdu.edu/2012/confirmed/; Farleigh Dickinson University PublicMind Poll, "Some News Leaves People Knowing Less," news release, November, 21, 2011, http://publicmind.fdu.edu/2011/knowless/; J. Curran, S. Iyengar, A. Brink Lund, I. Salovaara-Moring, "Media System, Public Knowledge, and Democracy: A Comparative Study," *European Journal of Communication* 24, no. 1 (2009): 5–26; and S. Kull, C. Ramsay, A. Stephens, S. Weber, E. Lewis, and J. Hadfield, *Americans on Iraq: Three Years On* (Washington, DC: Program on International Policy Attitudes; Menlo Park, CA: Knowledge Networks, 2006).

[425] Lewandowsky et al., "Misinformation and Its Correction," (referencing Weaver et al. 2007).

[426] Ibid., 113.

[427] Lewandowsky et al., "Misinformation and Its Correction," (referencing Marsh, Meade, and Roediger 2003).

general public,[428] but such findings have not received nearly as much media attention as the provocative "ClimateGate" event.[429] Within this context, it is important to understand the cognitive variables that can make information "stick."

One such variable is the power of a good story. The content of a message is often more memorable than its source, and an engaging story sticks in people's minds long after the source (even an untrustworthy source) has been forgotten. In addition, as people process a story and judge coherence, they give advantage to material that is easy to process. "People assess the logical compatibility of the information with other facts and beliefs. Once a new piece of knowledge-consistent information has been accepted, it is highly resistant to change, and the more so the larger the compatible knowledge base is."[430] The increasingly fractured media and message landscape has a tendency to reinforce particular worldviews, with implications for the retention of misinformation.

Attempts to de-bias or correct misinformation are much more difficult if the new message challenges the audience's worldview. These messages can backfire and cause people to adhere more tightly to worldview-consistent information. In these cases, one observes a motivated skepticism in which people accept worldview-consistent arguments but are highly skeptical of opposing information. "Munro (2010) has shown that exposure to belief-threatening scientific evidence can lead people to discount the scientific method itself: people would rather believe that an issue cannot be resolved scientifically, thus discounting the evidence, than accept scientific evidence in opposition to their beliefs."[431] The same has been found for risk perception or "cultural cognition of risk."

One approach to challenging misinformation and other information errors is the use of retractions. However, retractions can be ineffective in fighting misinformation. One problem is that retractions often involve the restatement of the misinformation, which can continue to reinforce the misinformation "even when people acknowledge and demonstrably remember the retraction."[432] "Myth busters" research has found that by repeating a false statement in an effort to refute it, the false belief can be reinforced because the repetition increases the familiarity of the misinformation.[433] Moreover, social psychology research also shows that the less informed the audience, the more likely that presenting opposing aspects of an argument will confuse them.[434]

Researchers have identified three strategies that can increase the effectiveness of countering misinformation: (a) "warnings" that coincide with exposure to misinformation (b) repetition of a retraction or correction without repeating the misinformation, and (c) corrections that tell an alternative story that can fill the "coherence gap" otherwise left when a belief is called into question.[435] All of these can be difficult to implement in practice. For example, the first strategy requires an upfront warning that the information about to be presented may be misleading, paired with an explanation about the ongoing effects of misinformation (it is not enough to merely mention that misinformation may be present). Such an approach can be useful for deliberative bodies. Warnings can be effective

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[428] National Aeronautics and Space Administration, Office of Inspector General, "NASA OIG: Investigative Summary Regarding Allegations that NASA Suppressed Climate Change Science and Denied Media Access to Dr. James E. Hansen," *SpaceRef*, June 2, 2008, http://www.spaceref.com/news/viewsr.html?pid=28174.

[429] Jason Linkins, "'Climategate' Debunking Gets Less Coverage Than Original Trumped-Up Scandal," *Huffington Post Media*, July 12, 2010, http://www.huffingtonpost.com/2010/07/12/climategate-debunking-get_n_642980.html.

[430] Lewandowsky et al., "Misinformation and Its Correction," 112.

[431] Lewandowsky et al., "Misinformation and Its Correction," 119, (referencing Munro 2010).

[432] Ibid., 114.

[433] Maibach et al., "Communication and Marketing."

[434] Aronson, *Social Animal*.

[435] Lewandowsky et al., "Misinformation and Its Correction."

because they can induce a state of skepticism, which stimulates more careful consideration and analysis of new information. Priming people to be distrustful also enhances creativity in certain circumstances.[436] Repeated retractions and alternative explanations (leaving out the original misinformation) is often the least effective of the three strategies, as repetition of misinformation is more strongly encoded than repetition of retractions. The last strategy—correction via delivery of an alternative story—is the most effective. This approach requires the integration of a correction within a story that conveys (a) information about the original source of information, (b) an explanation of why the information is incorrect and why it was originally thought to be correct, and (c) an explanation of motivations behind the incorrect report.[437] Ideally, this is all done in a simple way because, as noted earlier, simpler explanations are more likely to induce a shift away from misinformation. Complex arguments and stories can cause people to fall back on existing beliefs.

B-3. Values and Risk Perceptions

Dan Kahan and colleagues define the cultural cognition of risk as "the tendency of individuals to form risk perceptions that are congenial to their values,"[438] which can lead to differing interpretations of scientific information based on differing worldviews. "The cultural cognition thesis predicts that individuals will more readily recall instances of experts taking the position that is consistent with their cultural predisposition than ones taking positions inconsistent with it …. [As] a result, information sources who share their worldviews will be overrepresented in individuals' mental inventories of experts."[439] In a 2010 study, Kahan and colleagues measured subjects' cultural values and used the results to characterize their worldviews along two dimensions—primarily hierarchical and individualistic (HI) versus egalitarian and communitarian (EC)—and then examined how these worldviews influenced the interpretation of "expert" opinions on climate change, nuclear power, and gun control. Some researchers have found this "worldview" approach to be empirically and conceptually problematic,[440] but, nonetheless, such studies have yielded some notable findings.

Subjects first read a series of risk-related statements on each of the issues; they were then asked about their perceptions of the scientific consensus around the issues. Subjects identified as "EC" were respectively 57 percent and 59 percent more likely to perceive that "most expert scientists agree" that "global temperatures are increasing" and that "human activity is causing global warming."[441] The results for nuclear waste disposal maintained the pattern but were far less dramatic, which the authors attributed to the relatively infrequent political discourse on the topic in recent years.

The subjects were then presented with information about a number of fictional authors and excerpts from their books on the risks of climate change, nuclear power generation, and laws permitting citizens to carry concealed handguns in public. Each of the "experts" argued that the issues presented either a "high" or "low" risk to society, and these positions enabled the subjects to deduce their worldviews, which, in turn, dramatically affected the groups' perception of the experts' trustworthiness. The largest disparity arose around the climate change issue. The researchers found that 88 percent of ECs but only 23 percent of HIs indicated that the depicted author was "trustworthy and knowledgeable" (slightly, moderately, or strongly) when supporting a "high-risk" position. This reversed to 86 percent agreement among HIs that the author was an expert when supporting the "low-

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[436] Ibid.

[437] Ibid.

[438] D. Kahan, H. Jenkins-Smith, and D. Braman, "Cultural Cognition of Scientific Consensus," *Journal of Risk Research* 14 (2011): 147.

[439] Ibid., 148.

[440] Stern, "Human–Environment Interactions."

[441] Kahan et al., "Cultural Cognition," 159.

risk" position, whereas the proportion of ECs who saw this author as a trustworthy expert dropped to 47 percent.[442] To overcome the effect of worldviews, the authors emphasize that "communicators must attend to the cultural meaning as well as the scientific content of information."[443]

B-4. Worldviews and De-biasing

The above findings on the processing of misinformation and risk perception lead to recommendations for communicators attempting to better align expert and lay perceptions of risk. Identity- or self-affirmation can be critical; that is, one should present new or corrective information in a way that supports or is consistent with a conclusion that affirms the audience's worldview. For example, self-affirmation has been shown to better enable people with a strong personal connection to a brand to process negative information about it (by separating their evaluation of the brand from their own self-esteem).[444] This observation underscores the need to tailor messages to specific audiences. "By crafting messages to evoke narrative templates that are culturally congenial to target audiences, risk communicators can help to assure that the content of the information they are imparting receives considered attention across diverse cultural groups."[445]

Even simple changes in wording can make the difference between audience members hearing a message and remaining open, or shutting down. For example, during the earlier referenced presentation at the Environmental Defense Fund's 2012 Science Day, Drew Westen provided the following juxtaposition of word choices on the same topics:

- "Unemployed" vs. "People who've lost their jobs" (makes the message more personal and relatable)

- "Entitlement" (for many people this word activates negative thoughts on "handouts") vs. "Insurance we pay for through taxes" (easier for people to understand and accept)

- "Global warming" vs. "Extreme weather" (focus on what people can see with their own eyes)

- "Environmental justice" vs. "Justice" (this concept tends to be better received without a qualifier)[446]

Westen also emphasized the need to create a sense of common purpose—a sense of "we." Again, he juxtaposed a number of generic terms often used in the environmental arena that can evoke a range of mental images and responses with specific and relatable images that "bring the issue home," so to speak:

- "Environment" vs. "The air we breathe and the water our children drink"

- "Pollution" vs. "Pollution goes into our lungs and then into the environment"

- "Cap-and-trade" vs. "Penalties on polluters and rewards for good corporate citizens" (The majority of public approves of government stepping in to improve social services and stop pollution)[447]

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[442] Ibid., 162.

[443] Ibid., 169.

[444] Kahan et al., "Cultural Cognition"; Lewandowsky et al., "Misinformation and Its Correction."

[445] Kahan et al., "Cultural Cognition," 170.

[446] Drew Westen, "Shaping and Activating Voters' Neural Networks of Association" (presented at Environmental Defense Fund 2012 Science Day, New York, October 3, 2012).

[447] Ibid.

Messaging research also shows the utility of drawing attention to peers and experts who have adopted positions seemingly incongruent with their community's worldview—real or perceived (e.g., Christian coalitions to fight climate change). In one 2007 study, Kahan and his colleagues presented subjects with information for and against mandatory human papillomavirus vaccinations.[448] The initial expert opinions aligned with generalized worldviews—HIs against and ECs for—causing a similar polarization of subjects. But then the advocate arguments were reversed. When a hierarchical or individualist expert defended mandatory vaccination against an egalitarian or communitarian who opposed it ("unexpected alignment"), polarization shrank significantly.

> Clearly the cultural identity of advocates is an incredibly powerful mechanism—one that rivals the power that predispositions have on information processing …. When individuals see that even some persons who hold their values are willing to take such a position—to "vouch" for that position as acceptable for someone with their values to hold—they are less likely to form the subconscious impression that taking such a view will estrange them from their peers.[449]

Another finding is that media communications that rely on seemingly innocuous forms of engagement (e.g., using humor or stories that are not explicit attempts at influence) can have a more significant cumulative impact than direct efforts at education and persuasion. Non-explicit attempts at persuasion should "arouse little resistance, avoiding an inoculation effect and inhibiting the formation of counterarguments by distracting the audience. Most important, people will probably see them" instead of changing the channel or moving to the next article.[450]

If communication is direct, it may also be reasonable to engage in objective, non-emotional arguments ("nonviolent communication"). Studies of argumentation and rebuttal in science education have found that such types of communication often improve conceptual learning.[451] However, the role of emotion, racial or cultural differences, and social networks in processing of misinformation and evaluating risk needs further examination.[452]

B-5. Emotions and Making Things Personal

Expanding the conversation beyond attempts to cultivate new beliefs or shift perceptions, some basic rules of thumb for effective communication are often ignored, particularly by academic researchers. To again quote Drew Westen, the most effective communications often evoke emotion ("engage the gut and not just the head" and "if you don't feel it don't use it"); make interpersonal connections ("helping people to identify with other people activates the frontal cortex," the part of the brain linked to behavior and problem-solving); and incorporate engaging visuals ("visual cues activate emotional responses").[453]

In one study, social psychologists worked with home auditors to develop an engaging visual metaphor to get people to weather-proof their homes. Rather than simply pointing out cracks and holes and recommending weather stripping and insulation, auditors told homeowners that "if all the cracks around all the doors were added up, they would equal a hole the size of a basketball in your living room wall. If you had a hole that size in your wall, wouldn't you want to patch it up? That's what

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[448] D. Kahan, D. Braman, P. Slovic, J. Gastil, and G. Cohen, "The Second National Risk and Culture Study: Making Sense of—and Making Progress in—the American Culture War of Fact" (Yale Law School, Cultural Cognition Project, 2007).

[449] Ibid., 12.

[450] Aronson, *Social Animal*, 73.

[451] Lewandowsky et al., "Misinformation and Its Correction."

[452] Ibid.

[453] Westen, "Voters' Neural Networks of Association."

weather stripping does."[454] Use of the vivid visual metaphor increased implementation rates from 15 to 61 percent.

In a June 2012 TED Talk "Talk nerdy to me," Melissa Marshall, an outreach and communication advisor for scientists and engineers, shared her advice on how to make science interesting and engineering engaging, saying, "Science not communicated is science not done."[455] Marshall asserts that when developing science communication, the first question to ask is "so what?"—how do scientific findings relate to people's lives and wellbeing? Avoid jargon (e.g., "spatial" and "temporal" versus "space" and "time"), and liberally employ examples, stories, analogies, and visuals. Similarly, Drew Westen outlines "principles of effective messaging," emphasizing the importance of telling a "coherent, memorable story," using the example of climate change to illustrate the point:

- Start by connecting on common ground (e.g., temperatures and weather change all the time and always will);

- raise concerns (e.g., the 10 hottest years on record have occurred in the past 20 years, and 2012 was the hottest of all); and then

- end with hope (e.g., if we scale up currently available, cost-effective energy-saving technologies, we could significantly reduce emissions).[456]

Westen also argues that environmental messaging benefits from identifying a range of messages for advocates with a range of values for constituents and developing a set of "six-second pitches." For example:

- Our greatest natural resource is American ingenuity.

- Invest in clean energy and send money to Middle America and not just the Middle East.

- We can drill our way to China but all we'll see there are windmills.

- If you have to burn it, it isn't clean.

- Which do you prefer—clean, safe fuels of the 21st century or dirty, harmful energy of the 19th century? That's our choice.[457]

B-6. Scaling Up Social Marketing

> The consumer-oriented approach asks not "What is wrong with these people, why don't they understand?" but "What is wrong with us? What don't we understand about our target audience?"[458]

Systematic reviews of social marketing interventions have found that social marketing principles can be "effective across a range of behaviors, with a range of target groups, in different settings, and can influence policy and professional practice as well as individuals."[459] Although one complicating aspect of social marketing is the lack of a commonly accepted definition, it generally has four key

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[454] Aronson, *Social Animal*, 73.
[455] Melissa Marshall, "Talk Nerdy to Me" (TED talk, June 2012), http://www.ted.com/talks/melissa_marshall_talk_nerdy_to_me.html.
[456] Westen, "Voters' Neural Networks of Association."
[457] Ibid.
[458] M. Stead, R. Gordon, K. Angus, and L. McDermott, "A Systematic Review of Social Marketing Effectiveness," *Health Education* 107, no. 2 (2007): 33, http://oro.open.ac.uk/20470/2/Ross_et_al.pdf.
[459] Ibid., 2.

features: (a) it focuses on voluntary behavior change, (b) it invokes the principle of "exchange" (there is a clear benefit for the "customer" if change is to occur), (c) it uses commercial marketing strategies and techniques, and (d) it seeks a social or an environmental benefit or goal.

A 2007 study reviewed the effectiveness of 54 social marketing interventions and applied Andreasen's filter of six social marketing benchmarks to generate recommendations: [460]

- have a specific behavior change goal,

- use consumer research to inform the intervention,

- consider different segmentation variables and target interventions,

- demonstrate use of more than one element of the marketing mix,

- consider what would motivate people to engage voluntarily with the intervention and offer them something beneficial in return, and

- consider the appeal of competing behaviors and use strategies that seek to minimize this competition.

Standard types of advertising or other types of media communication are not generally considered "social marketing." The largest pool of social marketing applications have focused on public health concerns, such as smoking cessation, alcohol and illicit drug use prevention, and condom use and preventing sexually transmitted diseases. One criticism of social marketing with regard to environmental behavior change, and specifically climate change mitigation, is that relevant interventions to date have largely focused on narrow, small-scale behavior changes that may not add up to a significant mitigation impact[461] (though that criticism could be leveled at most climate mitigation approaches to date).

Many successful social marketing campaigns share a number of characteristics: they recognize the importance of extensive formative research; they are grounded in social cognition and social learning theories; they use multiple communications and outreach channels and strategies; and they involve monitoring, follow-up, and feedback.[462]

A few examples of both failed and successful interventions illustrate some of the challenges and opportunities of social marketing. The UK government sponsored an "Act on CO_2" campaign that promoted the adoption of lifestyle-consistent individual environmental behaviors. One component of the campaign was a TV advertisement, titled "Bedtime Stories," depicting a child being read a scary story about climate change that closed with a message that it is up to the viewer how the "story" of climate change ultimately ends. This "scary story" approach was poorly received by many parents, so it was pulled.[463] Another piece of the Act on CO_2 media campaign was a short film titled "Reflections," which emphasized that 40 percent of domestic emissions were linked to individual behaviors, and, in particular, that private car use was the single largest source of emissions, paired with a suggestion that viewers drive five fewer miles per week. Despite a significant capital investment, the campaign did not employ social psychology and cognition insights, failed to achieve its aims, and was broadly criticized. On the other hand, the Australian Department for Transport, Energy, and Infrastructure successfully used social marketing techniques—in concert with other interventions—to change behavior with its

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[460] Stead et al., "Social Marketing Effectiveness," 17–18 (quoting Andreasen 2002).

[461] A. Corner and Alex Randall, "Selling Climate Change: The Limitations of Social Marketing as a Strategy for Climate Change Public Engagement," *Global Environmental Change* 21 (2011): 1005–1014.

[462] Stead et al., "Social Marketing Effectiveness."

[463] Corner and Randall, "Selling Climate Change."

"Travelsmart" program, which aimed to reduce car use by a minimum of 10 percent in a suburban community of 100,000 households. Letters and door-to-door communication were used to introduce people to the program and solicit a commitment; personalized travel plans were developed that provided information about public transportation routes, fares, and stops as well as free maps and other "facilitative incentives;" and follow-up letters asked for feedback and offered assistance. This initiative tailored its approach to its audience and achieved a 14 percent reduction in car use over an 18-month period.[464]

Several evaluations and critiques of social marketing argue that, to maximize impact, campaigns should focus on building and supporting social capital and should work through existing social networks rather than appealing to private individuals.

With respect to "bigger than self" environmental and conservation issues, many argue that social marketing strategies should tap into "self-transcendent" values (i.e., benevolence, equality, and social justice) rather than "self-enhancing" values (i.e., materialism and status).[465] (We return to this argument in Part Four, the climate change communications case study.) According to Crompton, for example: "Unless [social marketing] techniques are employed in the service of values and frames that are conducive to solving bigger than self problems … their long-term efficacy is questionable."[466] This will require "deep framing"—building connections between communication strategies or public policies and deeper values or principles. Social marketing "must be anchored in the deeper notions of identity and citizenship if they are to have a meaningful influence on promoting a proportional response … widespread adoption of ambitious behavioral changes and the widespread acceptance of (or demand for) ambitious new policy interventions."[467] The most significant gains from social marketing may be realized by targeting networks, civil society organizations, and other broadly defined "communities." And, as Corner and Randall argue, social marketing alone is insufficient; to be truly effective, such social marketing must be integrated in multifaceted, multipronged approaches.[468]

Part Two: (III. A–B)—Broad Social, Cultural, and Political Settings: Summary of Key Findings

- "Capture theory" suggests that policies are often biased toward concentrated interests, rather than reflecting a choice taking broad public values into account, because concentrated interests often have a greater ability organize, lobby, and build political capital.

- Measuring people's preferences for public goods is often extremely difficult. Even if people have a value for gorilla habitat or air quality in the Grand Canyon, for example, they may not visit those places and incur travel expenses that provide an indication of their willingness to pay to enjoy those places.

- In a 2009 survey, the California Academy of Sciences found that "more than two-thirds of Americans don't clearly understand science or the scientific process, and fewer are able to pass even a basic scientific literacy test."[469]

- The proliferation of media and information sources has enabled people to selectively seek out like-minded channels, shows, news sources, and blogs. The emergence of the Internet, in

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[464] Ibid.

[465] Ibid., 1010–1011.

[466] Corner and Randall, "Selling Climate Change," 1011 (quoting Crompton 2010).

[467] Corner and Randall, "Selling Climate Change," 1012.

[468] Ibid.

[469] Andrew Hoffman, "Climate Science as Culture War."

particular, has facilitated an information landscape of echo chambers, which has been linked to the increasing polarization of political discourse.

- Messages from unknown or untrusted sources are more easily dismissed.

- Because most citizens have little direct interaction with the institutions or organizations that manage risk, they establish risk perceptions based on other cues and indirect sources of information, such as the media.

- The content of a message is often more memorable than its source, and an engaging story can stick in people's minds, even if it comes from an untrustworthy source.

- Attempts to de-bias or correct misinformation are much more difficult if the new message challenges the audience's worldview. These messages can cause people to adhere more tightly to worldview-consistent information.

- Three strategies can increase the effectiveness of countering misinformation: (a) "warnings" that coincide with exposure to misinformation, (b) repetition of a retraction or correction without repeating the misinformation, and (c) corrections that tell an alternative story that can fill the "coherence gap" otherwise left when a belief is called into question. The last strategy is the most effective.

- Individuals are more likely to recall instances of experts taking positions that are consistent with their cultural predisposition than ones taking positions inconsistent with it.

- When presenting new or corrective information, it is often critical to do it in a way that provides identity- or self-affirmation—that supports or is consistent with a conclusion that affirms the audience's worldview.

- The cultural identity of advocates is a powerful mechanism. If individuals see that a "leader" or public persona who holds their values takes a position outside the norm, they are less likely to be predisposed against that position.

- Systematic reviews of social marketing interventions have found that social marketing principles can be "effective across a range of behaviors, with a range of target groups, in different settings, and can influence policy and professional practice as well as individuals."[470]

- Many successful social marketing campaigns share a number of characteristics: they recognize the importance of extensive formative research; they are grounded in social cognition and social learning theories; they use multiple communications and outreach channels and strategies; and they involve monitoring, follow-up, and feedback.

- Social marketing campaigns should focus on building and supporting social capital and should work through existing social networks rather than appealing to private individuals. The most significant gains from social marketing may be realized by targeting networks, civil society organizations, and other broadly defined "communities."

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[470] Stead et al., "Social Marketing Effectiveness," 2.

Part Three: Case Example— Payment for Environmental Services on Working Lands

This section provides a detailed discussion of the origins and structure of a new payment for ecosystem services (PES) program in Florida. The objectives for this case example are to (a) describe and illustrate the design features of market-like incentive program and (b) illustrate how the basic principles of collaborative decisionmaking described above resulted in stakeholder agreement on the implementation of the market-like program.

I. Framing the Issue

In January 2011, the South Florida Water Management District (SFWMD) issued the first solicitation under its new Dispersed Water Management–Northern Everglades Payment for Environmental Services (NE-PES) Program. The program has market-like features designed to encourage private landowners—in this case cattle ranchers—to supply ecosystem services. The program, which took many years to develop and implement, involved collaboration among a wide variety of stakeholders.

> ### Market-Like Program Fundamentals
>
> Market-like programs combine decisionmaking flexibility with a financial incentive to reward innovative individual conservation actions; actions that in turn lead to desired environmental changes at larger scales (e.g., a watershed). Market-like programs involve the following fundamental features. First, they identify environmental services valued by buyers willing and able to pay for them. Second, because buyers want to purchase environmental results, not just conservation practices, they define performance goals and evaluate conservation practices in relation to those goals. Third, because they are designed to encourage innovation, they offer participants discretion in the practices undertaken to meet a performance goal. Fourth, a market-like program envisions mechanisms whereby buyers and sellers negotiate a price and then enter into contracts governing the terms and conditions under which payments will be made; payments are made after documentation of the quantity of the services produced.

The design process began with an ad hoc collaboration of ranchers and environmental groups, which evolved into the multiyear (2005–2011) Florida Ranchlands Environmental Services Project (FRESP).[471] FRESP was a collaborative process that began with four (and grew to eight) volunteer ranchers; staff experts from WWF and Resources for the Future (RFF); and representatives from the SFWMD, the Florida Department of Agriculture and Consumer Services (FDACS), the Florida Department of Environmental Protection (FDEP), and the USDA Natural Resources Conservation Service (NRCS). A technical support team included a wide range of disciplinary experts from the MacArthur Agro-Ecology Research Center and the University of Florida Institute of Food and Agricultural Sciences. Funding in excess of $7 million was secured for designing the NE-PES program.

In the initial years, ad hoc collaborators, and later the FRESP team, agreed on broad PES program principles meant to satisfy the different stakeholders and allow for an environmentally, socially, and financially effective program. Next, the broad principles were refined and program concepts tested as projects that could produce services were designed, permitted, constructed, and monitored on portions of eight participating ranches.

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[471] Further details on the region and on the Florida Ranchlands Environmental Services Project (FRESP), project photos, and other background materials can be found at www.fresp.org.

This case report describes the key features of a market-like program and illustrates how collaborative processes are needed and can lead to the acceptance and implementation of such a program. The case offers lessons for others designing market-like conservation programs.

II. The Setting

The Northern Everglades begins south of Orlando and includes the Kissimmee River, Lake Okeechobee, and adjacent coastal estuaries to the east and west (Figure 1). Beginning more than 100 years ago, public agencies and private landowners began to transform the land, building a vast ditch network. Today, the hydrologic regime of the more than 5 million–acre northern watershed, which is nearly flat with many seasonally flooded wetlands, is governed by hundreds of publicly managed flow-control structures and thousands of miles of canal and ditch networks on private land.

Figure 1. The Northern Everglades

This massive system drained the land, supported agricultural production, and, more recently, has accommodated a significant increase in human settlement. Today the pasture area (including improved and unimproved rangeland) is about 1 million acres. This pasture includes wetlands, woodlands, and other land uses, such as citrus groves. Therefore, the total area that can be defined as ranchland is more than 30 percent of the total watershed.

The hydrologic modifications and land use changes fragmented wildlife habitat and accelerated the movement of water and nutrients from working lands into marshes and lakes. The result has been an increase of nutrient loads into Lake Okeechobee and more extreme—and undesirable—water level fluctuations. When lake levels are high, nutrient-laden freshwater is pumped out of the lake through canals to the St. Lucie and Caloosahatchee estuaries, which are being harmed by the combination of excess freshwater and high nutrient concentrations. Over recent decades, an array of regulations; best management practice (BMP) cost-share programs; and public investments in regional reservoirs, aquifer storage, and recovery wells and stormwater treatment areas have been put in place to mitigate these adverse environmental changes.

It was against this backdrop that a disparate group of stakeholders came together, concluded that a complementary market-like PES approach was desired, and made the NE-PES a reality. Market-like program implementation requires thinking outside of existing policy frameworks and also requires collaborative problem-solving to find common ground among agencies, landowners, and environmental advocacy groups.

III. Converging Interests and the FRESP Process

The FRESP collaboration involved a primarily virtual (but at times physical) space where participants made decisions by consensus, worked to understand the interests and constraints of others, and trusted that all involved were committed to a PES program design that addressed all concerns.

A. Different Stakeholders—A Shared Interest

In the early 2000s, a staff expert from WWF recognized that large ranches north of Lake Okeechobee included extensive natural habitat for many common wildlife species, served as critical wildlife movement corridors, and supported habitat for several federally threatened and endangered species. These working ranchlands were mostly cow–calf operations that have a low per acre discharge of phosphorus (P) relative to most other land uses. However, cow–calf production has thin financial margins, and feeder cattle prices are volatile, as are prices for sod and citrus that is often produced on these same ranches. The result was ongoing pressure to convert ranches to more intensive agriculture or to urban development; such conversion would probably result in higher P loads and further aggravate the adverse hydrologic effects of drainage. The recognition of habitat values and limited water quality impacts led WWF staff and other Florida-based environmental organizations to conclude that cattle ranching was a "preferred land use."

In 2001, WWF began approaching ranchers with this understanding and found widespread concern about the future of the industry among the ranchers themselves. However, that same ranch community also believed that state regulatory agencies, abetted by "environmentalists," were ignorant of the pressures on the industry and had imposed or were likely to impose regulatory requirements that would further discourage continued ranching. WFF staff identified a small number of ranchers who were leaders in their community and began one-on-one conversations with those individuals. At the same time, WWF reached out to representatives of state agencies and found receptivity to the argument that cattle ranches were a preferred land use.

B. Building Trust and Finding Common Ground

A formal process was initiated when WWF and the six ranchers convened an ad hoc group to identify opportunities for increasing the financial returns to ranchland owners, with the goal of

"keeping ranchers ranching." At that time, the PES concept was only one among many options discussed for improving the financial position of the industry. It was that ad hoc process that identified the possibility that a state or federal agency might pay cattle ranchers to change on-ranch water management as a way to complement other restoration programs. Not only would the changed water management help reverse the adverse effects of past hydrologic changes, but water retention was widely recognized as the most effective way to reduce P pollution from land runoff.

In fact, cattle ranching demands active and sophisticated water management, so ranches in the area had already made large investments in drainage infrastructure. What was needed, all agreed, was an incentive program that would reward ranchers if they chose to retain the water as opposed to discharging water to the drainage network. The group discussed and agreed that a switch from "drain to retain" could be technologically accomplished with what the work group defined as water management alternatives (WMAs). However, all also agreed that retaining water (especially allowing some flooding of areas of pasture) might diminish pasture productivity, cattle production, and already low cattle revenues. It was for this reason that water retention was an optional rather than required BMP under the state regulatory programs then in place.

C. New Participants and the Basic Vision

The question then became: How could ranchers be motivated to retain water and, hence, also reduce P load, above and beyond state regulatory requirements? For this reason, state agencies—FDEP, FDACS, and SFWMD—were approached by WWF staff and engaged with the ad hoc group. Indeed, state agency staff at SFWMD and FDACS had long understood that changes in the way water is managed on private ranchlands could yield hydrologic restoration and water quality benefits. However, the changes in water management had to allow for profitable cattle, sod, and citrus production or offer compensation for lost profits.

The ranchers were not interested in selling their land so that more water could be retained. At the same time, the agencies faced limited budgets and limited staff for land management that made them willing to consider alternatives to land acquisition. The ranchers were interested in alternatives to existing easement programs that restricted use of the land for agricultural production, took land out of production, or prevented sale for development.

The preferred concept was to have agencies enter into time-limited contracts with ranchers who would agree to provide water services in return for a payment. The agency staff expressed support for such a program, but only if changes in P load reduction and water management were above and beyond what was expected to result from the BMPs under the existing regulatory programs.

D. Building a Credible Analytical Case

As part of the ongoing dialogue, the underlying assumption was that the buyer of services would be one of the state agencies—even though no commitment was made. However, the agencies clearly stated that they would be willing to pay for the services only if on-ranch water management was a cost-effective complement to the region's large reservoir and stormwater treatment projects. Clearly, the ranchers and the agencies needed a more certain analytical foundation for assessing the feasibility and relative costs of on-ranch water retention. For this reason, the ad hoc group used funds from the Kellogg Foundation to conduct a proof-of-concept study for a PES program. Staff experts from WWF and RFF managed the study, and these individuals later became project directors for FRESP.

The analysis itself was completed by technical specialists who were trusted by all of the stakeholders. A consulting engineer who had designed water management projects for the agencies as

well as for ranchers was engaged to work with ranchers in the design of hypothetical WMAs for a variety of ranch circumstances. The same contractor also estimated the effectiveness of on-ranch water management in reducing P loads and changing runoff volume at the ranch scale. At the same time, a nationally recognized ranch finance economist was employed to prepare-specific estimates of payments that would allow ranchers to recover costs, including compensation for production risk. Finally, the lead economist for the SFWMD worked with a well-regarded consulting firm to estimate the incremental cost and effectiveness of large regional P load reduction and water storage projects for comparison with on-ranch water management. Throughout the study, highly placed staff in FDEP, FDACS, and SFWMD, as well as the ranchers, served as reviewers of the work and as sounding boards for PES design ideas. As a result, when the final analysis concluded that on-ranch water management could be cost-effective, the results were deemed credible and were accepted by all stakeholders.[472]

E. Identifying Barriers and Challenges

The assessment also identified a daunting list of program design challenges that would need to be addressed—some typical of PES schemes in general, and some specific to the Florida situation. The ranchers' principal concerns were: (a) how potential adverse effects on ranch cattle production could be recognized and compensated and (b) whether their land and water management practices could be returned to pre-contract conditions when their contracts were over, even if implementation of the WMA resulted in an increase in endangered species habitat or expanded wetland footprint on the WMA site. The agencies expressed their understanding of these concerns and committed to addressing them.

The agencies were adamant that they would not make payments unless the payment was a demonstrably cost-effective use of public funds, and, as noted above, any payment had to be for improvements above and beyond what would be secured under existing regulatory requirements. The ranchers expressed their understanding of these agency interests.

The leaders of what would become FRESP from WWF and RFF made the argument that a market-like system was the best way to meet the interests of both the agency-buyer and the rancher-seller. The following market-like fundamentals became the foundation for the agreement to engage in FRESP and work toward what became the NE-PES.

- Environmental services are a commodity that can be produced on working ranches but, like any commodity, will be produced only if the rancher-sellers realize an increase in ranch profitability from sale of the services. Ranchers would be the ones to choose the level of services to produce and how to produce them, in consideration of the effect on the returns from other ranch enterprises and the expected profit.

- A government agency might become a buyer of services but would have the discretion to choose what ranches to buy from based on its own assessment of service potential offered by competing sellers.

- The agency-buyer and rancher-seller would enter into a limited term contract for the provision of a service, defined in terms of an environmental outcome, not as the construction or implementation of a conservation practice. Payments would be made only if rancher-sellers provided documentation that such a service was provided.

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[472] The final report can be found at www.fresp.org.

The need to address these design challenges demanded a process where representatives of the rancher community, agencies of the state of Florida, and the environmental community could openly discuss and come to agreement on each of the PES design elements. Further design and exploration was to be completed through a collaborative effort that ultimately became FRESP.

IV. FRESP Is Created

The trust engendered by the ad hoc committee process led to successful grant applications.[473] With the funds in hand, FRESP became an active collaboration among Florida agencies, USDA, NRCS, WWF, RFF, the MacArthur Agro-Ecology Research Center, the University of Florida and, most significantly, ranchers. The FRESP collaboration was formally launched in 2005 after most of the relevant parties signed a memorandum of understanding (MOU) agreeing to work together to design a PES program.

What was understood by the signatories, although not explicit in the MOU, was that FRESP would be an iterative process of dialogue, learning, and advocacy organized around designing, implementing, and operating eight pilot projects.[474] The pilots served as a laboratory for water management and measurement technology development and testing; they also created the specific examples for reaching a shared understanding about the interests of rancher-sellers and agency-buyers.

A. The FRESP Vision

By 2008, the FRESP collaboration developed a concise PES vision statement to accommodate and reconcile the different interests in the collaboration and the agreement on market-like program design principles. The vision was used in numerous presentations that were made to build support in the Florida legislature and among the senior leadership in the Florida agencies.

> Owners of working ranch lands, relying on modification to existing water management structures and strategies, will enter into fixed term contracts to provide documented water related environmental services, above and beyond regulatory requirements, creating a new profit center for ranch enterprises.

Accompanying the vision was agreement on a market-like design for the program, even though many details still needed to be resolved.

1. The agency-buyer would request proposals to retain water and/or P. The request would specify all relevant contract details (e.g., eligibility requirements, documentation requirements, method for estimating potential services, and contract exit and renegotiation clauses).

2. Ranchers who were in compliance with existing water quality program requirements would be eligible to submit a proposal to compete for available funding. The application packet would include an assessment of their sites' potential to provide the services and a requested up-front and annual payment.

3. The agency-buyers would make a selection among applicants using criteria including, but not limited to, an estimate of volume of water that could be retained and P retention potential using tools provided by the agency, the requested level of payments, and the proposed ways in which the service provision would be documented.

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[473] All partners signed on to a US Department of Agriculture Conservation Innovation Grant application, and the South Florida Water Management District agreed to provide cash and in-kind cost share as required by the grant.

[474] FRESP used a large portion of the funds to install water management alternatives on the ranches and to collect and manage hydrologic and water quality data from each site.

4. With a signed contract in hand, the rancher would implement any construction or other land and water management actions needed to provide the services. At the time of construction, documentation equipment would be put in place.

5. Payments would be made on an annual basis if documentation showed that the obligations were met and services were provided.

6. At the end of the contract period, the WMA could be shut down according to rules specified in the contract, or the contract could be renegotiated if both the agency and the ranchers agreed to an extension.

B. Addressing the Design Challenges

Participants in the FRESP collaboration were able to agree on these program fundamentals. Nonetheless, many design challenges remained to be resolved before the January 11, 2011, solicitation could be issued.

Specify Eligible Sellers: The collaboration had to define which ranchers, with which ranchlands, would be eligible to sell water retention and water quality improvement services. Three concerns had to be addressed. First, WMAs would be implemented on parcels within a ranch with parcel boundaries delineated by catchment area (an area where water drains by gravity or is pumped to an identifiable outlet). Because many ranches are spread over several thousand acres, any ranch might include several catchments where a WMA could be implemented. Within the catchments, current and past land uses could vary across the ranch, with some areas being citrus land, other areas plated for sod and vegetables, and others maintained as native and improved pasture and woodlands. The concern of the partners was that retaining water on some lands might suspend, and then release, certain agricultural chemicals used in sod, citrus, and vegetable production into state waters. Therefore, in catchments with that land use history, soil chemical analysis tests would be required before lands could be eligible for a WMA. However, such tests were expensive and often inconclusive. Therefore, the partners decided that only pasture and wetland areas within a ranch dedicated to cow–calf (cattle) production could offer environmental services, limiting the number of eligible parcels.

Second, collaboration participants agreed to a limitation based on geography. Specifically, with the focus of concern on areas north of the lake (what has come to be called the Northern Everglades), only certain ranchlands within the areas shown in Figure 1 would be eligible for payments to provide water services.

Third, a key concern of the buyer and, by extension, the taxpayer, was that program applicants be in compliance with all relevant regulatory requirements; thus, the services being paid for would need to be "above and beyond" those requirements. In summary, to be eligible to respond to the solicitation for the NE-PES program, a landowner must:

- have lands classified as ranchlands and be engaged in the production of beef cattle;

- be located within the Northern Everglades;

- have enrolled the ranchlands containing the proposed WMA(s) in the FDACS BMP program, or be in the process of enrolling the lands, by the date of the solicitation release; and

- be in compliance with SFWMD rules and regulations and federal wetlands regulations with regard to all of the lands in their ownership.

Define Environmental Services in Relation to the Buyer: Most landscapes have the potential to provide multiple environmental services, but buyers who are willing and able to pay for those services must be identified. Once they are identified, the buyer's particular interests influence the service's definition. In practice, defining the service requires an iterative process to balance what the buyer wants, what service providers are willing and able provide, and how the service can be documented credibly and cost-effectively.

The FRESP collaboration was able to identify three services: habitat protection and restoration, water quality improvement for Lake Okeechobee, and dampening of the fluctuations in Lake Okeechobee levels. Several federal and state agencies participated in the collaboration or were identified as possible buyers of these services. The buyer that emerged from the process was the SFWMD.[475] The FWS programs had reliable funding, but the funds were for the purchase of easements or fee-simple purchase of land to create wildlife reserves. The US Army Corps of Engineers and USDA had access to significant funding, but their programs were not designed to make payments to individual ranches for documented services in a market-like program. The SFWMD, the agency of the state of Florida responsible for improving water quality, maintaining flood control and water supply, and Everglades' restoration, was the logical buyer because of its dual missions of water quality and quantity, combined with ad valorem taxing authority and discretionary budget authority to create a new program. However, the SFWMD agency mission did not extend to habitat restoration, even though its regulatory programs did take adverse effects on habitat into consideration when evaluating permits to make changes to land and water management on private lands.

Hence, only two of the three services became the focus of PES program design. Depending on site characteristics, some ranchers would be paid for P removed from off-ranch water that was pumped onto the ranch, retained for a period required to remove and sequester P, and then discharged back into the public waterways. Other ranchers would be paid based on the amount of stormwater retained on their lands. Water retention—that is, water kept in rehydrated wetlands, ditches, and the soil profile to either evaporate or seep through the groundwater system—could be provided on a ranch with berms, pumps, culverts with riser structures, or combinations of all of these. Projects that retain water would be designed to ensure that they also removed P from stormwater.

Calculating Services above a Baseline for Contracting: Both the agency-buyer and the rancher-sellers rejected the use of contracts where the annual payment would vary with the weather (rainfall and runoff). Instead, the mutual preference was to establish contracts that would set a fixed annual service payment, a preference that had a significant effect on the program's contracts. The FRESP collaborators agreed that contracts would be based on model predictions of average annual water retention or nutrient removal service expected during a 10-year rainfall period of record. Although the payment would be fixed annually—and thus, in any one year a rancher might fall short of or exceed the service level commitment—over the life of the 10-year contract, the average service level would be provided.

Because of the tight relationship between the modeled estimate of the service and the payment, the collaborators agreed that model predictions would have to be based on site-specific conditions

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[475] There was no expectation that a private buyer would pay for the water services that ranch land could provide because those services accrued to society at large rather than being appropriable to any individual private entity. On the other hand, many of the ranches were selling exclusive hunting leases to private entities, which often worked with the rancher to improve habitat for recreational species. Early in the discussion, the creation of mitigation banks to sell habitat and wetlands offsets was explored. But because banks have a small footprint and are focused on habitat conditions, they would not address the watershed-scale goals for water quality improvement and hydrologic modifications in the Everglades watershed.

(e.g., size, soils, vegetation, topography, and existing and proposed water management infrastructure). The partners also agreed that every applicant would use the same model for estimating services. The collaborators then confronted the question of which models to propose for that common calculation. After deliberation and review of the available models, they concluded that all of the available models were either too complicated to run or were too data demanding to be used in a market-based solicitation. As a result, the collaborators hired consultants and engaged agency staff to prepare new models designed to compute average annual water retention and average annual P removal over a 10-year period of rainfall.[476]

As noted earlier, at the outset of the collaboration, a key concern expressed by the agencies (the buyer)—and, by extension, the taxpayer—was that services being paid for would be above and beyond existing requirements. Accordingly, an operational process and tool for calculating baseline environmental services was developed by the buyer and presented to the collaboration for approval. Using the tool, only above-baseline services would be credited for payment.[477]

Documentation for Payment: Programs that pay for performance need to define "service performance" in such a way that it is measurable. Also, because buyers have an interest in knowing that they are "getting what they paid for," and because no tangible commodity is produced (a pound of oranges or a steer at the market, for example), documentation of service level, and its certainty, became an important topic for the collaboration—so important that the partners established a documentation team tasked with finding cost-effective ways to measure the services provided by the rancher-sellers.

The FRESP collaborators agreed that documentation should be inexpensive and credible to both the buyer and the seller. All agreed that the benefits of more measurements (from greater accuracy and higher precision) needed to be evaluated in relation to the increased cost of collecting, analyzing, and managing additional data. To make this benefit–cost comparison, FRESP invested in extensive flow monitoring, automated water sampling, groundwater wells, vegetation transects, water chemical analysis, and soil analysis at the pilot sites. This investment allowed the documentation team to analyze the costs of collecting and assessing the data streams from this extensive measurement. The team was able to consider the loss of accuracy and precision if fewer data were available, relative to the heavily instrumented alternative. In this way, a balance between the costs of documentation and the benefits of additional service measurements was found.

In the end, the collaboration agreed to the following documentation requirements as the basis for payment. First, monthly site visits would be conducted by a third-party agent who would verify site conditions and collect a report from the rancher providing documentation that the operation and maintenance of the WMA was as specified in the contract. In addition, for the water retention service, the daily surface water stage would be measured and related to pump and rainfall records to determine whether the stage inside the WMA varies logically with rainfall and pumped water inputs (i.e., whether the water was being retained). For nutrient removal WMAs, the pump records would be able to show whether the pumps were running as required when the canal reached stages that, as specified in the contract, were supposed to trigger pump operations. Note that the documentation focused on verification of contract compliance and not on measuring the services provided in any year.

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[476] The time and resources it took to develop these program models was an unanticipated cost and delay in the development of the program.

[477] Furthermore, as a result of participation in the Northern Everglades Payment for Environmental Services program, the water retention baseline established will be permanently maintained postcontract.

Establishing the Payment: From the outset, the partners recognized that setting the payment for water management services was a critical issue. However, they also recognized that the payment system would depend upon how the services were defined and how the contracts were structured. As a result, the payment discussion remained at a conceptual level in the early years of the collaboration as other matters were resolved. The delay in fact had an advantage as, over time, the buyers and sellers were able to come to a better appreciation of each other's perspectives on payment.

The buyers stressed that the payment would have to be competitive with the cost of alternative ways in which they could secure the service, typically through large-scale regional projects. However, other nonfinancial considerations affected their willingness to pay, such as the following: WMAs could be put in place quickly, but the services they generated would not be permanent; WMA service levels would be less certain than those of public projects; and the administrative costs of monitoring a large number of dispersed water management contracts would be high. FRESP addressed each of these concerns in the contract design so that the agency would be more willing to pay for on-ranch services. However, the buyer was never able to define in advance what its willingness to pay might be.

The sellers emphasized the need to recover out-of-pocket costs and earn some margin above those costs to compensate them for increased managerial costs and risk to cattle production. What became evident was that, for the sellers, it was not a simple bottom-line cash calculation that established the minimum payment they might accept. Different ranchers had different accounting perspectives on what they considered profit (e.g., competitive return on investment, payback period, and cash flow certainty). Also, the ranchers were concerned with nonfinancial aspects: how much management time would be required to honor the water management contract and reporting requirements, reluctance to engage in a contractual relationship with a regulatory agency like SFWMD, and the risks (perceived or real) of allowing government agents access to their property.

Because the buyer was not able to define its willingness to pay, and different ranchers would have different payment thresholds at which they would be willing to provide services, the collaborators settled on a bid-in (reverse auction) process. Ranchers would submit a two-part payment request in response to a solicitation. The costs for the first part—payment to cover the costs of design, permitting, and construction of the WMA—would be reimbursed as justified by the submission of receipts to support actual costs incurred. The second part of the payment request would be for a lump-sum annual service payment, with no expectation that the service payment request must be justified to the buyer in the proposal. However, contract compliance documentation, as described above, would have to be provided annually for sellers to receive the service payment.[478] It would be up to the buyer to determine whether it was willing to agree to the combined payment request for the estimated level of service.

Accommodating Regulatory Requirements: The decision to use contracts created two regulatory challenges. First, because the NE-PES program would be a contract between a buyer and landowners, landowners argued convincingly that they would not enter into a contract unless given assurances that doing so would not lead to unanticipated regulatory requirements. For example, sellers were concerned about being required to maintain WMA-created endangered species habitat or wetland areas at the end of the contract. Second, from the pilot implementation experiments, it was clear that ranchers would not participate in a program requiring a significant amount of time for permit

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[478] A two-part payment meant that the rancher-seller would not have to finance the capital costs and then recover the costs through the annual service payment. This payment system was necessary because many ranchers were concerned that future annual payments would not be honored. The payment of up-front capital costs eliminated that concern.

application. State and federal agencies also were concerned about program administration costs and staff time resulting from a scaled-up version of a PES program.

Designing and putting in place the necessary framework and tools for an integrated and streamlined permitting approach became a major activity of FRESP project directors during the five-year pilot phase. The result of that effort was the creation of three sets of tools designed specifically for the NE-PES program: (a) a joint NRCS and FWS ESA consultation guidance matrix designed to protect federally listed species during the construction of a WMA, (b) a regional general permit from the US Army Corps of Engineers to expedite the initial permitting process and provide some assurance that the landowner could remove some structures at the end of the contract, and (c) the development of state and federal agency MOUs and related guidance that identify roles and responsibilities associated with implementing and permitting the NE-PES program.[479]

V. Lessons Learned

Encouraging private landowners to take on innovative conservation practices is an emerging goal of federal and state programs.[480] And at a conceptual level, support for market-like programs is broad and increasing. However, we are aware of relatively few working examples of programs that bring together private landowners and conservation interests in a market-like program.

The FRESP and NE-PES story illustrates what it means to use market theory in operational PES program design. The success in creating an operating program can be traced in large part to effective collaboration processes. Collaboration was necessary for a variety of reasons, but mainly because both the buyers and the sellers in a market can veto the program simply by not participating. A collaborative process and design team needs to be put in place and structured in much the same way as any other interest-based negotiation.[481] The following specific lessons can be drawn from the NE-PES experience.

- The first challenge is to gain trust among the key interests (landowners, environmental groups, and regulatory agencies) so they will make a commitment to working together to find acceptable program designs; however, participants' views are likely to be colored initially by suspicions (indeed caricatures) of each other.

- Trust-building requires a facilitator who has the dedicated time and financial resources to help the stakeholders understand the possible benefits of joining a PES design collaboration. WWF staff filled that role in the NE-PES development process.

- Most participants will already be busy, and the call to design a PES will become a new work responsibility. Given the complexity of the task, the collaboration requires dedicated leadership with skills in facilitation, project management, and fundraising as well as a basic understanding of the interests and constraints of each of the collaborators. The process that led to the creation of the NE-PES was supported by $7 million in funding and involved both WWF and RFF staff, who were viewed as credible and neutral facilitators.

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[479] Papers providing more detail, and the permit itself, can be found at www.fresp.org.

[480] "White House Conference on Cooperative Conservation," accessed June 25, 2013, http://govinfo.library.unt.edu/whccc/.

[481] See discussion above in section on "Communities and Collective Action."

- The facilitators had, or were able to rapidly acquire, credible technical knowledge of relevant federal and state policies, laws, and regulations;[482] ranch finance; hydrology; soil science; computer modeling; statistics; monitoring technology; and other technical issues. The combination of broad-based technical understanding and facilitation skills were important both to the process and to the ultimate design of the program, given the need to reconcile the participants' often differing interests in the collaboration.

- Designing a PES program demands the willingness and the opportunity to "learn while doing." For example, rather than design a program first and then try to implement it, FRESP partners decided to implement on-ranch demonstration projects and build the program around the experiences gained from contracting, designing, constructing, permitting, operating, and monitoring those water management projects. Through this iterative process, a more grounded, practical, and easy-to-administer program evolved because it was based on the real-world experiences of the partners.

- Learning while doing has implications for the process of program design. First, participants will need pilot sites and the funding to support them. Second, participants will need time to learn and reach agreement with each other through conversations and experimentation.

- One must develop credible technical arguments to support the PES design. Credibility can be enhanced via transparent, iterative interactions around technical analysis and by engaging credible and trusted scientific experts.

Acceptance among the collaborators is not enough. Reaching out beyond the collaboration and effectively advocating for a new idea requires an entrepreneurial spirit among those in the collaboration. In bringing about the NE-PES, the eight initial ranchers were environmental entrepreneurs willing to look for new approaches to producing socially desirable environmental services and new profit opportunities that would allow them to continue ranching. Most importantly, each was willing to serve as a messenger and a trusted voice to the rest of the ranching community. State agency personnel were policy entrepreneurs willing to stretch the agencies' missions, regulatory framework, and budgets to design a PES program. They had to have the ability to understand how a PES program could be designed and then argue for how it could fit within their agencies' bureaucracies. The researchers supporting FRESP were scientific entrepreneurs willing to make conclusive statements in the face of uncertainty and to make the success of the program a priority over peer-reviewed publications that served their immediate professional needs. The WWF and RFF facilitators acted as social entrepreneurs, arguing for adherence to market-like fundamentals but remaining open to ensuring that all stakeholder issues and concerns were addressed in the details of PES program design. Their neutrality about design elements earned them the trust of the ranchers and the agencies in the collaboration. In turn, this brought credibility to FRESP among agencies and among environmental NGOs and agricultural communities outside the collaboration that were often at odds. The credibility of the partnership created opportunities to secure increased funding. RFF and WWF also provided a bridge from the technical analysis needed to support the program and the ranchers, whose expertise was in the business of ranching. Likewise, WWF and RFF created a bridge between the agencies and the scientific community, allowing them to appreciate the challenges of ranching as a business.

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[482] For example, the payment for ecosystem services concept is a new approach to changing conservation behavior. As such, it will have a greater chance of acceptance if it fits into and complements existing policies and programs. On the other hand, existing programs may need to be modestly adjusted to accommodate the new payment for ecosystem services program.

Part Four: Communicating Climate Change

I. Climate Change: The Communications Challenge

Climate change is an existential challenge to our contemporary worldviews …. Not only do we have to change our view of the ecosystem, but we also have to change our view of our place within it. Have we as a species grown to such numbers, and has our technology grown to such power, that we can alter and manage the ecosystem on a planetary scale? … [S]ome see the question and subsequent answer as intellectual and spiritual hubris, but others see it as self-evident.

One field in particular needs to become more engaged: the academic scientists and particularly the social scientists. Too much of the debate is dominated by the physical sciences in defining the problem and by economics in defining the solutions. Both fields focus heavily on the rational and quantitative treatments of the issue and fail to capture the behavioral and cultural aspects that explain why people accept or reject scientific evidence, analysis, and conclusions.[483]

Within the environmental and scientific communities, climate change may be the central communications challenge of the first decades of the twenty-first century. In 2012, despite Superstorm Sandy, devastating drought, and record high temperatures, news coverage of climate change hit its lowest level since the climate negotiations collapsed in Copenhagen in 2009.[484] During a rash of extreme heat waves in July, fewer than 9 percent of television stories and 26 percent of print stories reported on the heat waves in the context of climate change. ABC and CNN mentioned the connection in just 2 and 4 percent of heat wave coverage, respectively, and Fox mentioned it only to deny the connection.[485] Notably, discussion of extreme weather was at an all-time high, and evidence suggests that experiences of extreme weather increase people's belief that climate change is occurring,[486] although the duration of this effect is unclear.

With only modest mainstream media coverage of climate change, and even more limited coverage emphasizing scientific consensus about climate change, numerous "niche" media sources and websites have emerged. However, these seem primarily geared to reach that small percentage of Americans who are already advocates for climate action. There is Joe Romm's "Climate Progress" blog; Al Gore's "Climate Reality Project" and the newly funded RealityDrop.org, designed to help people "spread truth" and "destroy denial" through social media; the coalition of scientists and journalists working to make the science more accessible at "Climate Central;" the organizing and advocacy group at "350.org" (referring to scientific findings of the need to keep atmospheric concentrations of carbon dioxide below 350 parts per million to keep the global average temperature rise to 1°C); "Forecast the Facts," which focuses on accountability for broadcast meteorologists and fighting climate science denial; and "ecoAmerica," which does extensive consumer research and cultivates partnerships to support programs aimed at mainstream Americans. These groups provide useful communications but are unlikely to attract the broader audiences that need to be reached if climate policy is to gain momentum. A 2010 study found that 97 percent of actively publishing climate scientists agree that

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[483] Andrew Hoffman, "Climate Science as Culture War," *Stanford Social Innovation Review*, Fall 2012, http://www.ssireview.org/articles/entry/climate_science_as_culture_war.

[484] Douglas Fischer, "Climate Coverage, Dominated by Weird Weather, Falls Further in 2012," *The Daily Climate*, January 2, 2013, http://wwwp.dailyclimate.org/tdc-newsroom/2013/01/2012-climate-change-reporting.

[485] Jill Fitzsimmons and Max Greenberg, "STUDY: TV Media Ignore Climate Change in Coverage of Record July Heat," *Media Matters*, August 15, 2012, http://mediamatters.org/research/2012/08/15/tv-media-ignore-climate-change-in-coverage-of-r/189366.

[486] T. Myers, E. Maibach, C. Roser-Renouf, K. Akerlof, and A. Leiserowitz, "The Relationship between Personal Experience and Belief in the Reality of Global Warming," Nature Climate Change 3, no. 3 (2012): 343-347.

humans are causing climate change,[487] whereas a survey the same year found that 66 percent of Americans are not aware of the broad scientific agreement on anthropogenic (human-caused) climate change—in fact, the belief that "most scientists think global warming is happening" actually declined between 2008 and 2011.[488]

A. Psychological Barriers to Action

Robert Gifford, professor of psychology at the University of Victoria and president of the Environmental Division of the International Association of Applied Psychology, asserts that seven psychological barriers stymie belief and action on climate change (many of which relate to our earlier discussion of insights from social psychology). These barriers include (a) limited cognition about the problem, (b) incongruous worldviews, (c) social comparisons and norms, (d) sunk costs and behavioral momentum, (e) negative perceptions of experts and authorities, (f) risk perceptions, and (g) positive but inadequate behavior change.[489] The implications of these barriers for climate change communication, information processing, and decisionmaking have not been considered as a group.

Cognition: Gifford points out that the human brain has not evolved far beyond "the ancient brain" concerned with the "immediate band, immediate dangers, exploitable resources, and the present time," none of which are "naturally consistent with being concerned … about global climate change."[490] Limited knowledge can also serve as a barrier, not just in terms of absent or inaccurate information, but also in terms of not knowing what to do about climate change and not knowing the relative magnitude of beneficial impacts of various actions. There is also the environmental numbness effect— tuning out and/or oversaturation and desensitization ("I'm sick of climate change"). The issue of uncertainty is particularly powerful: "Individuals tend to interpret any sign of uncertainty, for example, in the size of a resource pool or the rate at which the resource regenerates, as sufficient reason to harvest at a rate that favors self-interest rather than the environment."[491] Discounting is influential, not just in terms of undervaluing future risks, but also in the spatial discounting of current risks. People tend to see climate change as primarily impacting poor people in developing countries, but evidence also suggests that many people discount risks only as distant as the next county or state. Lastly, Gifford points to the optimism bias and, on the other hand, a perceived lack of self-efficacy and fatalism.

Worldviews: Diverse worldviews include the belief that mankind could not possibly be at the root of planetary change and that divine agency is at work or, alternatively, that environmental stewardship is a religious imperative. Others may believe that mechanical innovation and engineering (dubbed by some as "techno-salvation") can solve environmental problems. In addition, some will benefit, either literally or psychologically, from maintaining the status quo, leading to a system of justification and resistance to change, although Feygina and colleagues (2010) show that if mitigation can be "successfully portrayed as part of the system, this lack of action on the part of system justifiers can change."[492]

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[487] W. Anderegg, J. Prall, J. Harold, and S. Schneider, "Expert Credibility in Climate Change," *Proceedings of the National Academy of Sciences of the USA* 107, no. 27 (2010): 12107–12109.

[488] Ding et al., "Support for Climate Policy."

[489] Robert Gifford, "The Dragons of Inaction: Psychological Barriers That Limit Climate Change Mitigation and Adaptation," *American Psychologist* 66, no. 4 (2011): 290–302.

[490] Ibid., 291.

[491] Ibid., 292.

[492] Gifford, "Dragons of Inaction," 293 (quoting Feygina et al. 2010).

Sunk Costs and Behavioral Momentum: Most people have significant physical investments—in cars, appliances, and technology—that dissuade them from wanting to make new and additional investments, "at least until disadvantages become too painful."[493] This goes hand-in-hand with behavioral momentum. "Ensconced habits do not change without a substantial push; priming and even attitude change often do not lead to behavioral change."[494] As B. F. Skinner remarked, "It is often easier to escape in other ways—by ignoring or forgetting the advice or by finding a way to escape that does not require solving the problem."[495] Many people also have less and less "place attachment" and investment in their communities and environment as lives are increasingly characterized by geographic mobility—not just having six or seven jobs during their careers, but living in six or seven different places.

Mistrust: Significant evidence suggests that people distrust scientists and government officials. "Some strongly react against advice or policy that seems to threaten their freedom partly because it is based on a lack of trust in those who give the advice or set the policy."[496] Mistrust is a two-way street. With increasing political polarization, which has come to include vitriolic attacks on science, some liberal academics and others have come to distrust certain segments of society, such as the Tea Party movement. Gifford asserts that more research about "the emotional elements underlying the denial of climate change and its human connections [is] needed."[497]

Risk: One must consider not only how people perceive environmental risks, but also how they perceive risks associated with changing behaviors. Some risks are functional: If one purchases an electric car, what if the battery charge doesn't last as long as advertised, and he or she does not have access to a charging station? Some risks are physical: A hybrid car may not be as crash safe as a sport utility vehicle. Some risks are financial: How quickly will one recoup an investment in weatherizing a home? Some risks are social and psychological: A public change in behavior can lead to both positive and negative judgments by friends and colleagues. Finally, some risks are temporal: Will the time spent researching and planning be worth it relative to other activities on which one could spend one's limited free time?[498]

Inadequate Change: One of the prominent concerns with regard to social marketing and other attempts to induce proenvironmental behavior is whether these efforts should strive to influence individuals or broader social networks, and whether they should motivate piecemeal changes or more significant private and public actions, including advocacy and demands for political action. Proenvironmental intent may not correspond to proenvironmental impact, and the adoption of small, relatively ineffective environmental behaviors may lead one to justify other negative behaviors.[499]

B. Logic Schism and Moving toward the Middle

As Andrew Hoffman asserts, "Climate change is a proxy for deeper conflicts over alternative visions of the future and competing centers of authority in society …. The great danger of a protracted partisan divide is that the debate will take the form of … a logic schism, a breakdown in debate in which opposing sides are talking about completely different cultural issues."[500] Those interested in

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493 Ibid., 294.
494 Ibid.
495 Ibid.
496 Ibid.
497 Ibid., 296.
498 Ibid.
499 Corner and Randall, "Selling Climate Change."
500 Hoffman, "Climate Science as Culture War."

advancing actions to address climate change need to develop messaging and communications that affirm rather than challenge worldviews and values and "neutralize the tendency of people to polarize along cultural lines when they consider information."[501] A 2011 study, "Global Warming's Six Americas," identifies six distinct public viewpoints on climate change science. The "alarmed" and the "dismissive" are the vocal minorities whose positions are fairly entrenched. The majority are in the middle—the "concerned," "cautious," "disengaged," and "doubtful." They are more open to discussion and debate and "through direct engagement can be separated from the ideological extremes of their cultural community."[502] Hoffman outlines eight techniques for constructive discussion:[503]

- know your audience

- ask the right scientific questions

- move beyond data and models

- focus on broker frames

- recognize the power of language and terminology

- employ climate brokers

- recognize multiple referent groups

- employ events as leverage for change

One interesting aspect of climate change communication is that most messaging on this topic is "analytical," despite overwhelming evidence from social psychology that the experiential processing system is a much stronger motivator for action.[504] "Personal or anecdotal accounts of negative climate change experience, which could easily outweigh statistical evidence, are rarely put into play, despite evidence that even a stranger's past experiences can evoke strong feelings in people, making such communications memorable and therefore dominant in processing."[505] The section below on "Climate Brokers and The Right Science" highlights an example of capitalizing on experiential processing in a Colorado community.

C. Framing and Narrative

As noted earlier, framing can be critical for engagement, and specific frames need to be geared toward specific audiences. In the 1970s, cognitive psychologists Daniel Kahneman and Amos Tversky found that when individuals are presented with an ambiguous or uncertain context, "the different ways in which a message is presented or framed—apart from the content itself—can result in very different responses, depending on the terminology used to describe the problem or the visual context provided in the message."[506] Climate change presents just such a circumstance. Matthew Nisbet, associate professor of communication at American University and codirector of the Center for Social Media, has created a typology of frames applicable to climate change (see Table 2).[507] Frames could include an emphasis on American know-how and capacity to innovate (focusing on activities already

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[501] Kahan et al., "Second National Risk and Culture Study," 16.

[502] Hoffman, "Climate Science as Culture War," (referencing Leiserowitz, Maibach, Roser-Renouf, and Smith 2011).

[503] Ibid.

[504] Center for Research on Environmental Decisions, *The Psychology of Climate Change Communication: A Guide for Scientists, Journalists, Educators, Political Aides, and the Interested Public* (New York: Columbia University, 2009).

[505] Ibid., 16.

[506] Nisbet, "Communicating Climate Change," (referencing Kahneman 2002).

[507] Ibid.

underway in businesses, cities, and states); they could argue for scientific and economic competitiveness; or they could stress national security and energy independence. For example, General Anthony Zinni, retired marine and former head of US Central Command, stated, "We will pay for [climate change] one way or another. We will pay to reduce GHG emissions today and we'll have to take an economic hit of some kind. Or we will pay the price later in military terms. And that will involve human lives."[508] One frame that may deserve increased attention is replacing the uncertainty or probability of climate change with the risk of climate change. Many people are cognizant of low-probability, high-consequence events and the need to address them (e.g., by purchasing fire insurance). For some, climate change may be perceived similarly, such that "the prudent course of action is to obtain insurance in the form of both behavioral and technological change."[509] Some labels and hot-button words should be avoided by those interested in climate change communications. "Global warming" and "taxes" are common examples, but "denier," "uncertainty," and "consensus" also activate negative associations for many members of the public.[510]

Table 2. Typology of Frames Applicable to Climate Change

Frame	Defines science-related issue as . . .
Social progress	A means of improving quality of life or solving problems; alternative interpretation as a way to be in harmony with nature instead of mastering it.
Economic development and competitiveness	An economic investment; market benefit or risk; or a point of local, national, or global competitiveness.
Morality and ethics	A matter of right or wrong; or of respect or disrespect for limits, thresholds, or boundaries.
Scientific and technical uncertainty	A matter of expert understanding or consensus; a debate over what is known versus unknown; or peer-reviewed, confirmed knowledge versus hype or alarmism.
Pandora's box/Frankenstein's monster/runaway science	A need for precaution or action in face of possible catastrophe and out-of-control consequences; or alternatively as fatalism, where there is no way to avoid the consequences or chosen path.
Public accountability and governance	Research or policy either in the public interest or serving special interests, emphasizing issues of control, transparency, participation, responsiveness, or ownership; or debate over proper use of science and expertise in decisionmaking ("politicization").
Middle way/alternative path	A third way between conflicting or polarized views or options.
Conflict and strategy	A game among elites, such as who is winning or losing the debate; or a battle of personalities or groups (usually a journalist-driven interpretation).

Source: Nisbet, "Communicating Climate Change."

In addition to tailoring frames and messages to specific media and audiences, climate change communications need to use "carefully researched metaphors, allusions, and examples that trigger a

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[508] Center for Research on Environmental Decisions, *Psychology of Climate Change Communication*, 12.
[509] Hoffman, "Climate Science as Culture War."
[510] Ibid.

new way of thinking about the personal relevance of climate change."[511] Richard Somerville, climatologist and expert in communicating climate change, recommends medical metaphors for climate issues. Below we provide some highlights from his narrative:

- At your annual checkup, if you're sensible, when the doctor tells you to lose weight and exercise more, you don't argue. You don't insult your doctor by complaining that medical science is imperfect and can't yet prevent cancer or cure AIDS. You don't label your doctor a radical alarmist…Of course, some people just will not do what experts tell them. Non-compliance by some patients is a big problem for physicians.

- Everybody knows that a body temperature only a few degrees above normal is a symptom that can indicate medical problems that may have serious consequences, sometimes including death. Yet we still haven't educated most people to understand that a planetary fever of a few degrees can mean melting ice caps, rising sea level, massive disruptions in water supply, killer heat waves, and stronger hurricanes.

- Quitting smoking, like quitting using fossil fuels, is not easy to do, and in both cases the difficulty in quitting is immediate, while the most important benefits are all long-term.

- Medical decisions frequently involve substantial risk. People tend to be realistic about the consequences of serious medical problems. They know that a coronary artery bypass operation is major surgery. They accept the cost and the risk, understanding clearly that doing nothing also entails real costs and dangerous risks. They don't expect that a simple bandage will cure a potentially fatal disease. As a climate scientist, I sometimes fear that we are wasting time arguing about which type of bandage is most attractive as a climate remedy, instead of facing the hard decisions, and the risks, that climate change demands of us.

- As is often the case with medical decisions, our planetary wellbeing is ultimately in the hands of the patient.[512]

Governor Arnold Schwarzenegger used a medical metaphor when discussing climate change, saying, "If 98 doctors say my son is ill and needs medication and two say, 'No, he doesn't, he is fine,' I will go with the 98. It's common sense—the same with climate change. We go with the majority, the large majority …."[513] A more recent example is the analogy of climate change and steroid use. The National Center for Atmospheric Research developed a cartoon conflating carbon dioxide and other GHGs in the atmosphere with a baseball player on steroids. Steroids increase the chances of hitting a "home run" (i.e., extreme weather) but don't guarantee that each "home run" was caused by steroid use (i.e., GHG concentrations in the atmosphere).[514]

II. Climate Brokers and the "Right Science"

"A lot of scientists do a very poor job of communicating, and, like everybody else, they exaggerate how good they are at communicating. They hold their audience responsible for their own failures to communicate."[515]

[511] Nisbet, "Communicating Climate Change."

[512] Richard Somerville, "Medical Metaphors for Climate Issues," *Climatic Change* 76, no. 1 (2006): 1–6.

[513] Center for Research on Environmental Decisions, *Psychology of Climate Change Communication*, 26–28.

[514] Noah Besser, *Steroids, Baseball, and Climate Change. What Do Home Runs and Weather Extremes Have in Common?* (video produced by University Corporation for Atmospheric Research Communications for AtmosNews: NCAR & UCAR Science), accessed June 25, 2013, https://www2.ucar.edu/atmosnews/attribution/steroids-baseball-climate-change.

[515] Etienne Benson, *Society's Grand Challenges: Insights from Psychological Science—Global Climate Change* (Washington, DC: American Psychological Association, 2008).

Krosnick and colleagues studied specific cognitions or beliefs that predict people's perceptions of climate change as a national issue that warrants government intervention. They demonstrated five key beliefs that motivate people to take action on climate change and to support aggressive public policies. These include beliefs that (a) climate change is real, (b) "I am certain it is real," (c) it is primarily caused by humans, (d) it is harmful to people, and (e) the problem can be solved.[516] Related to this, Somerville argues that scientists should focus their messaging on six key principles: (a) the essential findings of mainstream climate change science are firm, (b) the GHG effect is well understood and is as real as gravity, (c) our climate predictions are coming true, (d) the standard skeptical arguments have been refuted many times over, (e) science has its own high standards, and (f) the leading scientific organizations of the world have carefully examined the results of climate science and have endorsed these results.[517]

Many Americans remain skeptical about whether humans are causing current climate change and ask, "Why us? Why now?" What more can the scientific community do to effectively communicate scientific information regarding climate change? Communications experts point to a role for "public intellectuals," personable and thoughtful academics and scientists who step out of their offices and conferences and talk to the media and local communities. This sort of outreach is rarely incentivized in current academic culture and, thus, the public intellectual has become "an arcane and elusive option in today's social sciences."[518] When it comes to cultivating discussions, scientists arguably have the most to offer if they can serve as "honest brokers … integrating scientific knowledge with stakeholder concerns to explore alternative possible courses of action."[519] Some climate communications analysts emphasize the need for a two-way public dialogue in which scientists and journalists "find out what [people] care about in their lives and provide information on how climate change impacts those things, moving us closer to the NRC recommendation 'getting the science right, and getting the right science.'"[520]

This is what Julia Kumari set out to do with her iSeeChange public media experiment, part of the Localore project funded by the Corporation for Public Broadcasting. Kumari, who has cultivated relationships with local farmers in western Colorado, brings their questions to relevant scientists, facilitating a two-way direct dialogue. The recently launched website, www.thealmanac.org, collects public observations and questions and brings formerly private observations and exchanges to the public eye, creating an online, crowd-sourced climate change journal.

However, getting a critical mass of scientists to engage in this way is a behavior change project unto itself. John Besley and Matthew Nisbet found that scientists' perceptions of the media, public science knowledge, and public affairs still remain largely out of step with research findings and work across a variety of social science fields over the past 30 years. "Few scientists view their role as an enabler of direct public participation in decision-making through formats such as deliberative meetings and [most] do not believe there are personal benefits for investing in these activities."[521] This situation has led Nisbet and others to conclude that, in addition to improving understanding of how

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[516] J. Krosnick, A. Holbrook, L. Lowe, and P. Visser, "The Origins and Consequences of Democratic Citizens," *Climatic Change* 77 (2006): 7–43.

[517] Richard Somerville, "How Much Should the Public Know about Climate Science?" *Climatic Change* 104, no. 3–4 (2011): 509–514.

[518] Hoffman, "Climate Science as Culture War."

[519] Ibid.

[520] R. Shwom, A. Dan, and T. Dietz, "The Effects of Information and State of Residence on Climate Change Policy Preferences," *Climatic Change* 90 (2008): 354.

[521] John Besley and Matthew Nisbet, "How Scientists View the Public, the Media and the Political Process," *Public Understanding of Science*, published online 30 August 2011: 1.

the presentation of scientific information influences public beliefs, behaviors, and decisionmaking, it is also "increasingly important to understand how scientists form judgments about the public sphere."[522] In addition to getting more scientists involved in public dialogues, it is also important to employ other climate brokers—such as business leaders, who can help make the connection between climate change and economic interests, or military leaders, who can help people see climate action as a way to improve national safety and security.

III. Communicating Impacts with Local Experiences

Can and should climate communications be more focused on local experiences and impacts, given that the general public may care more about local and immediate threats? On one hand, evidence suggests that natural disasters—even distant ones, like the tsunamis in South and Southeast Asia—can influence perceptions of climate change risk.[523] And clearly, "extreme events that may occur in a given year provide recurring teachable moments that communicators can use to relate climate change to the experience of a local audience."[524] On the other hand, there seems to be a clear connection between direct experience/observation of local/regional environmental problems, like toxic waste disposal, water pollution, or brownfields, and the willingness to invest financial and political resources in protecting the environment.

However, the unique nature of climate change may mean that direct correlation with local/regional impacts is less important when it comes to public support for climate change policies. Rachael Schwom and colleagues compared support for eight climate-related policies across a sample of Virginia and Michigan residents who were given information about either regional or national climate change impacts. First, the authors found no significant relationship between the scale of the information provided and willingness to support the policies.[525] Second, the study found that Michiganders were less likely to support six of the eight policies than were respondents from Virginia, but that this could not be attributed to factors like the auto industry's presence in Michigan or the larger number of urban dwellers in Virginia. The authors recommended that before the scientific community concludes that public support is greater for localized issues, "more empirical research is needed to better understand the role of framing issues at different geographic scales," and argued for a more deliberative dialogue between climate scientists and the public.[526]

IV. Networks and Innovative Marketing

"Individualistic framing of climate change is problematic for people for two reasons. Firstly, it does not provide a representation of society as it is experienced (as an interconnected network of social relations). Secondly, there is a constant tension with the depiction of climate change as a shared, collective problem and the individualized focus on behavior. Polls of the electorate have repeatedly revealed a desire for strong political leadership on climate change, suggesting that the strategy for individualizing climate change risk and responsibility may contribute to a governance trap."[527]

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[522] Ibid., 2.

[523] Benson, *Society's Grand Challenges*.

[524] Center for Research on Environmental Decisions, *Psychology of Climate Change Communication*, 10.

[525] Shwom et al., "The Effects of Information."

[526] Ibid., 253.

[527] Corner and Randall, "Selling Climate Change," 1010. Note that, although the referenced poll was conducted in the United Kingdom, Krosnick and colleagues have found similar support among the US electorate. Katherine O'Konski, "Dr. Jon Krosnick: Public Opinion on Climate Change and Its Impact on Voting," *Climate Science Watch*, October 18, 2011, http://www.climatesciencewatch.org/2011/10/18/dr-jon-krosnick-public-opinion-on-climate-change-and-its-impact-on-voting/.

Stern and colleagues developed the value–belief–norm model of environmentally significant behavior, which posits that the combination of altruistic values and an ecological worldview generates a sense of moral obligation to act, whereas being egoistic is negatively correlated with pro-environmental behavior. Furthermore, the model shows that even individuals who have the identified values will not act in a pro-environmental way if they do not believe that they are able to reduce negative consequences.[528] The question then is how to cultivate or activate "altruistic," "biospheric," "egalitarian," and "self-transcending" values; override "egoistic," "individualistic," and "self-enhancing" worldviews; and advance a clear sense of agency.

One successful nonprofit program that raises funds for people with leukemia and other blood cancers is Team In Training, which creates a group identity and support system, encourages accountability through physical and financial goals, and uses emotional narratives of survivors and sufferers to maintain motivation. Similarly, participants in the charity Global Action Plan's EcoTeams program have consistently cited mutual learning and support as a key reason for achieving and maintaining changes in behavior.[529] Emotional appeals from people around the world impacted by extreme weather could also help ensure follow-through on EcoTeams, and similar social network, commitments. These types of examples lend credence to Robert Brulle's criticism of the narrow scope of many environmental campaigns and the argument that "the public sphere and civil society institutions are the crucial mechanisms for affecting change … what is needed is a communication process that promotes civic engagement and public dialogue, rather than passive receptiveness to small-scale behavior change."[530]

National, state, and local governments can play an important role in encouraging and supporting preexisting social networks that can take ownership of climate change. Vandenbergh and his colleagues also argue for more horizontal marketing through social networks but emphasize that "to harness local social networks, yet achieve results at a national scale, federal programs will need to include innovative marketing efforts that engage other organizations to reach the numerous target audiences, not just simple advertising."[531] Ultimately, intensity and certainty of beliefs are primary drivers in public participation in decisionmaking, joining advocacy groups, attending or speaking up at public meetings, or even discussing an issue with friends or coworkers. Misinformation and misperception undermine public engagement.[532] Thus, the strategies for climate change communications and investments in such communication "can no longer be a guessing game. Careful research needs to be funded and translated into collective action."[533]

V. Communicating Climate Change: Summary of Key Findings

- Thus far, physical scientists and economists have largely driven the climate debate. Social scientists need to be better engaged to help explain why people accept or reject scientific evidence, analysis, and conclusions.

- In 2012, climate change news coverage hit its lowest level since the 2009 climate negotiations in Copenhagen. Meanwhile, media coverage of extreme weather was at an all-time high, and

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[528] Stern, "Human–Environment Interactions."
[529] Corner and Randall, "Selling Climate Change."
[530] Ibid, 1012 (referencing Brulle 2010).
[531] Vandenbergh et al., "Implementing the Behavioral Wedge," 10551.
[532] Ding et al., "Support for Climate Policy."
[533] Nisbet, "Communicating Climate Change."

evidence suggests that experiences of extreme weather can increase one's belief that climate change is occurring.

- A 2010 study found that 97 percent of actively publishing climate scientists agree that climate change is occurring and is human-caused, whereas another study the same year found that 66 percent of Americans are not aware of the broad scientific agreement on climate change; the belief that "most scientists think global warming is happening" declined between 2008 and 2011.

- It may be useful to consider seven psychological barriers to climate change belief and action: (a) limited cognition about the problem, (b) incongruous worldviews, (c) social comparisons and norms, (d) sunk costs and behavioral momentum, (e) negative perceptions of experts and authorities, (f) risk perceptions, and (g) positive but inadequate behavior change.

- More research about how emotions influence acceptance or denial of climate change and its human connections is needed.

- Insofar as possible, audience research is needed to ensure that climate change communications and messaging affirm rather than challenge worldviews and values.

- Eight techniques can facilitate a constructive climate change discussion: know your audience, ask the right scientific questions, move beyond data and models, focus on broker frames, recognize the power of language and terminology, employ climate brokers, recognize multiple referent groups, and employ extreme events as leverage for change.

- The majority of climate change messaging is "analytical," despite overwhelming evidence from social psychology that the experiential processing system is a much stronger motivator for action.

- One may want to shift from frames focused on the probability of climate change and bounded uncertainty to frames emphasizing risk. Many people are cognizant of low-probability, high-consequence events and the need to address them (e.g., by purchasing fire insurance). If climate change is perceived similarly, it could motivate behavioral and technological change.

- One should avoid certain hot-button words and terms in climate change communications: "global warming" and "taxes" are common examples, but "denier," "uncertainty," and "consensus" also activate negative associations for many members of the public.

- Climate change communications need to use "carefully researched metaphors, allusions, and examples that trigger a new way of thinking about the personal relevance of climate change."[534] For example, medical metaphors.

- Krosnick and colleagues identified five key beliefs that motivate people to take action on climate change and support aggressive public policies. These include beliefs that: (a) climate change is real, (b) "I am certain it is real," 3) it is primarily caused by humans, (d) it is harmful to people, and (e) the problem can be solved.

- "Public intellectuals"—personable and thoughtful academics and scientists who step out of their offices and conferences and talk to the media and local communities—need to play a heightened role in communicating scientific information. However, this type of outreach is rarely incentivized in academic culture.

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[534] Nisbet, "Communicating Climate Change."

- Climate communications analysts emphasize the need for a two-way public dialogue in which scientists and journalists find out what people care about in their lives and provide information on how climate change impacts those things—"getting the science right and getting the right science."

- Besley and Nisbet found that scientists' perceptions of the media, public science knowledge, and public affairs still remain largely out of step with research findings and work across a variety of social science fields over the past 30 years.

- More empirical research is needed to better understand the role of framing issues at different geographic scales (i.e., local or regional vs. national).

- Individualistic framing of climate change may be problematic. Some behavioral and social scientists argue that communications should promote civic engagement and public dialogue rather than individual behavior change.

- Climate interest groups need to encourage and support preexisting social networks that can take ownership of climate change, invest in horizontal marketing through social networks, and pursue innovative marketing efforts that engage other organizations to reach numerous target audiences.

Part Five: Conclusions and Summary of Findings

The social sciences have a lot to say about how conservation programs work, how conservation science (natural science) is interpreted and acted on by individuals and institutions, and how environmental advocates can motivate green behaviors. In fact, one reaction to this report might be that the social sciences have too much to say! Surveyed broadly, social theories present policymakers and advocates with a bewildering array of hypotheses to be tested. Consider, perhaps, the most important hypothesis of them all: Should we assume that people are rational and unbiased and use that assumption to design effective policies and advocacy strategies? The first part of this question is fairly easy to answer: people are not fully rational and unbiased—to the point that it is difficult to define what "rational" and "unbiased" even mean.

The second part of the question is trickier to resolve. Classical economics defines rational and unbiased to mean behavior that is informed, self-interested, and resistant to cognitive biases that work against self-interest. Moreover, classical economics tends to view that description as the best assumption to make when predicting how people will behave in response to a policy, new scientific insight, or marketing campaign. It is easy to poke fun at the obvious absurdity of the "rational and unbiased" assumption. Much of the work reviewed in this report undermines it. However, it is much more difficult to replace the assumption with a tractable alternative. If people are irrational and biased, can we predict how they will behave in response to a policy or advocacy intervention?

Classical economic behavioral assumptions are not a bad place to start, but they are not the full story, as this report notes. Can people's behavior be influenced by paying them to do things? Of course, but the impact of financial incentives on behavior is strongly influenced by a richer set of factors, including moral considerations and community values.

The theories and research summarized in this report—particularly those relating to individual cognition and behavior—expose the limitations of classical economic theories of human motivation and behavior. They also identify strategies to nudge behavior in directions favored by advocates (e.g., through strategic framing or the use of positive reinforcement). This report contains a wealth of

insights pertinent to the marketing of conservation initiatives, for example. However, these same insights and implied strategies are as likely to be used by conservation's opponents as by its advocates. Nudges cut both ways.

Behaviorally sophisticated interventions can generate political blowback. Mayor Bloomberg's soft drink size limitation policy was based on a behaviorally sophisticated nudge theory. The negative political reaction is instructive. First, many people do not like being nudged by governments, corporate advertising, or anything else, even if they share the behavioral goal, because it can feel like manipulation or a loss of freedom. Second, the reaction to such interventions will be particularly negative in the absence of a social consensus around the policy goal. Not everyone agrees that soft drink calories are a problem, or that it is government's place to address such a potential problem.

With this analogy in mind, we are, for example, not very optimistic about the deployment of behavioral nudges to meaningfully affect climate-related behaviors, at least at a national scale. The lack of social consensus around the importance of the problem and its solutions means that nudge-like interventions, even if pursued by NGOs and not governments, may harden opposition, distrust, and paranoia, rather than lead to environmentally desirable behavior. On the other hand, more strategic and widespread communications and marketing could have a meaningful effect on perceptions of scientific consensus, particularly as messaging spreads within and between trusted social networks. This could build receptivity to other climate-related messages and increase public interest in implementing and advocating for solutions.

Nudges are likely to be important and effective when applied in contexts where consensus exists around a social or community goal. For example, the success of household energy-saving nudges is probably due in part to the fact that household energy conservation is a relatively uncontroversial household and social goal. Accordingly, conservation organizations may consider trying to distinguish between goals that are broadly shared versus those that are contentious. Behavioral nudges are more likely to be effective in the former set of contexts than the latter.

For example, we would contrast a community that wants more open space, but just can't figure out how to finance it, with a community divided over a "jobs versus environment" debate. Nudges associated with property or sales taxes (e.g., the use of opt-in versus opt-out tax contributions) might work quite well in the first case.

A recurring theme in our synthesis is the cognitive and behavioral implications of complexity. Conservation and environmental issues are distinctive in that they often involve large-scale, interconnected social and biophysical phenomena and trigger correspondingly diverse social reactions and conflicts. Conservation science plays a schizophrenic role in this complexity. In helping us understand and communicate the workings of the natural world, science provides important tools to help people grapple with the unknown. However, as conservation science deepens, it also reinforces the complexities and uncertainties associated with both environmental problems and their possible solutions. It may be tempting for conservation advocates to think that if only the public understood "the science," they would be converted to the cause.

However, even if "the science" is conclusive and uncontroversial, the social implications rarely are. More typically, the science is not conclusive and its communication to "publics" reveals uncertainties and opens the door to doubt. This means that more and better science—by itself, conducted and communicated in isolation from the social interests it is meant to inform—may have limited influence as a contributor to conservation advocacy.

Much more promising is the integration of science with collaborative processes that bring stakeholders and knowledge providers together to iteratively frame the issues and develop data, tools, policies, and solutions. For one thing, collaborative processes build trust by fostering intimate social relationships that resist caricature. For another, they trigger science that is more directly applicable to the ecological and social problems at play in a given decision context. Collaborative processes do not just help people trust and understand the science; they also change the science in ways that make it more pertinent and powerful.

The virtues of collaborative processes go beyond this. The lessons of the FRESP case study are many, but our main takeaway is that creative new approaches to conservation—because they are new—depend to a great extent on collective process, co-learning, iterative conflict resolution, and the development of trust. The FRESP story can be read narrowly as a successful "conservation payments" story, which it is.

But this disguises the real point of the policy innovation. First, payments alone do not "a working institution" make. An important take-away from the FRESP example is that "devilish details" matter— the structure, timing, and form of payments; types of measures ranchers were expected to implement; modes of monitoring; and other factors all required detailed information and extensive negotiations and a collective process that generated the program's other necessary components (e.g., a way to measure performance and the financing mechanism). Second, the benefits of collaboration and the attention to process are pertinent to *any* kind of policy innovation and conservation solution. There is nothing unique about payment programs in this regard.

The science of collaborative behavior is arguably less robust than the science of individual behavior, at least in terms of empirical analysis. This is because collaborative behavior is highly dependent on things like institutional context, size, and the mixture of interests involved. We have, however, identified contemporary developments in this area. Moreover, our observations of conservation policy and practice suggest to us that collaborative behaviors will be particularly important to conservation in the coming decades.

In most of the developed world, top-down environmental policies have run their course. They are, of course, still important motivators of individual, business, and government environmental behavior. But the political low-hanging fruit—government interventions with a strong social consensus—has largely been harvested. Further progress is therefore likely to emerge from voluntary engagements, public–private partnerships, and creative deal making, all of which require collaborative conflict resolution rather than a reliance on top-down policy mandates.

Also, the ecological sciences are revealing interdependencies that affect stakeholders across wide geographic, administrative, and political scales. Wetland conservation in the Upper Mississippi affects shrimp farmers in the Gulf of Mexico (and wetland losses in the Mississippi affect duck hunters in the Upper Midwest). What is true within the United States and its patchwork of jurisdictions will also be true of ecological phenomena at cross-national and global scales. Conventional environmental policies, regulations, and statutes have difficulty embracing and resolving these diverse interests. Collaborative institutions and processes are increasingly filling that gap.

Our report contributes to the organizational distinction among individual, collaborative, and social behavior. We think that this approach provides a useful device for drawing distinctions among the very diverse social science disciplines, theories, and applications reviewed. And, as just argued, we think that collaborative behaviors are of particular ongoing relevance to conservation advocates. However, too much can be made of the distinctions. Social messaging clearly relies on individual-scale

psychological factors, not just social norms. Collaborations are collections of individuals, and so on. Our analysis of business behavior is perhaps the place where the distinctions most clearly dissolve.

Businesses are themselves collaborations of individuals, leading to analysis of both the role of the individual in a business (as employee, manager, or shareholder) and the ways in which individuals cooperate as members of the same business. Also, businesses routinely find it in their interest to collaborate with the communities in which they operate, and with government and NGO stakeholders, to gain competitive advantage. They are also clearly both influenced by social norms (e.g., current feelings regarding tobacco or genetically modified organisms) and manipulators of those norms via large and sophisticated marketing resources. Of course, they are ultimately beholden to consumers, in all their irrational, biased glory.

Conservation organizations hoping to achieve conservation gains via involvement with business supply chains need to take this diversity of behaviors into account. For example, supply chain interventions designed to leverage the influence of valuable global brands on their suppliers' behavior require attention, not only to business behavior and business-oriented interventions, but also to consumers' ability and willingness to absorb, care about, and evaluate environmental information related to the products they consume.

Despite the wide expanse of research surveyed in this study, empirical examination of natural resource conservation behaviors per se remains thin. Despite some notable exceptions (Elinor Ostrom being the most notable), it is only recently that the natural and social sciences have converged enough to make this kind of analysis practical. To date, conservation practice has been dominated by natural scientists. Conservation behavior has long been an interest of social scientists, but often one pursued from the desktop rather than the field. Philosophical, not just practical, barriers have also inhibited joint understanding.

But that is all quickly changing. Conservation NGOs increasingly embrace social goals as measures of their conservation effectiveness. Solutions-oriented natural scientists see human behavior as the key to making their science matter. And social scientists have become, not only more ecologically sophisticated, but also better at communicating the social importance of natural systems.

These trends suggest that ecological–behavioral conservation studies and interventions are poised to take an important step forward. Given that the complexities of human behavior clearly matter to conservation outcomes, we hope that this report will promote discussion of next steps.