Introduction

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The Science of Changing Behavior for Environmental Outcomes:

A Literature Review

STAP SCIENTIFIC AND TECHNICAL ADVISORY PANEL
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Introduction

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Introduction

The environmental challenges facing us are striking. Whether it is the threat of the sixth mass extinction or global climate change, these challenges can seem fundamentally intractable. What links nearly all present environmental problems is their root cause: human behavior (Foley et al., 2005; IPCC, 2018). Yet this cause also presents a solution: to address these challenges, humans must act differently (Schultz, 2011). In other words, environmental problems are behavioral problems, and environmental solutions must also be behavioral solutions. Whenever one approaches developing an environmental program, what they are doing is developing a behavior change program (Cowling, 2014).

Behavior Change Levers for the Environment

Even when not explicitly identified, changing behaviors have long been at the core of delivering environmental programs. Historically, there have been three main levers pulled for changing behavior: shifting material incentives, promulgating rules and regulations, and providing information to actors.

Shifting material incentives involves increasing or decreasing the costs, time, or effort for doing a behavior. This lever has its roots in neoclassical economics, where an actor is assumed to respond to only the material incentives for engaging or not engaging in a specific behavior. Standard methods for shifting incentives include enforcing penalties for non-compliance with rules, providing rewards for positive behavior, or making a target behavior materially easier, such as removing time friction or promoting substitute actions.

Passing rules and regulations that promote or restrict a behavior is perhaps the most commonly used strategy for achieving environmental outcomes. Rules and material incentives often work together, but each can exist without the other. For example, a seller might offer an incentive to purchase a product without any legal requirement. Similarly, laws and rules can be passed without their enforcement shifting the material incentives. Even without enforcement, rules can shift behavior due to people having a general preference to conform to rules even without positive or negative sanctions (Funk, 2007) or where rules convey factual or social information (Sunstein, 1996).

Figure 1. Rare's Levers of Behavior Change Framework (Rare, 2020)

Providing actors with information has also been a common tactic in traditional environmental programming, including explaining what the desired behavior is, why it is important, and how to engage in it. Informational programs implicitly assume something similar to the information deficit model; the lack of change in someone's behavior is assumed to be because they do not know key information, rather than psychological or socio-contextual factors (Burgess et al., 1998).

While these levers can be successful at changing behavior, they have also been well-documented as generally insufficient for changing behavior on their own (Cinner, 2018). Environmental behavior change program designers have recently expanded their toolkit to include a more comprehensive set of levers for shifting behavior and achieving environmental outcomes. These levers are choice architecture, emotional appeals, and social influences. These three novel levers, along with the three traditional levers, represent the Behavioral Lever Framework for categorizing behavioral interventions in the environmental field (Rare, 2020).

Using choice architecture means constructing an actor's choice environment without changing the value of said actor's underlying options. This lever deviates from the more traditional levers by not assuming that actors are solely

influenced by their rational deliberation, but also how a choice is presented to them. There are many ways in which a designer might construct the choice environment. These include prominent strategies such as directing attention by increasing salient features or changing what outcome occurs by default, using timely moments to prompt action, and providing decision aids that encourage short- or long-term decision making.

Emotional appeals function differently by changing how an actor feels about a set of options. Humans like to believe that they deliberate over all of their decisions, yet emotions often drive our decisions. Emotional appeals can include messaging that makes the behavior feel consistent with the target actor's core identities and values or encourage the actor to experience a particular emotion known to result in a particular behavioral pattern.

Finally, leveraging an actor's social networks and influences is an effective behavior change strategy. Social influence strategies involve understanding how an actor relates to others in their social system, including those with power and prestige, and leveraging these dynamics to support changes in the actor's behavior. Changing behavior in this way often includes social learning, making behavior more observable, or shifting social norms by changing an actor's expectations for what others in their reference network are doing or think is right or wrong.

These novel strategies complete the six levers of the Behavior Levers framework. These levers provide a typology for categorizing the majority of existing behavior change interventions, often delivered in combination rather than isolation.[1]

The logic, ethics, and effectiveness of behavior change programming across these levers have been an intense subject of research. This work has mainly been conducted from the behavioral science perspective, which focuses on the cognitive processes affecting how individuals make decisions, and the social science perspective, which focuses on how social structures shape an actor's capacity and interest in adopting a behavior.

The Behavioral Science Perspective

While there are many different definitions of behavioral science, we focus on the systematic study of human judgment and decision making. This research has been conducted by those working in several fields but is most commonly associated with psychology and behavioral economics. This perspective tends to take the individual actor as the central unit for analysis and understanding behavior.

The roots of what is now commonly known as behavioral science can be traced to rational choice models in neoclassical economics and the inability of those models to account for the decisions people often make. These systematic deviations from rational choice models are known as biases, which result from people applying cognitive heuristics to solve real-world decision problems (Tversky & Kahneman, 1974).

Research in this field focuses on the decision processes that affect how an actor is making a particular decision. These processes are often described as falling into two broad and simplified categories. The first mode is quick and automatic and is more likely to be driven by an emotional reaction. The second mode of thinking more closely approximates rational choice models. This way of thinking is often slow and deliberate, and the decision-maker is generally conscious of this mode. These two groups of processes are often labeled as System 1 and System 2 (Stanovich & West, 2000). Research in the behavioral sciences primarily focuses on documenting the mechanisms underpinning System 1.

Researchers have documented a host of deviations from rational choice models in decision making and the cognitive processes underpinning them. The most extensive set of this work has been conducted in contexts where people face some risky decision, where an outcome could end up going better or worse than their current state.

1 For a more exhaustive list of the strategies in each of lever category, refer to Rare, 2020.

One pattern is loss aversion, where people feel a loss more strongly than a similarly sized gain. Another is risk aversion, where people prefer a sure thing over a risky proposition, even when the risky proposition is likely to return even more. A third is ambiguity aversion, where people prefer to choose options where they know the likelihood of the different outcomes, even when they are guaranteed to do worse. Many of these findings have been replicated frequently and cross-culturally (Ruggeri et al., 2020).

This research has also documented an effect called status quo bias, a general tendency for people to keep doing what they have previously done, even when not in their best interest (Kahneman et al., 1991). This bias describes how habitual behaviors persist but also why it is difficult to form new habits that are inconsistent with one's previous status-quo.

While behavioral science researchers generally take the individual as their unit of analysis, this does not mean researchers ignore social influences. A large body of work on social preferences has documented how people—unlike what would be predicted by a selfish economic model—care deeply about what those in their social network do, believe, and receive. While early research attempted to identify universal social preferences (Fehr & Schmidt, 1999), these social influences differ dramatically across cultural contexts (Henrich et al., 2005). Behavioral scientists now primarily focus on the cognitive mechanisms that result in a particular pattern of behavior within a social context. For example, social norms describe where an individual's actions are influenced by their beliefs of what others are doing and what others think they should be doing (Bicchieri, 2016). The fact that these expectations may be different for different social groups, and different for individuals having different reference networks within a social group, allows for the varied social preferences we see among people of different social groups.

Behavioral science insights have recently been deliberately incorporated into behavior change program design, including at the bilateral, national, and regional levels of government and non-government entities (Whitehead et al., 2019). Many applications of behavioral science have been to design a choice environment to nudge people to perform behaviors in their interest (Thaler & Sunstein, 2009). Nudges are intended to be consistent with libertarian paternalism, where each person's actual choices are not restricted, but their environment is designed to encourage a particular behavior. Nudges are often subtle changes, such as shifting the default offering or making one choice more salient. However, nudges represent only one area of the application of behavioral science to behavior change. Other applications of behavioral science incorporate rich insights from the program's target actors. They also often involve shifting entrenched social norms, such as encouraging the adoption of toilets (Ashraf et al., 2020), reducing female genital cutting (Evans et al., 2019), or encouraging treatment adherence to painful drug regimens like those used to treat tuberculosis (Yoeli et al., 2019). This latter set of interventions differs from traditional uses of nudges by addressing actors as members of a community rather than narrowly as individuals, being more overt about the intervention itself, and often targeting socially constructed practices.

In summary, the behavioral science perspective has studied how individuals make decisions, concentrating on the ways human behavior deviates from the predictions of rational choice models. The field has documented various biases that result from people relying on cognitive heuristics for making decisions, many of which are the result of quick, implicit, and sometimes emotional processes rather than slow deliberation. While this work analyzes decisions from the perspective of the individual, it also investigates social influences, showing how people process their social environment and then apply it to their choices. This work has recently been adopted into behavior change program design across various institutions and levels of decision-makers, sometimes within the framework of nudges and larger-scale behavior change campaigns that often target more entrenched behaviors.

The Social Science Perspective

While there is no single definition of social science, in this review, we take it to be the study of the relationship between social structure and decision making. The fields most associated with this research include anthropology, sociology, political science, and human geography.

This perspective recognizes that individuals do not make their decisions in a vacuum. Instead, social science puts social structure into primary focus. This includes how that social structure defines an individual's social identities and social roles, as well as how an individual's actions can feedback into shaping the social structure for themselves and the network in which they are embedded. From this perspective, this feedback system of socially defined identities and roles create the foundation for individuals to make choices (Popitz, 1972). While identity is often thought of as how individuals see *themselves*, the social sciences point to an even more critical component: the bidirectional relationship between how others perceive an individual and how that individual behaves. Common identities and accompanying roles addressed in the social sciences include gender, race, ethnicity, socio-economic status, and various culturally specific positions of power through prestige and authority. Both formal rules, such as laws, and informal rules, such as social norms, can dictate directly and indirectly how individuals of certain identities can or must behave, with that behavior then feeding back into socially defining those same rules (Hechter et al., 1990).

It is important to note that an individual can rarely, if ever, be reduced down to a single identity. For example, an individual might be both a woman and of a particular ethnicity. Their sum identity is reflected in the intersection of these various identities (Crenshaw, 1989). Understanding what intersections an individual inhabits is critical for understanding their behavior, as the social rules governing their actions apply differently for different intersections. For example, while women might generally be given minimal autonomy to make farming decisions, older women might have significantly more independence, pointing to the possible importance of the intersection of age and gender in understanding an individual's ability to act (Carr & Owusu-Daaku, 2016). There are various combinations of identities, and researchers have cautioned against the essentialization of an individual through a particular identity.

Much of the research in the social sciences has focused on how these various instances of social difference affect how a social group may restrict or enable agency through different forms of rules, and how those rules are socially constructed. Agency can be defined as the ability to make decisions to achieve one's current and future goals (Petesch et al., 2018). Indeed, agency is not distributed equally across populations; marginalized and lower-status groups experience less agency and decision-making power in society. This further results in groups having different abilities to make changes in their own lives or affect broader social systems. Some of these effects may be obvious on first observation, such as only men allowed in a particular space. Others may be far more subtle but can have major implications for behavior change. For example, female farmers in South Africa have less autonomy in setting their schedules, meaning they cannot make time to listen to scheduled radio broadcasts for agricultural forecasts (Archer, 2003). While research into the relations between different identity groups often focuses on where they "result in contradictory interests, imperatives and expectations" (O'Shaughnessy & Krogman, 2011), differing social groups may also mutually reinforce each other in complementary ways. For example, in eastern African bushmeat hunting, women reinforce hunting by men through encouragement and praise, plus benefit from their successes (Lowassa et al., 2012).

Scientists across the social and environmental sciences have been expanding the models we use that incorporate agency by going beyond individual actions to include strategic, political, and collective agency. This also aligns with shifts away from purely rational-actor models or Integrated Assessment Models that rely on narrow assumptions about human behavior. Such concepts help researchers explain and operationalize the influences humans can have on transforming systems, such as those required for global environmental change. For example, groups with greater agency tend to be those with greater wealth and those contributing more greenhouse gas emissions in daily activities. This has implications for how designers and scientists perceive leverage points within a system to change existing structures (Otto et al., 2020).

While different forms of relations exist, social scientists have found power between individuals of different social roles to be a particularly strong explanatory force for understanding human behavior. While analyzing these power dynamics within a community can be a fruitful lens, social scientists have also frequently applied this lens to the wider social system outside a given community. This often includes power dynamics between the behavior change implementer, such as a government agency, and those impacted by it. A social science lens can shed light

on phenomena such as why communities surrounding natural reserves area may refuse to comply with hunting regulations (Strong & Silva, 2020), or why someone might comply with an intervention designed to preserve free choice, even when the individual would not otherwise wish to comply (White, 2013).

Social scientists recognize that individuals are not just subject to social structures, but that they *constitute* those social structures as well. This creates feedback loops where one actor's behavior makes up another's social context. This can result in systems-level emergent properties, where the behavior of each individual can fundamentally only be understood by taking into account the behavior of the other actors in the system. This includes social tipping points, where changes among a minority can result in rapid group-wide changes in beliefs or behavior (Granovetter, 1978; Schelling, 1978). This work has been extended to understand how behavior adoption diffuses through social networks, in which each individual adopts a behavior only when a sufficient set of surrounding connected others do the same (Centola & Macy, 2007).

Taking this social-systems viewpoint often highlights the unintended consequences of a behavior change intervention that an individual-focused standpoint might miss. For example, interventions might have achieved their intended behavioral and environmental impacts but had negative impacts as well. Social scientists have pointed to unintended effects of strengthening bureaucracies (Ferguson, 1994), creating informal lines of employment such as interpreters and fixers (Jeffrey, 2010), or even undermining traditional authority structures (Beall, 2010). Understanding the totality of consequences has implications for how social scientists approach program assessment. They focus not only on the behavioral and environmental outputs but also on assessing any social impacts, intended or not, positive or negative, that may result.

The social sciences present a unique opportunity to evaluate the ethics of behavior change programming. One common but ethically questionable element of behavior change programming is its often top-down nature, where local stakeholders have no input into the programs they experience. As a result, programs can fail to recognize local communities' rights or simply be ineffective. A designer's lack of local knowledge results in a program being ill-suited for its target actors (Hansen, 2018). Because of their rich focus on the various identities among target actors, the social sciences have raised ethical concerns over the equitable distribution of a program's costs and benefits. While programs are often evaluated by estimating the average treatment effect for the entire population, the social sciences have focused on disaggregating these results to reveal disparate impacts.

Social scientists have further found justification to criticize the ethical nature of "nudge" style behavioral interventions, which are often invisible to target actors. Designers of this style of intervention often argue that their solutions preserve free choice and are not coercive. However, social scientists have pointed out that those subject to these interventions find a lack of disclosure to violate their autonomy, whether or not the designer finds it free-choice-preserving (White, 2013). Social scientists have also identified that these interventions rarely change the root structures of systems and problems they seek to address, even when they account for the social system in which they are deployed (Feitsma, 2018).

In summary, the social science perspective focuses on the actor as both the product and creator of their social context, rather than as an individual. This view recognizes the importance of the various social identities that an actor might have and how those identities dictate their position in the social system that defines their ability to adopt a behavior. By analyzing this system as a whole, a social science perspective can identify various ways in which actors might influence each other. These include power, allowing some to restrict the choices of others, or reinforcement, where some support others' ability to act. In the context of behavior change programming, this view can provide a critical lens on how powerful organizations, such as governments or NGOs, may, sometimes inadvertently, coerce target actors into compliance, which is ethically dubious. By looking at the total social system, this view recognizes the commonly inequitable distribution of costs and benefits from behavior change programming, often tying those inequalities to existing inequalities in the social system.

Review Focus and Scope

Presented this way, behavioral science and social science may appear quite different. However, both disciplines aim to explain human behavior and interaction. Instead of seeing them as fundamentally different, we argue that behavioral science and social science are best understood as two levels of analysis that exist on a spectrum (See Figure 2). This spectrum ranges from the most cognitive explanations of decisions existing entirely within the individual to the most abstract descriptions of social interaction focused solely on the system in which those individuals are embedded. Many sub-disciplines exist closer to the middle of this spectrum, blending these two perspectives, such as social psychology, cultural psychology, cognitive anthropology, and network analysis. By embracing this entire spectrum of behavioral and social science, we better understand human behavior as a whole.

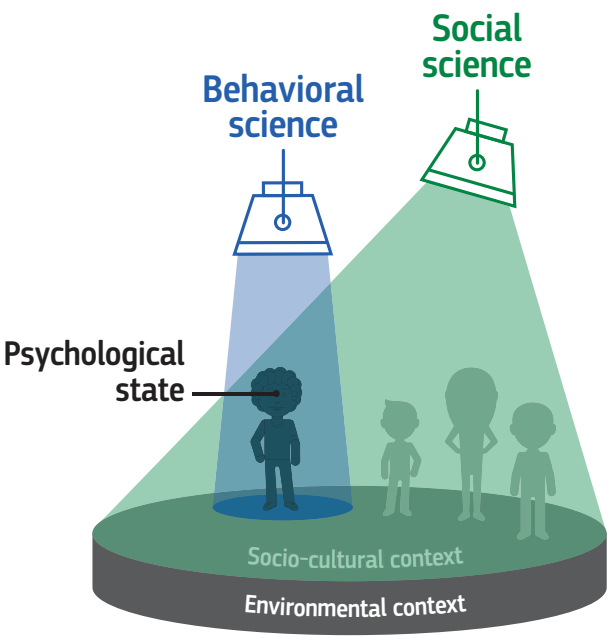

Figure 2. The interaction of behavioral and social science in understanding human behavior. Behavioral science focuses on understanding an actor's psychological state, whereas social science focuses on understanding the socio-cultural context for that actor. Both are necessary for understanding an actor's behavior within a given environmental context. Changes to the socio-cultural context, environmental context, or actor's behavior create feedback loops with one another.

In this review, we aim to identify how these perspectives can be applied to understand existing behavior change interventions designed to address biodiversity conservation, climate mitigation, water management and conservation, waste management, and land management. For each of these topic areas, we review empirical evidence for behavior change programs targeting behaviors in each of these areas. We include evidence that provides empirical analysis on the effect of interventions designed to change these behaviors, as well as evidence for the psychological, material, and socio-cultural barriers and motivations for their adoption. This includes evidence from the behavioral and social sciences, as well as non-disciplinary evaluations, and consists of both qualitative and quantitative analysis across a variety of measurement paradigms.

We then provide an analysis of that evidence in three areas. First, we review the evidence's strength for changes in the target behavior, including the internal validity, external validity, and geographic spread of the interventions. Then, we identify behavioral science insights demonstrated in the interventions or gaps in the intervention logic that behavioral science may elucidate. Last, we similarly identify social science insights in the interventions, including insights to help identify opportunities and gaps. After conducting this analysis for the five topic areas, we provide an overall summary of these analyses to identify trends across the environmental field. We conclude by proposing a framework for understanding how behavioral and social sciences can most effectively integrate into behavior change programming to improve environmental outcomes further.

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Rare inspires change so people and nature thrive. Conservation ultimately comes down to people—their behaviors toward nature, their beliefs about its value, and their ability to protect it without sacrificing basic life needs. And so, conservationists must become as skilled in social change as in science; as committed to community-based solutions as national and international policymaking.

The Center for Behavior & the Environment at Rare is translating science into practice and leveraging the best behavioral insights and design thinking approaches to tackle some of the most challenging environmental issues. Through partnerships with leading academic and research institutions, they are bringing the research into the field to connect the next generation of behavioral scientists with practitioners on the front lines of our greatest environmental challenges.

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The Global Environment Facility (GEF) was established on the eve of the 1992 Rio Earth Summit to help tackle our planet's most pressing environmental problems. Since then, the GEF has provided close to $20.5 billion in grants and mobilized an additional $112 billion in co-financing for more than 4,800 projects in 170 countries. Through its Small Grants Programme, the GEF has provided support to nearly 24,000 civil society and community initiatives in 133 countries.

The Scientific and Technical Advisory Panel (STAP) comprises seven expert advisers supported by a Secretariat, which are together responsible for connecting the GEF to the most up to date, authoritative, and globally representative science. The STAP Chair reports to every GEF Council meeting, briefing Council members on the Panel's work and emerging scientific and technical issues.