Making Better Decisions

How to use evidence in a complex world

ALLIANCE FOR CONSERVATION EVIDENCE AND SUSTAINABILITY

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Abbreviations and Acronyms

ACES   Alliance for Conservation Evidence and Sustainability
ALNAP   Active Learning Network for Accountability and Performance
           in Humanitarian Action
CBC   Community-based conservation
CBD   Convention on Biodiversity
DRR   Disaster Risk Reduction
IPBES   Intergovernmental Science-Policy Platform on
           Biodiversity and Ecosystem Services
MPA   Marine Protected Area
NGO   Non-Governmental Organization
RCTs   Random Controlled Trials
USAID   United States Agency for International Development
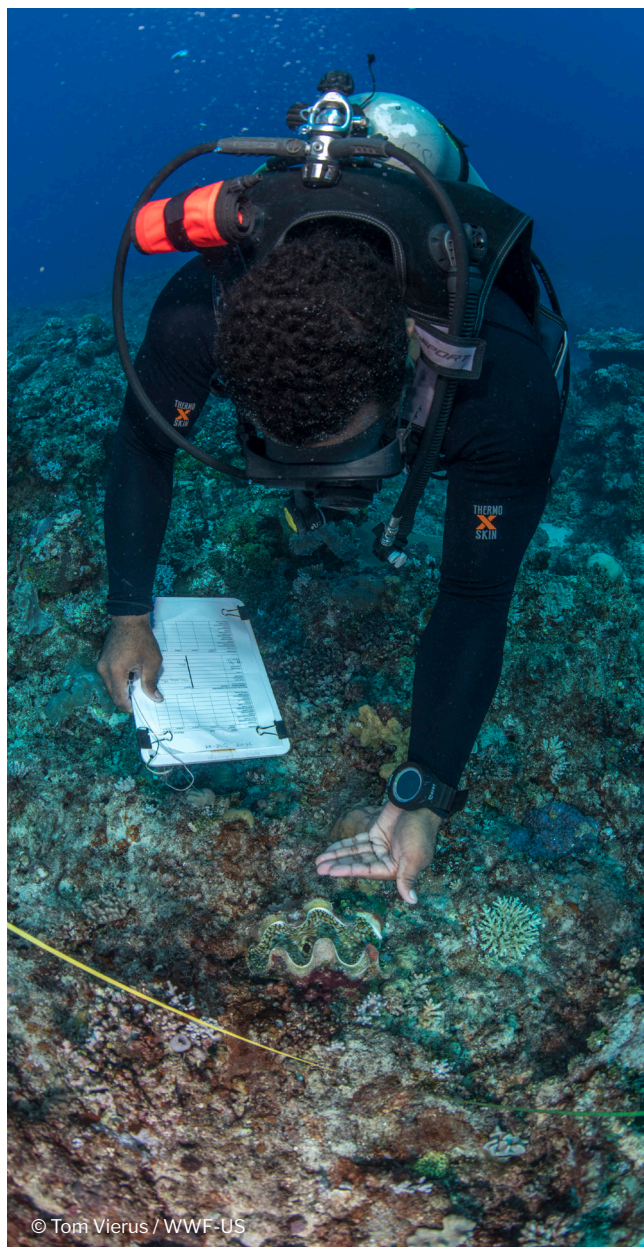
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Executive Summary

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Conservation leaders make hundreds of decisions each year on the design, implementation, and funding of conservation. Yet little is known about how evidence is used to inform these decisions and the mechanisms that could help encourage the integration of evidence in decision-making. Based on a cross-sectoral review informed by 25 semi-structured interviews, and gray and scientific literature, this paper explores both the current role of evidence in conservation decision-making and the effective ways evidence could better influence decision-making.

We begin by distinguishing between different types of decisions and decision makers, and explore the multiple factors that influence a decision, including factors relating to the decision maker, their context, and the approaches used for building consensus and acting on decisions. We distinguish between contextual factors, such as organizational profiles and considerations on social outcomes, and personal factors, such as stress, cognitive biases, and the pressure to overlook evidence that is politically sensitive or that undermines current project activities. We argue those that understand the contextual factors for organizational decision-making will be best able to shape organizational approaches and practices.

We explore the different types of evidence that influence decisions, including the question the evidence responds to, the methodology used, and the level of rigor applied. Our discussion covers diverse types including situational evidence, local knowledge, and evidence of impact and performance.

We note the lack of information available on what types of evidence support effective decision-making in both the conservation and humanitarian sectors. We argue that the types of evidence that are needed depend on the context of the decision, including the speed with which it must be made, the level of uncertainty that exists, the complexity of factors that require consideration, and the potential consequences of making a 'bad' decision.

We conclude by looking at the challenges and opportunities for increasing the influence of research and evidence in organizational decision-making. Drawing on the findings of this study, as well as our own experience seeking to influence and inform decision-making, we identify five strategies that can help foster the use of evidence and increase its influence in organizational decision-making – thus improving the quality of organizational decision-making:

1. Strengthen researcher-practitioner relationships
2. Develop approaches for combining different types of knowledge or evidence
3. Support structured decision-making processes
4. Make research accessible
5. Influence organizational norms

1. Introduction

Organizations, program leaders, and individuals must make hundreds of decisions each year on the design, implementation, and funding of conservation projects and programs. Often, there is a "best" decision (or decisions) so that good results flow from discovering and making those right choices. The hypothesis of this paper is that evidence is one way that these varied actors can improve the chance that they are making the "best" choice.

The Alliance of Conservation Evidence and Sustainability (ACES) commissioned this study in order to understand how research can influence conservation decision makers as well as to explore what could be learned from the approaches taken within the humanitarian and development sectors. ACES is a partnership of non-governmental organizations (NGOs) and academic institutions committed to transforming how we generate and use evidence to support effective community-based conservation (CBC). As a collective, ACES strives to:

- **fill knowledge gaps on the establishment, sustainability, and scaling of CBC**
- **pivot knowledge into actionable insights and tools for practitioners to design, implement, and monitor CBC**
- **facilitate shared learning across geographies - includes fostering evidence-based reflection, data sharing, and collaboration**

This paper explores the factors that influence decision-making and how evidence can be effectively incorporated into decision-making processes. The objective of the research was to address the following questions:

1. **What is evidence-informed decision-making?**
2. **What type of evidence is considered by decision makers when they are determining a course of action?**
3. **What factors, apart from evidence, influence decision makers?**
4. **What factors should researchers consider while generating evidence to aid decision makers?**

Box 1. Definitions in the literature

The term 'evidence-based decision-making' (or, more recently 'evidence-informed decision-making') has increased in prominence over the last two decades but has no generally-accepted definition. The literature reviewed as part of this study had varied interpretations but mostly centered around the use of empirical data and research by decision makers in order to support their actions. For example:

'Knowledge derived from research, monitoring or formal assessment e.g. student research, site-level monitoring, gray and peer-reviewed literature.' (Cook et al., 2010)

'evidence-based conservation management requires the collection and analysis of valid, impartial data regarding conservation activities in the past and the application of this knowledge to future decision-making.' (POST 2011)

'Evidence-based practice is the collation and synthesis of the available evidence in an explicit, repeatable, and transparent manner.' (Schwartz et al., 2018)

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This paper adopts a broad definition, using evidence-informed decision-making to describe the process of combining and balancing individual professional judgement with systematic research. We use the term "evidence" to refer to the many different types of information that are derived from raw data and processed to understand an underlying context or meaning (see Figure 1). This is not limited to formal forms of evidence. Instead, we follow categorization from the academic literature and include two forms of knowledge that inform the decisions we make: tacit and explicit knowledge. Tacit, or 'soft' knowledge is 'centered in the knower' and includes a person's experience, wisdom, and values.

Much of the experience that practitioners draw upon as well as the indigenous and local knowledge that is based on years of observation and experience is tacit. By contrast, explicit knowledge includes types of information that can be documented and is found in reports, manuals, and guidelines (Vasconcelos et al., 2005).

Figure 1. Data, evidence, and knowledge.

Data

Collection of related facts, usually organized in a particular format such as a table or database and gathered for a particular purpose.

Evidence

Data that has been interpreted, verbalized, translated, or transformed to reveal the underlying meaning or context.

Knowledge

Internalization of information, data, and experience—this usually results in either tacit or explicit knowledge.

Adapted from Tatham and Spens (2011).

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2. Approach and Methods

The research is based on a structured review of 51 articles on the types of evidence used to make decisions in the conservation and humanitarian sectors. Key articles were identified through keyword searches and a snowball methodology was used to identify additional relevant literature. The papers were reviewed using a template that mapped: the types of decisions discussed; the types of evidence used for the decisions; other factors that inform decision-making and how they constrain the use of evidence; use of evidence; and, the challenges.

The research also draws on 18 semi-structured interviews with 25 key informants. The informants came from two ACES-led learning projects (10) as well as strategic-level decision makers in both conservation (8) and humanitarian organizations (7). The ACES learning projects focused on:

1. **Marine community-based conservation in Eastern Indonesia:** This project utilized a long-term, quasi-experimental monitoring dataset to examine the impacts and interactions of governance, social factors, environmental conditions, and property-rights regimes of marine protected areas (MPAs) on ecological outcomes. The project integrates data collected by ACES member institutions in order to deliver insights for adaptive management to key audiences such as MPA managers and government authorities.

2. **Community forestry in Latin America, Asia, and Africa:** This project examines community forestry initiatives of varying longevity in Latin America, Africa, and Asia in order to characterize the governance factors, acting singly or in concert, that shape those outcomes.

The interviews aimed to explore the details of decision-making processes at the field level as well as within organizational headquarters. The objective was to use this data to learn about the approaches that are currently used to support decision-making, and the factors that inform it.

This approach had several limitations. We were largely restricted to information that was generated by online searches of publicly available literature and documents. There is likely to be much more information that is available at the organizational level and not necessarily made public. We found that the overall quality of research on this topic was relatively low, with many articles merely reiterating earlier findings or asserting the assumptions that are made in organizational decision-making processes.

In addition, the research available on conservation is limited to studies that have been conducted in the global north. We were unable to identify studies focused on practices of organizations headquartered in the global south. This is likely to represent a gap in the literature, although studies in other languages may not have appeared in our searches.

Finally, and perhaps most significantly, the literature on decision-making within the conservation sector does not distinguish the use of evidence at the project, program, or organizational levels. Rather, it looks at the use of evidence in decision-making within the conservation sector as a whole with insufficient nuance or specificity on the decisions themselves.

Structure of this report

Section three begins by providing a brief overview of the different types of decisions and decision makers that are included in this research.

In **section four**, we explore the multiple factors that influence a decision. These include factors relating to the decision makers, the context they work in, and the approaches that they take to building consensus and acting on decisions. We argue that 'producers of evidence' who understand the contextual factors for organizational decision-making will be best able to shape organizational approaches and practices. This builds on work by Roux et al. (2019) who found that researchers embedded in organizations act as skilled gatekeepers that increase the two-way flow of knowledge between scientists and managers and align their research with information needs.

Section five explores the many different types of evidence that influence decisions, including the question the evidence responds to, the methodology used to develop the evidence, and the level of rigor applied. The most appropriate type of evidence will depend upon the organizations, the level of uncertainty in their decisions, and the level

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of risk in the outcome.

And finally, **section six** outlines that while the approaches, methodologies, and priorities for evidence vary significantly for conservationists, humanitarians, and development practitioners, many themes highlighted in this paper are the same. These include the challenge of translating research into practice, the difficulty of combining multiple and different forms of evidence, and the factors that inform how and when evidence should be used. The paper argues that the types of evidence that are needed and appropriate depend on the context of the decision, including the speed with which it must be made, the level of uncertainty that exists, the complexity of factors that require consideration, and the potential consequences of making a 'bad' decision.

The paper concludes with strategies that can enable better integration of evidence into decision-making processes. A summary of tools, techniques, and tips for identifying relevant decision makers and working with them to develop and communicate research findings are provided in two knowledge briefs also (see Tanner et al., 2020a, 2020b).

3. Understanding Decisions

People working in NGOs make dozens of decisions every day. To understand how evidence affects and influences their decision-making, it is important to first understand what those decisions are. However, there is little agreement in the literature on what 'decision-making' actually means. This section introduces the concepts of 'decision makers' and decisions that will be explored further in the remainder of the paper.

Decisions and decision makers

Overall, there has been significant critique of decision-making in both the conservation and humanitarian sectors. For example, conservationists are criticized as making decisions based on personal opinion and past experience rather than scientific data (Walsh et al., 2015). In the humanitarian sector, decision-making has been characterized as "informal, emergent, ad-hoc, and reactive" (Comes et al., 2015). Yet despite reported failures, relatively little academic attention has been given to the specifics of the decisions that are being made, when, by who, and how. There is no consensus on what a *'decision'* is, or what 'decision-making' actually means. In particular, as was noted in the limitations, the conservation sector does not distinguish between types of decision maker or decision in its critiques of the uptake or influence of evidence.

A recent study by the humanitarian network Active Learning Network for Accountability and Performance in Humanitarian Action (ALNAP) aimed to track how decisions are being made in the humanitarian sector. The study used an app-based diary method combined with interviews and a questionnaire to identify the wide variety of decisions being made, which range from whether to share information with donors, to whether to promote or hire someone in a certain role, to whether to apply for a funding call, which contractor to hire, or what criteria to use for targeting (Campbell and Knox Clarke 2019).[1]

Our interviews highlighted a variety of day-to-day programmatic decisions relating to CBC, in terms of the type of decision, the length of time it takes to make, how many people are involved, and various other factors. Table 1 provides examples of key programmatic decisions based on the experience of researchers studying MPAs in Indonesia. The researchers in Indonesia aimed to deliver an increase in direct use of their work at three different organizational decision-making levels:

Table 1. Decision-making levels

Decision	Illustrative example
Field level	**The NGO site managers.** These individuals are responsible for day-to-day decisions. Researchers provide them with direct observations and recommendations based on what they've seen in the field.
Program level	**Regional NGO manager.** These individuals are interested in the patterns across different conservation sites and the broader political context. In the Indonesian example, researchers find that these decision makers are most interested in how MPAs are influencing human livelihoods and other social indicators across different sites. Researchers share observations about the local perceptions of MPAs, approaches being taken by local government, and social indicators.
Strategic level	**Conservation NGO department head.** They are most interested in demographic information and other data that might be important for annual and five-year strategic planning.

[1] The app-based diary method had not previously been applied in the conservation or humanitarian sectors. It included 55 participants, of whom 58% were international staff and 42% were national to the country they were working in. 60% worked for INGOs and 25.5% for national NGOs (though only three INGO participants completed the study and eight of 11 submitted one decision before dropping out). Participants were asked to submit 30 decisions each. 32 of 55 completed the study by submitting over 16 decisions. These 32 participants were interviewed twice at the end of the study and completed a number of additional questionnaires asking them to rate the perceived quality of each decision they had made. This was not a representative sample and there were varying levels of participation and consistency in responses.

At the **field level**, project managers make decisions relating to the day-to-day adjustments they make to project activities. The questions that they ask may include "are we meeting our output targets?", or "is this working?" They may also make decisions to work with, or not work with, another actor, or to obtain more information. In Indonesia, for example, provincial level staff within NGOs make decisions on how to prioritize limited funds to track and monitor ecosystem indicators or to increase community engagement for marine resource management. Their decisions focus on what activities to prioritize in order to make the most of the financial resources that they have.

Decision makers at a **program level** or **regional level** will make decisions about when to start/stop a program. For example, they may choose to implement one conservation project over another, or to scale down activities if there isn't sufficient proof that their activities are working. At this level, many decision makers are considering not only the program itself, but also how the program fits within the organizational portfolio. They may also make decisions about how and when to collaborate with other organizations, consortiums, or 'systems'.

Strategic-level decisions are centered on the values, focus, and priorities of the organization, how different types of activities will be financed, major collaborations and partnerships, and countries of operation. They may include decisions about how to respond to a particular type of problem, the delivery method, location of programs, and types of intervention across many contexts and programs. For example, a team or individual may consider whether to continue or abandon a department or initiative.

At all levels, therefore, there are operational and programmatic options relating to activity design and delivery, geographical and ecosystem focus, research or information, collaboration, and resource allocation. These align closely with categories identified as important for humanitarian decision makers, although there is an additional emphasis on decisions about targeting (who will receive assistance) and responding to threats (Campbell and Knox Clarke 2019).

Although current discourse often focuses on decision-making about programmatic options, interestingly in the Campbell and Knox Clarke (2019) study, only 19% of decisions submitted were about programmatic options or targeting. The types of decisions submitted to this study were "largely those unlikely to require consultation of a formal evidence base." These included decisions on working approaches, coordination, scale of operations, staffing and resource allocation, logistics, and ways of working. However, the authors argued that to the people making the decisions, "many of the 'administrative' decisions are perceived to be every bit as significant, in terms of consequences, as the more programmatic ones."

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Approaches to using evidence within these contexts are discussed within the rest of the paper. However, overall, the lack of data on this subject suggests that both the conservation and humanitarian sectors would benefit from greater clarity on when evidence will support effective decision-making and when naturalistic forms of decision-making are appropriate and sufficient.
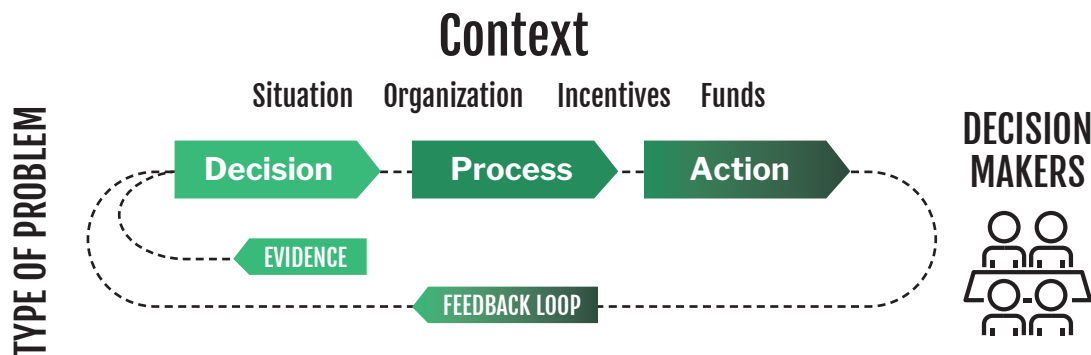
4. Factors That Inform Decisions

In any decision, multiple factors will inform the ultimate choice. These include the organizational context, the organization's funding and incentive structures, and the situations that programs are being implemented within. In addition, the decision makers themselves will be affected by stress and biases that can undermine good decision-making. This section outlines why these factors are important as well as the possible role of feedback loops that enable decision makers to learn from the decision-making process and to reevaluate their approach to integrating evidence.

What makes a good decision?

An organization can be thought of as a "factory that manufactures judgements and decisions" (Kahneman 2011). Within the organization, individuals and groups will make a variety of choices in what may be single events, processes, or series of linked events. These choices require a decision maker to frame the problem, gather or generate information to inform their understanding of the problem, take action, and reflect on the outcome of that action (see Figure 2). The extent to which the actions that result are recognized as arising from formal choices or processes will differ. However, to be effective, an organization must find a way of assessing and improving the quality of these processes.

Figure 2. The factors that influence decisions include the situation of the program, the organizational mandate, incentives, and funding as well as evidence and feedback.

Decision makers operate within an institutional, political, and economic context that determines what decisions are and are not possible and what decisions are optimal. Our research highlighted a range of factors that inform decisions and their perceived quality. Interestingly, research suggests that **familiar** decisions are perceived to be higher quality (Kahneman 2011), and that understanding of context has a positive influence on the quality of decisions. Experienced decision makers operating in familiar contexts will therefore not only make better decisions but will also be able to influence the options available to them; for example, by influencing donors or government stakeholders around funding flexibility or generating political will.

At the same time, the options available to a decision-maker will be shaped by **context**. This might include things like the capacity of the implementing team at a field level, access to different sites in a region, and issues relating to political feasibility on a national level. Decision makers may also have to consider security concerns and financial or reputational risks arising because of the context.

Social programs will also be informed by **trade-offs around the appropriateness of different solutions and the preferences of local populations**. For example, when considering conservation on commercially used land, a trade-off between agricultural production and biodiversity on farmland is almost inevitable. The conflict between economic requirements and ecological outcomes will also have to be considered (POST 2011).

Organizational financing and **program flexibility** will also play an important role. In both the conservation and humanitarian sectors, decision makers are often constrained to make decisions that keep programs and projects within the mandate and skill set of their organizations. While this encourages specialization, Ramalingam (2013) highlights how it can also lead to "one size fits all" solutions rather than genuine problem solving. He cautions that this can result in organizations implementing solutions that they can finance, rather than being informed by evidence of what works.

Why is making decisions hard?

Decision makers consider all these factors in a complex cognitive process that involves sequential steps to analyze, validate, and select between options (Campbell and Clarke 2018). The **difficulty** of the decision derives from the complexity of the political and organizational constraints being faced by the decision maker combined with the number of divergent perspectives on the best choice. It also increases if the decision is ethically contestable.

Box 2. Four types of uncertainty
Adapted from Smith and Stern (2011)

Imprecision relates to outcomes which we do not know precisely, but for which we believe robust, decision-relevant probability statements can be provided. This is also called 'statistical uncertainty'.

Ambiguity relates to outcomes (be they known, unknown, or disputed) for which we are not in a position to make probability statements. Also called 'recognized ignorance.'

Intractability relates to factors known to be relevant to an outcome but are beyond the current capacity to formulate or to execute faithfully. It can also lead to situations where we are unable to formulate the relevant factors, or computations.

Indeterminacy relates to quantities relevant to decision-making for which no precise value exists. It can also arise from the diversity of views among people, regarding the desirability of obtaining or avoiding a given outcome.

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Sometimes individuals or groups make a decision knowing the precise outcomes of each option, but more often they have to bet without an exact knowledge of the current situation and its possible consequences. Smith and Stern (2011) describe four different types of **"uncertainty"** (imprecision, intractability, indeterminacy, and ambiguity: see Box 2) that can arise in the capture, analysis, and use of data to inform decisions. Uncertainty is a particularly important consideration for organizations seeking to make change in complex systems where system dynamics are unpredictable, or when a poor decision may have significant downstream consequences. An academic conference convened by the EPSRC STEPS Centre suggested that in these cases acknowledging different views, framing evidence, and being aware of the chance of surprises could help organizations consider more possibilities and prepare better for the future (Oxley 2020).[2]

[2] Blogs, video clips, and podcasts from the conference are available at https://steps-centre.org/event/the-politics-of-uncertainty-practical-challenges-for-transformative-action/

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There has also been speculation on how **stress** affects decisions, particularly given how it affects an individual's ability to absorb information, narrowing her focus of attention or leading to oversimplification, and stifling creativity (Talbot et al., 1992). Stresses on decision makers can arise from a variety of factors including contextual factors (such as time and costs), personal overstretch, and low well-being. In a review of the literature relating to decision-making, Morgado et al. (2015) find that stressed individuals tend to display increased levels of risk-taking, but that these effects vary by age, gender, and other individual characteristics. For example, acute stress was found to exacerbate risk seeking in men and risk aversion in women (van den Bos et al., 2009). Less is known about the effects of chronic stress on decision-making processes that involve risk.

Researchers in the humanitarian sector have attempted to assess the proportion of decisions that are *"significant, urgent, uncertain, and stressful"* (Campbell and Knox Clarke 2019): most decisions were urgent and/or would have significant consequences; but "only 38% were identified as taking place in uncertain conditions, and only 49% where the future was also uncertain. Decision makers reported feeling stressed at the time of decision-making 47.5% of the time." Interestingly, the study also reported that the more urgent a decision became, the better the perceived quality of the decision.

Pforr (2018) highlights the importance of the individual's emotional process, and how in difficult or uncertain situations individuals must find the courage to take action. This is particularly pertinent in the conservation and humanitarian sectors, where conviction narratives are used in order to justify actions to oneself and others. In a study for the Start Network, a collaboration between 42 humanitarian organizations, Pforr found that organizations may resort to coping strategies in order to find conviction to act under conditions of uncertainty. These included the creation and use of unsubstantiated data, a lack of attribution and ownership for decisions, a lack of evaluation as a protection mechanism, an attempt to avoid decisions by relying on outside expertise, and finally, a disproportionate focus on review without implementation. Kahneman (2011) also notes that organizations will typically undertake wholesale reviews of decision-making processes in the wake of disasters, rather than focusing on ongoing quality control. Such coping strategies lead to the introduction of bias.

Using heuristics and introducing bias

Because making decisions is hard, the vast majority of decisions are based on intuition and learned mental shortcuts, i.e. heuristics, to identify a single, relevant course of action (Tversky and Kahneman 1974). In their paper on sensemaking, Weick et al. (2005) outline how individuals are faced with a constant stream of information, and within this, they determine which information they pay attention to and will respond to, on an ongoing basis. Rather than taking one moment to weigh options, most decision makers are constantly making sense of 'chaotic streams of information' by organizing them into 'meaningful patterns'. Individuals will consider what has 'worked before' and if this is not possible, attempt to create a new understanding – a 'springboard to action' (Ancona 2012). These heuristics can be particularly problematic for organizational decision makers.

Lovallo and Sibony (2010) provide a useful typology of biases affecting organizational decision makers. We summarize them here, and provide additional detail on countering biases in a briefing on decision-making biases (Tanner et al., 2020b):

Action-oriented biases
Action-oriented biases are those that cause people to take actions without properly considering other options or the consequences. One example is optimism bias, in which we tend to overestimate our odds of success and underestimate our chances of failure, or of negative events happening to us. Another is the planning fallacy that results in a tendency to optimistically plan project timescales and resources and to overlook project risks.

Pattern recognition biases
Experienced professionals rely on pattern recognition skills to make decisions based on previous experience. There is broad consensus across eight of the key research papers on decision-making within conservation that management decisions are overwhelmingly based on anecdotal sources (such as discussions with colleagues and experts and field excursions) and people's experiences. In a 2004 study on land management, for example, 77% of actions taken by land managers were based solely on anecdotal evidence rather than rigorous scientific data (POST 2011). Similarly, a study conducted by Broadland-England on fen site management revealed that 77% of the decision makers sources were anecdotal.

While rules of thumb and pattern-matching skills are vital for decision makers', they can also lead us to recognize patterns even where there are none. For example, decision makers may overweigh anecdotal evidence that is consistent with their favored belief, retain facts that are presented in stories better than those presented in scientific papers, or rely on past experiences that are not directly comparable (Lovallo and Sibony 2010a). These are all examples of pattern recognition biases and can lead to poor decisions, particularly from experienced managers (Lemieux et al., 2018).

Incentives and the interest biases
Certain decision outcomes that appear sub-optimal from the outside may actually be optimal when accounting for the individual and systemic incentive structures. These may relate to individual progression within an organization, access to funding, or pressure from local and national authorities.

The academic literature on humanitarian decision-making places an emphasis on the problems of perverse incentives. In his searing critique, De Waal (1988), for example, questions the morality of organizational decision-making regarding program design and concludes that *'one explanation for this lack of initiative is that agency field staff gain promotion by being conservative and unadventurous. This has an element of truth, but the psychological tensions are also important."*

Researchers interviewed for this study also emphasized how perverse incentives may arise from the pressure to overlook evidence that is politically sensitive or that undermines current project activities, or from the systematic tendency to ignore failures.

Stability biases
We are often influenced by the past. Sunk costs which are irretrievable and have no bearing on future outcomes will continue to distort our decisions. Similarly, the status quo bias describes the tendency to stick to a current course of action because it is harder to justify a change of course and requires more effort.

The interviews conducted for this study highlighted this as a significant challenge, noting, for example, data that indicates that some project sites performing better than others can create sensitivities that undermine trust and threaten the research process (Interview ID 1). Similarly, several interviewees noted the pressure to keep failures quiet because of fear of losing funding or undermining trust will frequently prevent learning.

Social biases

The research highlights the sociality of decision-making and reliance on colleagues. The ALNAP study described in Section 3, for example, states that "humanitarian decision-making is a highly social activity. In the study, 24% of decisions were made by a group, 57% were made by the decision maker after consultation with others, and 19% were made by the decision maker, acting alone" (Campbell and Knox Clarke 2019). Almost 60% of decisions were inter-agency, involving input from another organization.

Decisions made by groups can be undermined by social biases such as groupthink. This is the tendency to be influenced by the opinions and actions of others when operating within a group. Reviews of decision-making processes within the humanitarian sector's Start Network highlighted that decision-making committees tended to adopt a consensual approach that was most often steered by the most senior committee member (Start Network 2018).

Overcoming biases

In his book *Thinking Fast and Slow,* Kahneman (2011) provides a detailed analysis of these cognitive biases, and more, that arise from rapid decision-making. He outlines the results of cognitive biases such as a consistent over-estimation of success and benefit realization, as well as under-estimation of cost and time resources. In the final paragraphs of the text he concludes that organizations are more able to reduce such errors because they "think more slowly and have the power to impose orderly procedures."

Indeed, research suggests that organizational leaders are becoming more aware of these biases and there have been many attempts to reduce their effects through checklists and frameworks (De Smet et al., 2017). These include everything from simple tricks such as having colleagues play devil's advocate to formal exercises such as forecasting (where decision makers consider possible outcomes and then check the degree to which these outcomes are achieved), reference class forecasting (where planners predict future outcomes by comparing current projects to the statistical distribution of outcomes of similar projects), or project pre-mortums (where project teams imagine their project has failed and work backwards to imagine all the reasons why the project would have failed).

The aim of these exercises is to encourage decision makers to actively test their assumptions as part of the decision-making process. Kahneman (2011) argues that they can also give people the vocabulary to spot biases and constructively assess the quality of decisions. See Tanner et al. (2020b) for additional resources on overcoming bias.

5. Bringing Evidence into Decision-making: Where Are We Now?

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The interview data highlights that different types of knowledge and evidence are prioritized in different organizations, and that these priorities often reflect the disciplinary backgrounds of leaders and their programs. This section introduces the factors that influence the production of evidence, different types of evidence, and how they inform current decision-making.

When is evidence a priority?

Section 3 outlined how decisions involve framing the problem, gathering data, taking action, and then reflecting on that action and its outcomes. This is not necessarily a formal process. Indeed, research during the 1980s highlighted that in general decisions are not made by people generating alternative options and comparing them against a single set of evaluative dimensions. Instead, they draw on available information and prior experience to choose a course of action given the circumstances. This is sometimes called naturalistic decision-making (NDM) and is based on judgement (Klein 2008).

Research on humanitarian and conservation practitioners suggests they rely heavily on expert opinion (Bradt 2009) and their past experiences, instincts, and assumptions (Darcy et al., 2013). Amid rapidly changing environments, these individuals rely on gathering perspectives of trusted individuals to construct a narrative of the situation and define the response options (Darcy et al., 2013). In many situations this is sufficient. Not all decisions need new or rigorous evidence. Evidence can be difficult and expensive to obtain, and often requires political buy-in and consensus around the research questions, methodologies, and reporting.

However, sometimes judgment is not enough (even when biases are accounted for). As discussed in the introduction, researchers express concern that NGO decisions are too often based on personal preference or maintaining the status quo (Sutherland et al., 2004; POST 2011; Heyse 2013; Fabian et al., 2019). Similarly, in a review of 2,207 corporate executives, only 28% said that the quality of strategic decisions in their companies was generally good; 60% thought that bad decisions were about as frequent as good ones.

For this reason, decision makers must identify when to invest in generating evidence and when to draw on existing evidence or rely on heuristics. As discussed above, this is likely to include complex situations characterized by high levels of at least one of the following factors:

1. **Risk.** High potential for negative consequences as a result of an action or lack of action.

2. **Uncertainty.** Inability to accurately predict the outcome of an action with any real accuracy.

3. **Difficulty.** Numerous constraints and perspectives compounded by ethical contestability.

What counts as evidence?

The most important criteria for generating and using evidence is therefore "fitness for purpose"; i.e., what form of evidence is relevant for the question being addressed (Haddaway and Pullin 2013). This means that the way that a problem is framed will inform the type of evidence that is considered for collection.

Implementing a large conservation program or humanitarian initiative is a multi-stakeholder process that requires significant time and effort from a number of organizations, government departments, local representatives, and others. Each of these groups will have different priorities in terms of the evidence it thinks is important. Each set of stakeholders will make different sets of decisions.

Despite this diversity, researchers and practitioners will often emphasize particular methodologies. Medical clinical trials are often seen as a guiding star for designing evidence of new approaches and programs. Conservation, humanitarian aid, and development organizations have all borrowed from techniques developed in medicine and implemented randomized controlled trials (RCTs) and quasi-experimental studies to explore whether their interventions led to change (Ferraro and Pattanayak 2006). The importance of these techniques was underlined when the 2019 Nobel Prize for Economics Sciences was awarded to Abhijit Banerjee, Esther Duflo, and Michael Kremer "for their experimental approach to alleviating global poverty." Their work has highlighted the potential of RCTs for evaluating programs to reduce poverty across a wide range of sectors (Banerjee and Duflo 2011).

However, RCTs are only useful in situations where evidence is needed on the causal relationship between an intervention and specific, known outcomes. In social programs, they can only ever be one part of the puzzle, which includes conceptual and theoretical development, to discover not only 'what works', but 'why things work' (Deaton and Cartwright 2018). They are particularly ill-suited to programs that aim to change complex systems, where there are complex relationships between people and their environment, characterized by non-linear relationships, feedbacks, and thresholds between different system states. In such cases, there should be more focus on learning loops, on drawing on multiple different perspectives (Befani et al., 2015), on producing representations of the system (Grove 2015), and on determining what evaluation questions need to be asked (Garcia and Zazueta 2015). Stirling (2010) argues that given the uncertainty in much scientific knowledge, decision makers should be presented with an honest appraisal of incomplete and ambiguous knowledge, with dissenting interpretations, and with openness about the possibility of surprise.

The focus on experimental evidence also belies an underlying emphasis on evidencing impact. Within the humanitarian sector, for example, there is an overwhelming reliance on measuring impact based on the number of lives saved or improved (Mwenda 2020). While these are useful as a starting point, **they do not necessarily consider the quality of problem framing, evaluate the efforts to build a supporting ecosystem, or measure whether barriers are being identified and overcome**. The Fuller Transformation Collaborative (2019) emphasizes that the blend of monitoring, learning, and evaluation needs will evolve over time, moving, for example, from considering relationships and governance in the program to dynamics and feedback in the system, and then on to the results that the system is producing. It emphasizes that careful thought is needed to ensure that research is aligned to timelines for responding to learning.

A final challenge is that local populations are often excluded from the process of contributing to evidence used in organizational decision-making. Indigenous or traditional knowledge as well as feedback from populations that organizations engage does not feature in much of the evidence literature. This includes important ways of understanding both why change happens but also the impact, the magnitude, and the benefit of that change over time.

The different ways evidence is generated

Evidence in its broadest and most basic sense is anything presented in support of an assertion. It can be quantitative or qualitative, but must be clear, supported by data, and based on a process that can be described and repeated. Interviews with conservation practitioners and researchers highlighted seven types of evidence that are perceived to be important for establishing the success of an intervention and informing future decision-making (this typology builds on the one described in Mascia et al. (2014)). Note that the decision types are relevant across the levels described in section three, and that there are often blurred lines between these types.

Table 2. Decision-making levels

Type of evidence	Type of decision	Description
Situational evidence	**Setting priorities**	To understand risks, needs and priorities, organizations require a snapshot of intersecting information at a single point in time (organizations use different terms for their situational assessments; WWF, for example, refers to this as a 'landscape analysis'). These include information on issues, availability of resources, sources of problems, and their impact on the local population. Situational assessments may also be developed on-site for specific programs based on established methodologies for the ecosystem in question.[3]
Indigenous or traditional knowledge[4]	**Adapt activities and strategies to improve programs**	There is no universally agreed definition of indigenous/local/traditional knowledge among NGOs. However, within the conservation sector, most definitions are centered on the beliefs, norms, and cultural practices held by a particular community that are used to preserve its environment. The World Bank, for example, describes indigenous knowledge as, "a complex set of knowledge and technologies existing and developed around specific conditions of populations and communities indigenous to a particular geographic locality" (Parrotta and Trosper 2012). And the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) describes that "this knowledge is formed through their direct dependence on their local ecosystems, and observations and interpretations of change generated and passed down over many generations, and yet adapted and enriched over time."
		Literature emphasizes that local knowledge is most effective when it can be used to inform interventions of which local people themselves can influence and take ownership (Nyong et al., 2007; Byg and Salick 2009; Mercer et al., 2010; Robinson and Berkes, 2011).
Scientific evidence on a management approach	**Adoption and investment in particular strategies**	This is compiled data on a particular conservation intervention or management approach. It includes evidence reviews of existing data on a specific issue, or systematic reviews that aim to assemble all relevant data and records regarding a specific conservation issue. Information is classified and weighted according to its provenance and the rigor with which it was collected.
Ambient monitoring of an ecosystem	**Initiate activities, adapt or stop activities**	Scientific evidence includes the data that is collected and analyzed in order to understand more about a particular ecosystem through primary research on a particular site or sites. Techniques such as horizon scanning and scenario planning provide advanced warning of potential new opportunities and threats related to biodiversity (Cook et al., 2014; Ramírez and Wilkinson 2016). Ambient monitoring is described in more detail in Mascia et al. (2014).
Evidence for why change happens (or doesn't)	**Adapt activities and strategies to improve programs**	Change may happen at multiple levels. Organizations need to establish "how" change occurs, and the perspective of the local population on what happened (Knox Clarke and Darcy 2014). This may incorporate knowledge of the history and culture of a location, its geography, and local perspectives on the relevance of the change and its unintended consequences as well as dynamics between the organization and other stakeholders.
		There is a move towards adopting more "complexity aware" methodologies that try to assess social change in complex systems (see for example USAID (2016)). Stirling (2010) notes the need for methods that are "plural and conditional," in that they illuminate a variety of alternative reasonable interpretations and explicitly explore the assumptions and values associated with each. Three of the most common (and simplest) approaches used by USAID funded projects in complex settings are outcome harvesting, most significant change, and outcome mapping techniques.
Evidence of performance	**Determine future interventions or make changes within a current program.**	While scientific research processes answer questions about the nature of conservation and ecosystems, program evaluation processes (or performance measurement (Mascia et al., 2014)) may provide a lighter-touch process for insights into what is working and why in a particular project or program. The findings of an evaluation can be used to improve the program and to generate knowledge and evidence on what worked, what did not work, and lessons learned. There are a variety of methodologies used in evaluation but many will explore the effectiveness and efficiency of a certain project by focusing on its processes. Critiques of process evaluations, particularly in the humanitarian sector, cite that agencies are reluctant to share information that might be sensitive and reflect badly on their programs (Spiegel 2017).

[3] See also "Situation Analysis" section of Conservation by Design 2.0. Available at:
http://www.conservationgateway.org/ConservationPlanning/cbd/Documents/CbD2.0_Guidance%20Doc_Version%201.pdf
[4] These terms are used interchangeably in the literature that we identified.
[5] https://ipbes.net/indigenous-local-knowledge-ipbes

6. Fostering Evidence-Informed Decisions

Our research so far has highlighted the complex factors that shape the way that evidence is produced, used, or ignored. It has illustrated the importance of considering the context of decisions, the diverse types of evidence that can be gathered, and the other personal and organizational factors that will shape any conservation management decision. This section outlines the ways that evidence can be incorporated into decision-making and suggests strategies for those looking to effectively integrate evidence into decision-making processes.

Evidence fit for context

A successful evidence-informed decision-making process integrates evidence and contextual considerations, while accounting for the decision makers' positions and cognitive biases. But as we have seen, modern organizations need to make dozens of decisions each day and at the individual level most decisions are based on information provided by trusted advisors, people, and organizations. Creating good processes that integrate evidence and improve the quality of decisions will depend on the relationships between researchers and practitioners and on the resources available for generating evidence.

This research highlights five strategies that can help researchers increase the relevance of their work and influence organizational decision-making:

Strategy 1. Strengthen researcher-practitioner relationships

The majority of research questions are defined by academics and may not address the questions and priorities of conservation managers, or may not be published at the time it might be of most use (Cook et al., 2014). The research therefore points to the need for greater interaction between the researchers and conservation practitioners (Lemieux et al., 2018) in order to increase researchers' understanding of decision-making processes (Heyse 2013) and to better address the challenges that are most pressing for conservationists.

Researchers can increase their influence **by involving decision makers in designing the research questions**, or by sourcing these from organizational management (Cook et al., 2013). By establishing links and relationships between researchers and decision makers (Marshall et al., 2017), researchers gain insights on the priorities and needs of decision makers and are exposed to the challenges and problems faced within the conservation sector that might not be on their radar (Cook et al., 2013).

This allows researchers to build trust, which was described as an important factor by all of the researcher interviewees included in this study. By building trusting relationships, researchers have the opportunity to keep reminding decision makers of the importance of their findings. One of the researchers in Indonesia, for example, explained:

> *'The more that you tell those decision makers - the more frequently - the better they are listening. If you go only once a year, most likely they don't really hear. But if you continuously remind them of the information that you have then they will be aware of what is going on. They also have many things in their mind so you need to constantly remind them and tell them of what you are doing. That is basically it. Providing them with the latest information, frequently.'*

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In this way, researchers may directly influence specific decisions, such as when a report leads to funding to increase the geographical coverage of a marine conservation program. But they may also indirectly inform future decisions by shaping the decision makers' understanding of the options that are available in different scenarios. As we have shown, field- and program-level decisions are often made quickly based on a handful of observations, and repeated engagement with practitioners can therefore shape their understanding.

Strategy 2. Develop approaches for combining different types of knowledge or evidence

The importance of indigenous knowledge for both conservation and disaster resilience are well established (Tengö et al., 2017). For example, the 2015 Third World Conference on Disaster Risk Reduction led to the adoption of the Sendai Framework for Disaster Risk Reduction 2015-2030, which explicitly acknowledges the value of traditional knowledge in disaster risk reduction (DRR): "Indigenous peoples through their experience and traditional knowledge, provide an important contribution to the development and implementation of plans and mechanisms, including for early warning."

However, a major gap is in methodologies for interweaving indigenous knowledge with scientific evidence in the decision-making process. NGOs tend to have hierarchical decision-making systems which do not always sufficiently invest in understanding local realities (Belloni 2007). Knowledge of local culture, history, or survival strategies may be seen as having limited operational relevance, or difficult to fit into the bureaucratic frameworks for dealing with humanitarian information (Comes et al., 2015).

The subfield focused on building community resilience to climate change has made some progress in this area and processes for elevating indigenous knowledge in DRR are well developed compared to those for interweaving local knowledge into other parts of NGO programming. Participatory community-led DRR processes include techniques such as community situation analysis and community mapping (van Aalst et al., 2008). Proponents of community-led DRR state that it is most effective when it is integrated into decision-making processes related to community resilience (Visman and Kniveton 2016).

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International conservation agreements such as the Convention on Biodiversity (CBD)[6] and policy platforms such as the IPBES have also recognized the importance of including indigenous ways of knowing in decision-making. The IPBES has established a task force on indigenous and local knowledge systems tasked with promoting effective engagement with indigenous and local knowledge holders in all relevant aspects of its work. Research papers and studies have also been published that showcase the benefits of considering this type of knowledge alongside scientific knowledge in conservation (Mackinson and Nottestad 1998). In the Solomon Islands for example, indigenous knowledge and practices were used alongside scientific knowledge to establish MPAs for bumphead parrotfish conservation (Folke et al., 2005).

Nevertheless, more work is needed to elevate these processes across multiple levels of organizational decision-making and to share learning. Robinson and Berkes (2011) argue that participatory processes should occur at multiple levels of the system, to allow a greater number of voices and ways of knowing to be included. This can be done by adopting a multiple evidence approach whereby each knowledge system is valued equally within its own context and no system is assigned the role of external validator (Tengö et al., 2014). It is also important to create spaces and platforms where representatives from diverse knowledge systems can converge to discuss and exchange ideas, with equal legitimacy and power for each representative. It is not enough to include experts who have studied diverse knowledge; those who hold the diverse knowledge should be included (Tengö et al., 2017).

These should not be seen as one-off events. Methods for conservation planning need to be adapted to support protracted community-managed lands and marine applications (Pressey et al., 2013). As an example, in 'Aid on the Edge of Chaos,' Ramalingam (2013) describes approaches taken to reduce the effects of drought on food insecurity by the African Centre for Holistic Management. Its 'Operation Hope' developed a method for holistic management of arid grasslands which is described as a 100-year project that incorporates local understanding with scientific knowledge of ecosystems.

[6] Article 8 (j)

Strategy 3. Support structured decision-making processes

Section 3 outlined a variety of biases that arise when we take mental shortcuts to assess information and make judgements (Tversky and Kahneman 1974). Such shortcuts include taking an "educated guess" or using "a rule of thumb." These pattern recognition skills may serve managers well, but as we have seen, they can also lead to cognitive biases.

Important decisions in which there are high levels of uncertainty and/or risk should therefore be made through **analytical process**, whereby alternatives are formulated and analyzed using standard operating procedures. This type of process is most likely to make use of formal data on present and future conditions, and where information isn't available, to work on the basis of assumptions. As discussed in Strategy 2, it is important that efforts are also made to include both scientific and indigenous knowledge.

The appropriate frameworks will depend on the types of decisions that are made. For example, frameworks may be designed for comparing different project locations, or determining the level of funding required for a program. Martin et al. (2009) outline a number of frameworks for specific decisions that relate to ecological, project performance, and management decision thresholds.

Analytical processes can also be supported by a range of tools and techniques to reduce biases as a valuable step towards better evidence-informed decisions (see Tanner et al., 2020a). These tactics include having someone play devil's advocate, reference class forecasting (where planners are required to predict future outcomes by comparing previous similar situations), and searching for evidence that does not support one's own hypothesis.

Strategy 4. Make research accessible

The pursuit of scientific credibility can come at the cost of legitimacy in the eyes of decision makers, and different actors can have conflicting views about what constitutes legitimate information (Cook et al., 2013). The uptake and use of evidence are challenges for both the conservation and humanitarian sectors, as well as for the development sector more broadly. Analysis by the World Bank found that between 2008 and 2012, "nearly one-third of the World Bank's reports had never been downloaded, not even once. Another 40% of their reports had been downloaded fewer than 100 times. Only 13% had seen more than 250 downloads in their lifetimes" (Doemeland and Trevino 2014).

Decision makers are faced with competing demands and day-to-day pressures; they do not have time to comb through hundreds of resources to determine what is relevant, let alone to evaluate the quality of the evidence. The Swiss study referenced above (Fabian et al., 2019) found 75% of participating professionals cited lack of time as the main reason for not referring to publications relevant to their work. Time was a particular constraint for women (who worked part time or had family responsibilities) and for less experienced professionals who took longer to read and understand the material.

Conservation practitioners face additional challenges because the research publications are primarily written for an academic audience. Papers are often detailed and hard to understand (Cook et al., 2013), staff might not have the skills to synthesize the information (Pullin et al., 2004), and practitioners might have language constraints since most of the publications are in English (Fabian et al., 2019). Moreover, scientific and academic research relevant to conservation is housed in academic journals behind paywalls. Subscription costs are often high and can prevent practitioners from accessing the research (Fabian et al., 2019).

So how can research be made more accessible? The ALNAP explored whether the length of research reports affected its chance of being used by humanitarians. After consulting with its membership ALNAP found that people are more likely to use a long and rigorous research report if there is a video or summary document alongside it. This led the group to increase its investment in producing bite-sized outputs that summarize key points as gateways to its reports (Interview ID 8).

Another approach for increasing accessibility of research is storytelling. Recent discoveries in neuroscience have shown that storytelling techniques impact the brain of both the storyteller and listener (Zak 2015), allowing the audience to become emotionally receptive to facts and increasing the chance that they will remember and act on that information. New research suggests that no matter how a narrative is expressed — through words, gestures, or drawings — our brains relate best to the characters, focusing on the thoughts and feelings of the protagonist of each story (Yuan et al., 2018). There are a number of factors that researchers can consider in developing narrative stories about research; for example, the purpose of the story and the barriers to action, as well as pointing to a variety of resources, tools, and techniques that can help in this process (Tanner et al., 2020a).

[7] Including the majority of papers accessed for this research

Strategy 5. Influence organizational norms

Norms are the patterns of organizational decisions that respond to both internal and external pressures and are often based on informal or intuitive decision-making processes. These types of decisions are made for situations that are common, have occurred in the past, and can be expected to occur relatively frequently in the future and so require a generic response. They are based on best practices combined with the decision makers' understanding of the values of the organization.

In the conservation sector, one way for researchers to shape such practices is by influencing the development of organizational-level strategy documents and/or project-level management plans. These are documents that set out objectives and outline the proposed actions that will be taken to meet them within a specific time frame, as well as contain the monitoring necessary to evaluate progress in achieving objectives (Pullin and Knight 2003). A study conducted in Australia and the United Kingdom of protected area management plans from major conservation organizations reveals that the most sought source of information was existing management plans (Pullin and Knight 2005). In a second study conducted in the United Kingdom, 60% of management plan compilers reported that they always used or usually used existing management plans while making their decisions (Pullin et al., 2004). In an effort to ensure that organizations conform with these frameworks, institutions might overlook the evidence presented to them (Darcy et al., 2013).

Those who are invested in the production and use of evidence can therefore play an important role in identifying how, for example, ongoing research conforms with or amends existing strategies and management principles. This can be done through strategies like peer-reviewing documents or actively participating in strategy and planning processes.

Conclusion

This paper has summarized insights from both the literature and key informants on the role of evidence within organizational decision-making, with a particular focus on conservation. It builds on a rich body of literature that critiques the ways that organizations approach complex decision-making and the often ad-hoc ways in which evidence is used, but also acknowledges the difficult conditions in which many organizational decisions are made.

Complex system structures and behaviors all shape the way evidence is produced, used, or ignored in conservation decision-making. To mainstream the use of evidence in conservation decision-making, researchers and practitioners must acknowledge and effectively navigate the diversity of worldviews on what is defined as 'evidence' and the complexity of conservation decision-making. Only then can conservation teams develop actionable and mutually reinforcing solutions that foster the uptake of evidence in practice.

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Making Better Decisions

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