7

Inducing Better Stakeholder Searches for Environmental Information Relevant to Coastal Conservation

Diana L. Ascher and William Ascher

CONTENTS

7.1 Introduction

Sound knowledge is crucial for good coastal policy and management decision-making, as well as to guide farsighted practices by relevant resource users. We have in mind both group and individual decisions: (1) to support or oppose policy initiatives impacting coastal conservation, (2) to manage resources in particular ways, (3) to comply with conservation regulations, and (4) to engage

in voluntary conservation actions. In many contexts, marvelous opportunities to protect or improve coastal systems exist, but they are neglected because their benefits are underappreciated compared to their costs. And, of course, long-term risks also exist, for example, situating oil facilities nearshore or offshore, applying fertilizer to farmland near estuaries, and resisting or defying fishing moratoria; when such risks are underappreciated, significant damage can be done by misguided policies and practices.

Experts have recognized for decades that the complexity of coastal systems—involving land and sea effects, multiple affected industries, and multiple regulatory jurisdictions—necessitates integrated coastal management (ICM). (These challenges are explored in detail in Mercer Clarke 2010.) The need for integration requires that knowledge of coastal systems must not only be generated, but also be incorporated sufficiently in decisions by resource users, resource managers, and policy makers. In light of the highly polarized opinion camps on coastal conservation issues, reliance on overly simplistic information gathering and interpretation, especially when it leads to confirming existing narrowness and biases, creates a significant barrier to leaders who want to ensure that stakeholders have adequate knowledge about complex issues. Therefore, it is desirable for such information providers to induce stakeholders to engage in more active, systematic information seeking, as opposed to rudimentary information acquisition—or not seeking relevant information at all.

Yet, in many contexts over the past several decades, knowledge use has become more problematic than knowledge generation. As we shall argue, the use of knowledge to make sound decisions based on ICM inputs is challenging. Although remarkable progress has been made in generating information relevant to environmental decision-making, little attention has been paid to the creation of supplemental information to guide stakeholders in the *use* of this knowledge. Similarly, though challenges in the generation of sound environmental information persist, it is clear that the uptake of sound environmental information has not kept pace with its supply. Citizens, resource users, and policy makers too often rely on partial, inadequate, or inappropriate environmental information. To overcome the difficult challenges of integrated coastal management, the technical knowledge that often is *siloed* within esoteric groups or insulated fields must be synthesized, translated, and made actionable for the community at large. This is important particularly for selecting from among policies and practices that pose different types of risks residing in what seem like different areas of concern. Cass Sunstein (2002) documents environmental policy failures that occur due to misjudging or neglecting the relative risks of alternative policies. For example, declining agricultural yields may seem like an isolated challenge to farmers. However, to other stakeholders, such as fishers, this challenge presents a significant risk for long-term yields because of the potential for algal blooms and eutrophication of coastal waters due to increased fertilizer use (Anderson et al. 2002).

There is no shortage of possible reasons for the limited uptake of sound, actionable coastal conservation information by stakeholders. Unsound environmental messages can be retransmitted easily via social media networks, creating greater salience for members of the network than sound information that better represents the complex issues relevant to coastal conservation. Assessing the authenticity and authority of information sources can be challenging, raising doubt as to stakeholders' ability to identify valid information about coastal policies and practices. Similarly, overly technical information is daunting to stakeholders who lack the esoteric vocabulary that comes easily to those working directly on coastal conservation within governments, nongovernmental organizations (NGOs), and coastal management groups. In addition to the challenges posed by technical terminology and a lack of confidence in the ability to discern credible, authoritative information, the general overabundance of environmental information can cause stakeholders to develop an inaccurate judgment of the capacity for individual action to make a significant difference in the long-term sustainability of coastal conservation efforts. Further, a lack of differentiation from other messages concerning the environment, such as global climate change, makes coastal conservation knowledge vulnerable to issue fatigue.

These problems have been addressed largely with efforts to package and deliver sound environmental information more effectively. While such efforts are useful—particularly with regard to education and research in the technical arena—we maintain that the primary problems challenging the salience of sound environmental messaging and the ability of coastal conservation information to motivate action must be addressed from the other side, that is, by devising approaches to induce more effective acquisition and use of coastal conservation knowledge by stakeholders. Therefore, understanding how stakeholders acquire, interpret, and make decisions based on coastal conservation knowledge is instrumental to any attempt to improve coastal conservation knowledge transfer. This chapter offers approaches to enhance the salience of sound coastal conservation information and to motivate stakeholders to take action based on this information. Such approaches are not intended to supplant marketing and communications strategies to tailor information content and format for particular audiences; rather, our focus pertains to strategies informed by social interaction, identity formation, and triggers that motivate the use of sound coastal conservation knowledge, whether it is acquired actively or encountered passively.

It is important to note that the approaches may target one or more of four somewhat overlapping arenas in which acquisition and use of coastal conservation knowledge may be relevant to stakeholders:

- Individual action and state of mind: for example, complying with or defying regulations; adopting best conservation practices in farming, fishing, and so on; overcoming the anxiety arising from feelings of lack of mastery

- Peer interaction: for example, explaining ecosystem interactions, expressing views on what ought to be done regarding coastal management
- Collective action of nongovernmental stakeholders with common interests: for example, farmers jointly mounting a lobbying effort for or against a conservation proposal
- Government actions: funding research, creating regulations, invoking regulations in particular cases, assessing effectiveness.

Stakeholders may straddle various arenas, or information contexts. For example, sometimes stakeholders with common interests are also bound together through simple friendship or family ties, or membership in social or civic clubs that are not directly related to collective action with respect to resource exploitation. Sometimes stakeholders with personal or group interests also serve on governmental or quasi-governmental planning commissions, water district boards, and so on. Despite such overlaps, distinguishing among these arenas is important because it clarifies the multiplicity of instrumental uses of the knowledge (select a position, strengthen the argument for that position within the collective action group, strengthen the argument of that position vis-à-vis the government) and a host of other motives, including fulfilling basic psychological impulses, expressing value preferences, gaining intellectual mastery, and achieving personal advancement.

7.2 Knowledge for Sound Coastal Conservation Decision-Making

What does it mean to assert that a stakeholder has adequate knowledge to make sound decisions about activities that affect coastal conservation? This is the epistemological facet of the problem. Stakeholders must recognize that information is relevant and useful in order for them to decide to incorporate the information into their understanding of an issue. Relevance and utility of information are assessed in a variety of ways, including source trustworthiness, social consensus, and whether the new information makes sense in the context of the stakeholder's beliefs and value system.

Regarding the content facet of the problem, it is important to note that the standard scientific knowledge that is typically the heart of the ICM knowledge base has to be reinforced by the oft-neglected knowledge of the priorities and outlooks of other actors. What do *they* want; how do *they* see the world? For example, knowledge of current circumstances and causal patterns should encompass the objectives, intensity, and outlooks of both allies and opponents. This includes beliefs about causal patterns. Thus, if opponents of

a conservation plan see a causal link between the plan's elements and serious declines in their yields, they may conclude that the plan would destroy their businesses. The plan's proponents, however, may be surprised by this conclusion if they had believed it was common knowledge that the effects on yields would be minimal. In short, the actual causal patterns are only one aspect of conditioning factors that one must assess; the perceptions held by others are essential, whether accurate or not. These viewpoints often are difficult to understand without research, especially because opposing groups may have significantly different value systems from which their issue-oriented positions derive. More often than not, advocates of one perspective assume opponents are ignorant, naïve, misinformed, or mal-intentioned, rather than consider the possibility that opponents are operating with a different worldview.

To comprehend the multiple perspectives of other stakeholders and the motivations underlying their actions requires a sufficiently comprehensive mapping of priorities, and sufficiently insightful understanding of *others'* understandings of the effects of alternative policies and practices. In polarized policy debates, with positions often expressed with hyperbole and demands couched in extreme terms for the sake of negotiation, nuanced information about the preferences and outlooks of others rarely can be acquired without active information search. This greatly increases the knowledge burden for those engaging in coastal conservation policy issues and, consequently, the need for more comprehensive information searches.

To address the challenges of inducing more useful information searches, we first present an overview of knowledge transfer and information behavior. Next, we identify opportunities for intervention in the knowledge-acquisition process that can be leveraged to enhance the salience of sound coastal conservation information and motivate informed use of this knowledge by stakeholders. Finally, we suggest categories of strategies to enhance coastal conservation stakeholders' decision-making. The chapter concludes with implications of these approaches and suggestions for future research.

7.3 Knowledge Transfer, Acquisition, and Information Behavior

If the aim is to improve stakeholder use of sound information, several aspects of the knowledge-acquisition process must be understood and leveraged to ensure stakeholders have adequate knowledge for coastal conservation decision-making. Decision-making and information behavior are interconnected in both theory and practice. Information studies researchers have tended to focus on the stages and manners in which people use systems and networks to find and/or encounter information that affects their decision-making. The emphases of these studies include access, ease of use, quality,

quantity, relevance, and speed, with information scientists emphasizing how systems help or hinder the information-seeking process, and information studies researchers tending to focus on the information context and the societal forces that can threaten access and use. Behavioral and decision scientists, on the other hand, tend to focus on how and why various biases prevent people from using information to generate the best outcomes according to rational economic theory. Researchers in both broad domains (as well as in psychology, sociology, and public policy) have explored the roles of uncertainty and information need as motivators of information search.

Most models of information-seeking behavior are based on the premises that (1) individuals are engaged in an active search task to reduce anxiety arising from the recognition of a knowledge deficit, (2) the search process has a discernible start and terminus, (3) knowledge acquisition is equivalent to understanding, and (4) information retrieval systems are unbiased. For marvelous detail on information behavior models, see Case (2012). Information studies research over the past half-century has yielded several useful models of information behavior: Ellis's (1984) behavioral model of information search strategies, Kuhlthau's (1988, 1991) information search process, and Wilson's (1997, 1999) problem-solving model, as well as contributions from Bates (1989), Belkin (1996), Choo et al. (1998, 1999), Dervin (1998), Ingwersen (1984, 1996, 2001), Krikelas (1993), Leckie and Pettigrew (1997), Leckie et al. (1996), Marchionini (1995), Savolainen (2007), Sonnenwald (1999), Sonnenwald et al. (2001), and Spink (1997), among others.

Most of these models are predicated on the notion of the needy information seeker engaged in a goal-directed search using context-agnostic information-retrieval systems that, when properly configured, transfer knowledge from information generator to information seeker. However, an examination of the constraints of the most highly regarded models of information-seeking behavior yields insight into how coastal conservation knowledge transfer efforts can be enhanced.

Four important aspects of knowledge transfer are missing from several of these models: (1) information may be sought, but also it may be encountered, raising questions of intentionality; (2) knowledge acquisition is a dynamic, recursive, nonlinear process, raising issues of salience and classification of information; (3) information acquisition does not ensure knowledge, raising epistemological concerns; and (4) information retrieval systems manifest the biases and assumptions inherent in their algorithms, raising apprehension about objectivity. We briefly address each of these concerns in the context of coastal conservation knowledge transfer.

7.4 Seeking and Encountering Information

While we know that people seek information through a variety of channels, the advice of family members and friends remains one of the primary

sources of opinion-forming sustainability information for many people. For example, in the United States, an assessment of the conditions related to the adoption of sustainable agricultural practices concludes:

> It has long been known that information sources besides agriculture professionals, such as mass media and family and friends, are vitally important in helping a farmer become aware of new agricultural techniques. … More recently, farmers have reported that their most utilized sources of information are chemical and fertilizer dealers, followed by family and friends, and media publications. Professional sources of information, such as the extension service and USDA [US Department of Agriculture] personnel, have been ranked lower in importance. (Fazio et al. 2005, p. 27)

We also know that the Internet has expanded people's search options—there were an average of 5.74 billion Google searches conducted per day in 2014 (Statistic Brain Research Institute 2015)—both in terms of information retrieval mechanisms and social networks. Further, traditional media channels now incorporate new media messages as sources of goals, trends, conditioning factors, projections, and preferred alternatives, drawing attention in popular discourse. Aside from turning to these information channels, people encounter information—serendipitously and/or incidentally—throughout their daily activities (Rice et al. 2001). Understanding the contexts of encountered information and how such information is incorporated into people's stances on hotly debated issues is at least as important as generating sound coastal conservation technical information. Therefore, those concerned with coastal conservation knowledge transfer must consider both passive information encountering, as well as active, systematic information-seeking behavior. This is particularly important, because people tend to evaluate encountered information using heuristics, which we explain after a brief discussion of intentionality.

The balance of passive and active information behavior tends to correlate with the degree of intentionality of the information recipient. By definition, active information seekers intend to locate and interpret knowledge about a topic and use various resources to do so; passive information recipients encounter knowledge about a topic without undertaking an intentional search for that information. In both cases, the judgments about whether and how to classify and use the acquired knowledge are governed by several factors, including the information recipient's (1) background and beliefs, (2) cognitive ability and load, and (3) estimation of the usefulness of the information.

The intersection of information behavior and information literacy is, perhaps, the most important area on which to focus in efforts to improve stakeholder decision-making based on sound coastal conservation knowledge. As Williamson and Asla (2009) observed in their study of people in the "Fourth Age," information literacy (defined as the ability to recognize a need for

information and take action to acquire it) is very often the result of engagement in strong information networks. In addition, Williamson and Asla concluded that, in some circumstances, the knowledge gained as a result of active information-seeking behavior is less useful than the information people passively encountered through interactions within social and professional networks.

Table 7.1 presents a matrix of active versus passive information seeking and the process by which information recipients classify knowledge for use. As noted above, adequate knowledge for coastal conservation decision-making requires either:

1. Active, systematic knowledge acquisition to become informed about the assumptions, perspectives, and motivations that create the information context in which a stakeholder makes decisions, or
2. Passive, heuristic knowledge classification that allows for rapid assimilation of new information into the stakeholder's perspective on the issue at hand.

Often, the relevance, veracity, completeness, and usefulness of information are not evaluated through thorough analysis; instead, they are evaluated according to analytical shortcuts that go by the label of "heuristics." For example, an environmental activist might see a particular pro-economic-growth leader on television advocating for incentives for oil companies and have the heuristic response of filing the messages under "total nonsense." This heuristic—anything that leader says is total nonsense—is not universally accurate, but it saves the activist the time and effort of analyzing the leader's messages and determining their value relative to all the other

TABLE 7.1

Intentionality and Information Behavior

	Systematic	**Heuristic**
Active	Explore multiple perspectives Evaluate authenticity and authority Assess dynamic context • Goals • Trends • Conditioning factors • Projections • Preferred alternatives	Classification according to individual or group identity • Confirmation bias • Assimilation bias
Passive	Opportunity for intervention	Classification according to individual or group identity • Confirmation bias • Assimilation bias

information about corporations, the environment, and climate change that he/she seeks and encounters.

It is crucial to understand that under conditions of uncertainty, no judgment can be fully comprehensive. Herbert Simon's 1978 Nobel Prize in Economics was based on his twin insights of (1) *bounded rationality*, whereby future events and conditions depend on an unbounded number of possible conditioning factors; hence, rationality (in the sense of selecting the definitively known optimal decision) is always bounded; and (2) *satisficing*, whereby given the impossibility of knowing everything, and given constraints on resources, people tend to end their searches when they deem the results are "good enough," where "good enough" is a function of expected effectiveness and the individual's assessment of the trade-offs involved in expending the effort (Simon 1959). The most prominent proponents of the *heuristics* and *biases* paradigm embrace Simon's insights with the premise that reaching judgments, whether through deliberate search or intuition, cannot entail a fully comprehensive search (Kahneman 2003). Kahneman and Frederick (2002) propose that because the case at hand cannot be subjected to intensive scrutiny given the limitations of time and other resources, the heuristic process entails "attribute substitution," whereby characteristics of the current case are substituted with attributes of prior cases or generalizations regarding those cases.

Thus, when Todorov, Chaiken, and Henderson contrast heuristic and systematic information processing related to risk assessment, what they really mean (or at least ought to mean) is that some processing is rudimentary while other processing is *more*, *but never fully*, systematic. They try to clarify the distinction by noting that "[i]n a systematic mode, people consider all relevant pieces of information, elaborate on these pieces of information, and form a judgment based on these elaborations" (Todorov et al. 2002, p. 196). They contrast this with the heuristic mode:

> However, even if people are not sufficiently motivated or do not have sufficient cognitive resources, they can engage in superficial or heuristic processing of available information … people consider a few informational cues—or even a single informational cue—and form a judgment based on these cues. For instance, such cues may be the source of the message or the length of the message. (Todorov et al. 2002, p. 196)

The premise that people *can* consider *all* pieces of relevant information flies in the face of the bounded rationality concept. In fact, although Todorov, Chaiken, and Henderson list reliance on the source of a message as a possible heuristic action, even highly systematic information processing depends to a certain extent on the shortcut acceptance of information as credible based on a belief that the source is regarded to be expert, truthful, or both, rather than on the basis of corroborating or validating evidence. The useful distinction between these forms of information processing is that some information processing relies on a few new cues, while other information processing relies on a richer set of cues. In other words, heuristics can be rudimentary or sophisticated.

Moreover, Kahneman (2003, p. 697) points out that heuristics can be deliberate or intuitive. Deliberate reliance on heuristic classification of information can be a conscious choice selected to increase efficiency of knowledge acquisition. In Table 7.1, deliberate heuristic judgment would fall in the upper-right quadrant, active heuristic classification according to the decision maker's acknowledged values, beliefs, and identity. Intuitive heuristics, on the other hand, are used "automatically and rapidly" (Kahneman 2003, p. 697) and occur within particular cultural, political, or social milieus that do not encourage teasing out the layers of complexity that result in opposing viewpoints. They would fall in the lower-right quadrant of Table 7.1; people making decisions based on passive heuristic information acquisition may not even be cognizant of the heuristic judgments entailed in the decision-making process. For example, the rapid, automatic assumption that a highly respected professor's findings are valid presumes that she has employed an appropriate paradigm. In most countries today, full professors at distinguished universities are regarded broadly as likely to be highly expert in their areas of specialization. This was less so, for example, in the United States in the 1960s and 1970s.

Therefore, biased searches can derive from passive heuristic judgments that entail attribute substitution, that is, replacing a more complex, analytically challenging attribute such as the current issue at hand with a more easily understandable attribute, such as an expert's view or the outcome of a past case. This would cut down on the evaluative work of information classification during a search. By substituting attributes, for example, the decision maker assumes the professor's findings are valid and can allocate mental, physical, and financial resources to a more extensive exploration of other information related to the decision (Schulz-Hardt et al. 2000). Thus, accepting the opinion of the authoritative source rests on the representativeness heuristic: the individual believes the expert's opinion is similar to the population of the expert's past opinions; because these opinions are regarded as correct, the expert's opinion on the current matter is assumed to be correct, as well.

The ambivalent treatment of heuristics in the literature, as a source of bias but also as "efficient cognitive processes" (Gigerenzer and Gaissmaier 2011, p. 451), raises the question of whether people can be equipped with guidance to employ sound and efficient search heuristics actively, yet remain cognizant of behavioral tendencies that can undermine systematic or active heuristic decision-making. Gigerenzer and Gaissmaier note that

> [b]ecause using heuristics saves effort, the classical view has been that heuristic decisions imply greater errors than do "rational" decisions as defined by logic or statistical models. However, for many decisions, the assumptions of rational models are not met, and it is an empirical rather than an a priori issue how well cognitive heuristics function in an uncertain world.

Going back to Todorov, Chaiken, and Henderson's juxtaposition of heuristic versus systematic searches, we must conclude that if a relatively quick

search is the only search an individual is willing to undertake, guidance on how to make the most of it could be very helpful.

7.5 Overcoming Obstacles to Inducing More Effective Searches

While individuals or organizations may be *capable* of engaging in more systematic information-seeking behavior, different scenarios dictate the extent and nature of further search activity. First, some may be unaware of the risks and/or opportunities involved with the issue, or find the issue to be of such low salience to their welfare or deference values—Lasswell's distinction between valued material outcomes and valued relationships, respectively, which we detail in Section 7.7.3—that no search is worth the effort. Second, some may regard the issue as salient, but despair that a search would not provide useful guidance in making decisions, either because they (a) believe constructive understanding is beyond their grasp or (b) do not believe that gaining the knowledge would help them take effective action. Finally, some may have views based on prior knowledge acquisition such that they are con-fident they can make sound decisions without seeking additional information. None of these scenarios induces stakeholders to believe that further search would have a reasonable chance of improving the instrumental effectiveness of their actions or their deference rewards. Each of these implies thresholds of salience, confidence, or both. These thresholds, which differ for every person and in every unique context, are set according to the potential information seeker's assessment of the expected intelligibility and usefulness of additional information, the trustworthiness of the information source, the gravity of the decision, and the belief that the process by which the information was acquired will stand up to scrutiny. In other words, a person sets these thresholds, often unconsciously, based on his or her belief that the search effort is commensu-rate with the level of attention that the issue at hand deserves. This complex decision-making protocol exposes several facets of information behavior that are not addressed by Zipf's principle of least effort, which asserts informa-tion seekers tend to use the most convenient, minimally demanding search method until just barely acceptable information is acquired (Zipf 1949).

Those interested in inducing more effective information-seeking behavior with the aim of helping stakeholders base their decisions on sound environmental (or any other kind of) knowledge should note that any stakeholder is not merely a needy, lazy information seeker. Rather, every individual employs a multifaceted decision-making process based on the individual's assessment of how each of the factors (confidence, salience, utility, gravity) affects to his or her ability to improve directly instrumental effects and def-erence rewards. For example, if an influential farmer is considering a request by a member of his or her political party to persuade others to acquiesce

to a policy initiative that tightens run-off regulations, he or she may conduct a search by reading the government's policy briefs, talking with the agricultural extension agent, visiting websites about the risks of fertilizer and pesticide run-off, skimming Twitter feeds, reading the bulletins of farmers' associations, or consulting any number of other information sources. Some of these searches may seem too time-consuming or unlikely to provide understandable results. The farmer may, in fact, do no search, relying on his or her existing beliefs; otherwise, he or she not only must select sources of information, but also must decide how much effort to put into the search.

The amount of effort a decision maker is willing to expend also is influenced by the degree and nature of affect. The degree of affect associated with commitments to influence coastal policies or practices is part of the implicit or explicit benefit-cost calculus that determines whether a particular search activity is worthwhile for that individual. While the predominant focus of efforts to increase commitment to conservation has focused on the positive affects associated with love for nature or for future generations, it is important to recognize the mobilizing strength of appealing to darker impulses. The focus on emotion and affect in the information studies field largely has concerned feelings that would deter otherwise-motivated searches, such as anxiety and intolerance of uncertainty (Wilson, 1997, p. 555), lack of confidence, frustration, doubt, pessimism, or disappointment (Kuhlthau, 1991, p. 367). We propose the alternative of focusing on fundamental drives that may heighten basic motivation and overcome these feelings, resorting to the classical distinctions among raw impulse, reason, and conscience. (These categories were defined in the field of political psychology in the more traditional Freudian language of id, ego, and superego (Lasswell 1932)). This slice of the mental process is a useful basis for search-promotion strategies because appeals can be targeted systematically to each drive or combination thereof. Aside from the obvious instrumental goals pursued through reason, appeals can be directed to positive impulses such as camaraderie or to negative impulses like aggression; there can be appeals to conscience, with the potential flexibility of specifying different norms as ethical. Such appeals change the least-effort calculus in terms of the value individuals and groups place on their identification as environmentalists, good citizens, winners, or ethical people, respectively.

7.6 Strategies for Mobilizing Motivations

Under the assumption that intentional searches are goal-directed, the first aspect of constructing potential strategies is to offer a map of possible goals held by individuals for whom we would hope to induce better information-seeking behavior. A useful organizing principle is the distinction between directly instrumental motives related to advancing material interests

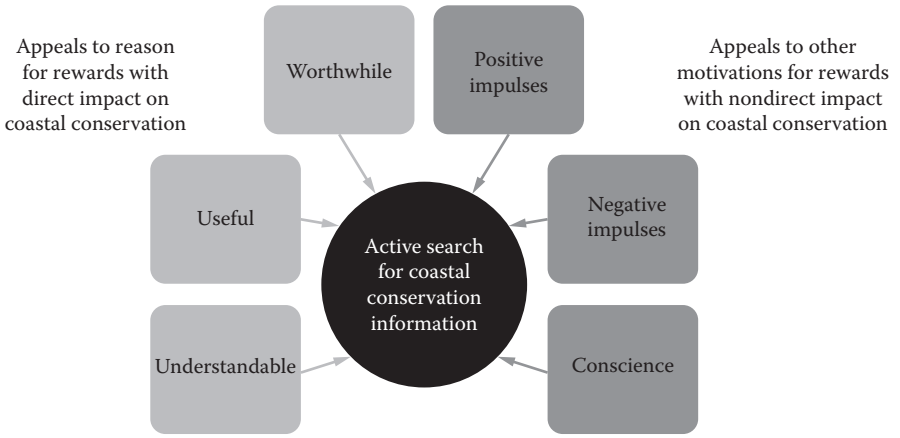

FIGURE 7.1
Appeals to induce active search for coastal conservation information.

through activities or policies affecting coastal systems, and motives that have no such direct connection. The breadth of potential strategies to motivate searches rests on the fact that while the objectives of stakeholders may pertain directly to rewards from achieving preferred outcomes of coastal policy or practices, others' objectives do not. Those who develop coastal conservation information and strategies to induce the acquisition of this information are likely to focus intently on motivating stakeholders to choose sound policies and practices, yet other, indirect motivations may be even more useful in particular contexts. In other words, opportunities to encourage improved information-seeking behavior arise not only from efforts to increase the reach and salience of targeted coastal conservation messaging, but also from appealing to motivations associated with achieving objectives that may or may not have anything to do with coastal conservation at all. The simple diagram in Figure 7.1 conveys the implications of the two kinds of appeals that can act as motivation for active information search related to directly instrumental and nondirectly instrumental objectives.

7.7 Strategies

7.7.1 Category 1: Supplemental Information

7.7.1.1 Supplemental Information on How Core Information Can Be Used

Focusing first on the left-hand side of the diagram in Figure 7.1, those appeals to reason that have direct impact on coastal conservation, we make the perhaps

obvious point is that for a search to be motivated by the desire to choose optimal policies or practices, the individual must have sufficient confidence that knowledge exists and that it can be accessed readily, understood adequately, and used effectively. The individual must also have sufficient confidence that an instrumentally effective search stemming from an appeal to reason is worth the time and other resources required for the search. Although good effort has been put into organizing the knowledge needed for managers to engage in ICM (e.g., Perry et al. 1999; Berkes et al. 2007; Lertzman 2009), or its cousin, adaptive management (e.g., Allan and Curtis 2003; Lawrence and Bennett 2002), to make directly applicable knowledge more understandable and usable for lay stakeholders, another class of knowledge is important: *how to use* the direct-impact knowledge. Such *utilization information*, beyond the technical knowledge of the projected consequences of policies and resource practices, may be needed to instill this confidence in the decision maker. One type of utilization knowledge is epistemological: whether and how the knowledge can be understood. The other type of utilization knowledge is sociopolitical: how the knowledge can further the objectives of the individual, group, or organization. For example, in addition to understanding that agricultural run-off may erode nearshore ecosystems, the motivation to master this knowledge may require confidence in its usefulness, perhaps to invoke scientific projections in support of a lawsuit demanding a stronger conservation effort. There may be opportunities, such as workshops, write-ups of past cases, and so on, to help stakeholders use more helpful heuristics as bases for judgments of relevance and usefulness of information. It should be noted that decision aids abound to assist resource managers (Holling 1978; Pearson et al. 2010), but few exist to assist lay stakeholders.

Another approach entails organized interactions between experts and lay stakeholders. A host of formats, many pioneered in Europe, such as citizen advisory committees, citizen juries, consensus panels, science shops, study circles, and joint fact-finding commissions, are among the venues that can support such expert-novice engagement. These are all variants of exchanges in which stakeholders clarify their objectives and concerns, work with experts to project possible outcomes of policies, and help orient scientific research and knowledge dissemination (Rowe and Frewer 2000; Ascher et al., 2010, pp. 195–196). Such strategies translate well to online discussion groups, webinars, podcasts, and other technologically facilitated interaction. In all cases, however, the stakeholder must know the opportunity for interaction exists and is accessible, and that the information that may be gained through such interaction is understandable, actionable, useful, and worth the effort to acquire. These approaches have the advantage of both conveying that relevant knowledge can be grasped, and presenting stakeholders with current information to offset searches that return obsolete information. However, these approaches can run into opposition if some participants believe that the formats are manipulated to gain compliance for particular policies. Even so, strong efforts by participating groups can be reassuring if their leaders

have sufficient knowledge and influence regarding the balance and credibility of the experts brought into the deliberations.

7.7.1.2 Supplemental Information on Calibrated Uncertainty

Although ICM theorists and practitioners have endorsed the notion that uncertainty ought to be embraced rather than ignored or used as a pretext for inaction, it is still important to overcome the dual dangers that information about projections of future consequences of policies or practices is either certain—which could cut off the search prematurely—or totally uncertain—which could discourage the search entirely.

7.7.2 Category 2: Mitigating Heuristic Bias in Information Search

Numerous strategies may be suitable for *de-biasing*, or mitigating human judgment biases, as well as the *filter bubble* that arises from search algorithms that tailor search engine results based on a searcher's prior online activity:

- Nisbett et al. (1982, pp. 448–451) suggest that clarifying the distinctiveness of the circumstances in which the most available or apparently representative cases occurred could help decision makers weigh the prevalence of accounts described in search results more appropriately. Thus, calling attention to particular circumstances under which relevant outcomes occurred may counteract the availability and representativeness biases. Clarifying the circumstances in which presumed experts produced their assessments, and conveying that changed circumstances bring these assessments into question, might induce active seeking for updated information.
- The availability bias can be offset further by publicizing summaries of a broader range of circumstances, events, or policies, to focus attention on other cases in addition to the most prominent one(s). For example, to offset the presumption that the consequences of the next initiative to enact a fishing moratorium will be the same as the latest or most painful moratorium, the local newspaper could run a feature on "The History of Fishing Bans—Balancing Access and Sustainability." The tendency to presume that the pending issue is similar to a narrow set of previous cases could be addressed by the same tactic of giving prominence to many different cases. Of course, this becomes more difficult as Internet users customize their search behavior and tools in ways that fuel the confirmation bias.
- Nisbett et al. (1982, p. 447) and Fischhoff (2002, p. 746) suggest that specifying the assumptions underlying the analyses of credible sources may reveal their possible shortcomings. This could also

clarify which assumptions may no longer hold. Further, explicit description of tendencies of humans and algorithms to focus attention on information that confirms existing beliefs might prompt stakeholders to investigate alternate perspectives.

- Wilson et al. (2002, p. 197) suggest that conveying a full range of possible outcomes can offset overconfidence in the most obvious possible outcome by presenting pathways and explanations that could lead to other results. This is a means of conveying uncertainty without implying that the uncertainty is so crushing that further information seeking would be futile.
- Specifying how the current issue differs from some prior issues can make the set of representative cases more appropriate. This may require discipline to avoid overpublicizing the most striking or exciting cases; by countering salient generalizations with strategic promotion of specific, distinctive cases to serve as representative cases, calling attention to differences may induce stakeholders to undertake deeper information searches.
- The presumption that the view of the individual or institution perceived as most authoritative ought to be accepted unquestionably may be offset by publicizing the views of other individuals or organizations of comparable repute. For example, the views of major environmental groups such as the Natural Resources Defense Council (NRDC), the Environmental Defense Fund, the Sierra Club, and Greenpeace on issues such as hydraulic fracturing or offshore drilling, or on the advisability of collaborating with the corporate sector, vary considerably. Exposing pro-environment individuals to this range of *pro-environment* views would clarify that no single source has a monopoly on pro-environmental expertise or commitment.

7.7.3 Category 3: Social Strategies for Strengthening Search Incentives

The right side of Figure 7.1, depicting appeals leading to nondirect impacts, suggests that searches can be triggered by any of a range of rewards expected as a result of undertaking the search, regardless of whether or not the search ultimately provides directly instrumental coastal conservation benefits resulting from particular policies or practices. For example, while a fisher's decision to learn whether it is in her interest to abide by a fishing moratorium is an obvious example of the directly instrumental category, the alternative, nondirectly instrumental category would be exemplified by a parks and wilderness society member's effort to gain greater mastery of coastal ecology in order to earn the respect of other chapter members or simply to feel good about the increased mastery. We could hope that this nondirectly instrumental motivation will lead to knowledge acquisition that is deployed soundly in selecting directly relevant actions.

Rather than fastening on one or a few motivations, such as mastery per se or respect from peers, a fairly comprehensive map is necessary to depict the enormous variety of motivations that may be mobilized effectively across contexts. Such a map yields a host of possible appeals with the potential to induce better searches. Even so, for a particular context, these potential motivations can be identified systematically. We propose the use of the "valued outcomes" categories of the policy sciences framework (Lasswell and McDougal, 1991, pp. 35–38) as an effective tool for assisting in the identification of both potential motivations involving expected rewards from policies and practices, as well as the rewards that do not derive from these policies and practices. The categories and illustrative examples are displayed in Table 7.2.

Lasswell and Kaplan (1950, pp. 55–56) distinguish two broader motivational categories: "welfare values" ("those whose possession to a certain degree is a necessary condition for the maintenance of the physical activity of the person") and "deference values" ("those that consist in being taken into consideration [in the acts of others and of the self]"). As a first approximation, the welfare values pertain largely to instrumental motives. The deference values, especially power, can be deployed to pursue welfare values, but the key point is that they may be valued in and of themselves, apart from advancing the material interests involved in coastal management. Because each of these motivational categories listed in Table 7.2 is plausible, it is

TABLE 7.2

Categories of Valued Outcomes

Category	Value	Example
Welfare values	Enlightenment	Greater sense of understanding and mastery
	Wealth	Greater sustainable yields; higher ecotourism revenues
	Wellbeing	Lower health risks; reduction of anxiety stemming from feelings of lack of mastery
	Skill	Higher status within an organization; greater success for the organization
Deference values	Power	Influence within an organization; group's success vis-à-vis other groups
	Respect	Status among peers and within an organization
	Affection	Friendship among peers and within an organization
	Rectitude	Being a responsible citizen or group representative

worth exploring which motives are most compelling on a case-by-case basis. The virtue of both instrumental and noninstrumental objectives presents a challenge for those who are trying to motivate more effective searches. Nevertheless, we present several strategies appropriate when particular motivations are known to be potent.

7.7.3.1 Strategies for Conservation Groups

One approach available to nongovernmental conservation organizations is to decentralize decision-making such that the members of local branches or chapters (a) feel a responsibility to be well-informed in order to take positions, and (b) reward local members with respect and power insofar as their mastery is known and regarded as an asset to the organization. In the United States, the Sierra Club, with its fairly small chapters and its penchant for giving a host of local and national awards every year, is a notable example of this approach. In contrast, the NRDC, with well over a million U.S. members, a lack of chapters, and its trumpeting of its "expertise of more than 350 lawyers, scientists and other professionals" (NRDC 2014), provides little incentive for members to engage in their own searches on environmental issues. As one member communicated in confidence, "[t]he NRDC has very smart people. If they say that fracking is a bad idea, it's a bad idea." Why search for knowledge about the relative risks of fracking versus continued reliance on coal, with its greater burden of greenhouse gas emissions and conventional pollution than natural gas, when smart people have already determined the best course of action? And how can one debate the fracking advocate who cites statistics on emphysema from particulates, except to say that smart people oppose fracking? Although it is unclear whether the NRDC leadership's actual position is truly so definitive, or whether it is a negotiating stance vis-à-vis the government and the energy industry, the heuristic shortcut of taking its position as the last word in expert analysis is clearly problematic.

Another strategy for conservation NGOs is to co-finance and collaborate in designing research projects along with the relevant industrial groups. Busenberg (1999) has demonstrated the greater credibility of collaborative research and guideline development regarding oil spills. This approach has been shown to reduce confusion over the authenticity and authority of information sources in a manner akin to governmental checks and balances.

7.7.3.2 Strategies for Government

As mentioned previously, governments have the potential to organize interactions between lay stakeholders and experts. They should also consider increasing stakeholder affect by stimulating face-to-face debates among citizens with opposing views. Although rivalry seems to have no place in the idealized vision of rational debate, the reality is that conservation debates

tend to be acrimonious. Pro-conservation activists are criticized either as naïve, accepting the doomsday scenarios of radical environmental activists, or as elitists, uncaring about the economic burdens on less well-off citizens imposed by stringent conservation regulations. Opponents of stronger conservation measures are criticized as selfish, shortsighted, and naïve in ignoring the consequences of weak conservation efforts. Therefore, the raw-impulse motive of feeling superior to those with opposing views—afforded by being able to marshal more evidence to win the debate—can be a powerful motivation, which dovetails with the rational need for gratifying affiliations and identifications, as well as the need to be a conscientious citizen. At the same time, face-to-face debates, such as town meetings and open hearings, provide each side insight into the perspectives of others.

7.8 Conclusion

While those charged with providing coastal conservation information for stakeholders have focused on generating and organizing core technical information, much more needs to be done to strengthen the incentives for stakeholders to search for, make sense of, and make decisions based on the knowledge needed for sound resource practices and stances toward conservation policies. Both to increase the motivation to seek information actively on the effects of coastal policies and practices and to make the acquired knowledge more useful, the generation of information must be broadened to encompass how the core information can be supplemented by information to mitigate bias in the decision-making process, as well as to present alternate perspectives to provide opportunities for greater understanding of the range of relevant viewpoints. Regarding social pressures, the basis for optimism is that so many potential appeals can be made. The more general point is that organizations convey the roles that they expect their members to play. If the role is to engage in meaningful debate with policy adversaries or to persuade other resource users that sustainable practices are imperative, it is incumbent upon the organization to emphasize and reward this role. As we have described, inducing better searches for coastal conservation information can be accomplished through appeals to reason that trigger stakeholders' consideration of welfare values concerning direct effects on coastal conservation, as well as by leveraging other motivations, which appeal to deference values to nudge people to conduct more thorough searches and to take action that has nondirect effects on coastal conservation.

In short, insights from information studies and the psychology of motivating more sound information-seeking behavior can be useful to guide prototypes and focus groups to determine which strategies are promising in particular contexts. What it cannot do is specify a general strategy that will

hold in every case, as contextual factors must inform the development of strategies to motivate better knowledge practices.

References

Allan, C. and A. Curtis. 2003. Learning to implement adaptive management. *Natural Resource Management* 6: 23–28.

Anderson, D., P. Gilbert, and J. Burkholder. 2002. Harmful algal blooms and eutrophication: Nutrient sources, composition, and consequences. *Estuaries* 25 (4): 704–726.

Ascher, W., T. Steelman, and R. Healy. 2010. *Knowledge and Environmental Policy: Re-Imagining the Boundaries of Science and Politics*. Cambridge, MA: MIT Press.

Bates, M. 1989. The design of browsing and berrypicking techniques for the online search interface. *Online Review* 13 (5): 407–424.

Belkin, N. 1996. Intelligent information retrieval: Whose intelligence? In *Proceedings des 5. Internationalen Symposiums für Informationswissenschaft (ISI '96)*, 25–31. Konstanz: Universtaetsverlag Konstanz.

Berkes, F., M. Kislalioglu Berkes, et al. 2007. Collaborative integrated management in Canada's north: The role of local and traditional knowledge and community-based monitoring. *Coastal Management* 35: 143–162.

Busenberg, G. 1999. Collaborative and adversarial analysis in environmental policy. *Policy Sciences* 32 (1): 1–11.

Case, D. O. 2012. *Looking for Information: A Survey of Research on Information Seeking, Needs, and Behavior*. Bingley: Emerald Group.

Choo, C. W., B. Detlor, and D. Turnbull. 1998. A behavioral model of information seeking on the web: Preliminary results of a study of how managers and IT specialists use the web. Paper presented at the American Society of Information Science, Pittsburgh, PA.

Choo, C. W., B. Detlor, and D. Turnbull. 1999. Information seeking on the web: An integrated model of browsing and searching. In *Proceedings of the 62nd Annual Meeting of the American Society for Information Science, Washington, DC. Knowledge: Creation, Organization and Use*, edited by L. Woods, 3–16. Medford, NJ: Information Today.

Dervin, B. 1998. Sense-making theory and practice: An overview of user interests in knowledge seeking and use. *Journal of Knowledge Management* 2 (2): 36–46.

Ellis, D. 1984. The effectiveness of information retrieval systems: The need for improved explanatory frameworks. *Social Science Information Studies* 4: 261–272.

Fazio, R., J. M. Rodriguez Baide, and J. Molnar. 2005. Barriers to the adoption of sustainable agricultural practices: Working farmer and change agent perspectives: Final report. Auburn, AL: Auburn University, Department of Agricultural Economics and Rural Sociology.

Fischhoff, B. 2002. Heuristics and biases in application. In *Heuristics and Biases: The Psychology of Intuitive Judgment*, edited by T. Gilovich, D. Griffin, and D. Kahneman, 730–748. Cambridge: Cambridge University Press.

Gigerenzer, G. and W. Gaissmaier. 2011. Heuristic decision making. *Annual Review of Psychology* 62: 451–82.
Holling, C. S., ed. 1978. *Adaptive Environmental Management and Assessment*. Chichester: Wiley.
Ingwersen, P. 1984. Psychological aspects of information retrieval. *Social Science Information Studies* 4 (2/3): 83–89.
Ingwersen, P. 1996. Cognitive perspectives of information retrieval interaction: Elements of a cognitive IR theory. *Journal of Documentation* 52 (1): 3–50.
Ingwersen, P. 2001. Users in context. In *Lectures on Information Retrieval: Third European Summer-School 2000, Varenna, Italy, September 11–15, 2000, Revised Lectures*, edited by M. Agosti, F. Crestani, and G. Pasi, 178–200. Berlin: Springer-Verlag.
Kahneman, D. 2003. A perspective on judgment and choice: Mapping bounded rationality. *American Psychologist* 58 (9): 697–720.
Kahneman, D. and S. Frederick. 2002. Representativeness revisited: Attribute substitution in intuitive judgment. In *Heuristics and Biases: The Psychology of Intuitive Judgment*, edited by T. Gilovich, D. Griffin, and D. Kahneman, 49–81. Cambridge: Cambridge University Press.
Krikelas, J. 1993. Information-seeking behavior: Patterns and concepts. *Drexel Library Quarterly* 19 (2): 5–20.
Kuhlthau, C. 1988. Developing a model of the library search process: Cognitive and affective aspects. *Reference Quarterly* 28: 232–242.
Kuhlthau, C. 1991. Inside the search process: Information seeking from the user's perspective. *Journal of the American Society for Information Science* 42 (5): 361–371.
Lasswell, H. D. 1932. The triple-appeal principle: A contribution of psychoanalysis to political and social science. *American Journal of Sociology* 37: 523–538.
Lasswell, H. D. and A. Kaplan. 1959. *Power and Society*. New Haven: Yale University Press.
Lasswell, H. D. and M. McDougal. 1991. *Jurisprudence for a Free Society*. Dordrecht: Kluwer.
Lawrence, P. and J. Bennett. 2002. Improved planning and management in coastal environments using an adaptive management framework. *Water: The Journal of the Australian Water Association* 29 (6): 24–27.
Leckie, G. and K. Pettigrew. 1997. A general model of the information seeking of professionals: Role theory through the back door? In *ISIC '96 Proceedings of an International Conference on Information Seeking in Context*, 99–110. London: Taylor Graham Publishing.
Leckie, G., K. Pettigrew, and C. Sylvain. 1996. Modeling the information seeking of professionals: A general model derived from research on engineers, health care professionals, and lawyers. *The Library Quarterly* 66 (2): 161–193.
Lertzman, K. 2009. The paradigm of management, management systems, and resource stewardship. *Journal of Ethnobiology* 29: 339–358.
Marchionini, G. 1995. *Information Seeking in Electronic Environments*. New York: Cambridge University Press.
Mercer Clarke, C. S. L. 2010. Rethinking responses to coastal problems: An analysis of the opportunities and constraints for Canada. PhD diss., Dalhousie University.
Nisbett, R., D. Krantz, C. Jepson, et al. 1982. Improving inductive inference. In *Judgment under Uncertainty: Heuristics and Biases*, edited by D. Kahneman, P. Slovic, and A. Tversky, 445–459. Cambridge: Cambridge University Press.
NRDC (Natural Resources Defense Council). 2014. About NRDC. http://www.nrdc.org/about/.

Pearson, L., A. Coggan, W. Proctor, et al. 2010. A sustainable decision support framework for urban water management. *Water Resources Management* 24 (2): 363–376.
Perry, R. I., C. Walters, and J. Boutillier. 1999. A framework for providing scientific advice for the management of new and developing invertebrate fisheries. *Reviews in Fish Biology and Fisheries* 9 (2): 125–150.
Rice, R., M. McCreadie, and S. Chang. 2001. *Accessing and Browsing Information and Communication: An Interdisciplinary Approach*. Cambridge, MA: MIT Press.
Rowe, G. and L. Frewer. 2000. Public participation methods: A framework for evaluation. *Science, Technology, & Human Values* 25 (1): 3–29.
Savolainen, R. 2007. Information behavior and information practice: Reviewing the "umbrella concepts" of information-seeking studies. *The Library Quarterly* 77 (2): 109–113.
Schulz-Hardt, S., D. Frey, C. Lüthgens, et al. 2000. Biased information search in group decision making. *Journal of Personality and Social Psychology* 78 (4): 655–669.
Simon, H. 1959. Theories of decision-making in economics and behavioral science. *American Economic Review* 49 (3): 253–283.
Sonnenwald, D. H. 1999. Evolving perspectives of human information behaviour: Contexts, situations, social networks and information horizons. In *Exploring the Contexts of Information Behaviour*, edited by T. Wilson and D. Allen, 176–190. London: Taylor Graham.
Sonnenwald, D. H., B. M. Wildemuth, and G. Harmon. 2001. A research method using the concept of information horizons: An example from a study of lower socio-economic students' information seeking behavior. *The New Review of Information Behavior Research* 2: 65–86.
Spink, A. 1997. Information science: A third feedback framework. *Journal of the American Society for Information Science* 48: 728–740.
Statistic Brain Research Institute. 2015. Google annual search statistics, Comscore. http://www.statisticbrain.com/google-searches/.
Sunstein, C. 2002. *Risk and Reason: Safety, Law, and the Environment*. Cambridge: Cambridge University Press.
Todorov, A., S. Chaiken, and M. Henderson. 2002. The heuristic-systematic model of social information processing. In *The Persuasion Handbook: Developments in Theory and Practice*, edited by J. Dillard and M. Pfau, 195–211. Thousand Oaks, CA: Sage.
Williamson, K. and T. Asla. 2009. Information behavior of people in the fourth age: Implications for the conceptualization of information literacy. *Library and Information Science Research* 31 (2): 76–83.
Wilson, T. 1997. Information behaviour: An interdisciplinary perspective. *Information Processing & Management* 33 (4): 551–572.
Wilson, T. 1999. Models in information behaviour research. *Journal of Documentation* 55: 249–270.
Wilson, T., D. Centerbar, and N. Brekke. 2002. Mental contamination and the debiasing problem. In *Heuristics and Biases: The Psychology of Intuitive Judgment*, edited by T. Gilovich, D. Griffin, and D. Kahneman, 185–200. Cambridge: Cambridge University Press.
Zipf, G. K. 1949. *Human Behavior and the Principle of Least Effort*. Cambridge, MA: Addison-Wesley.