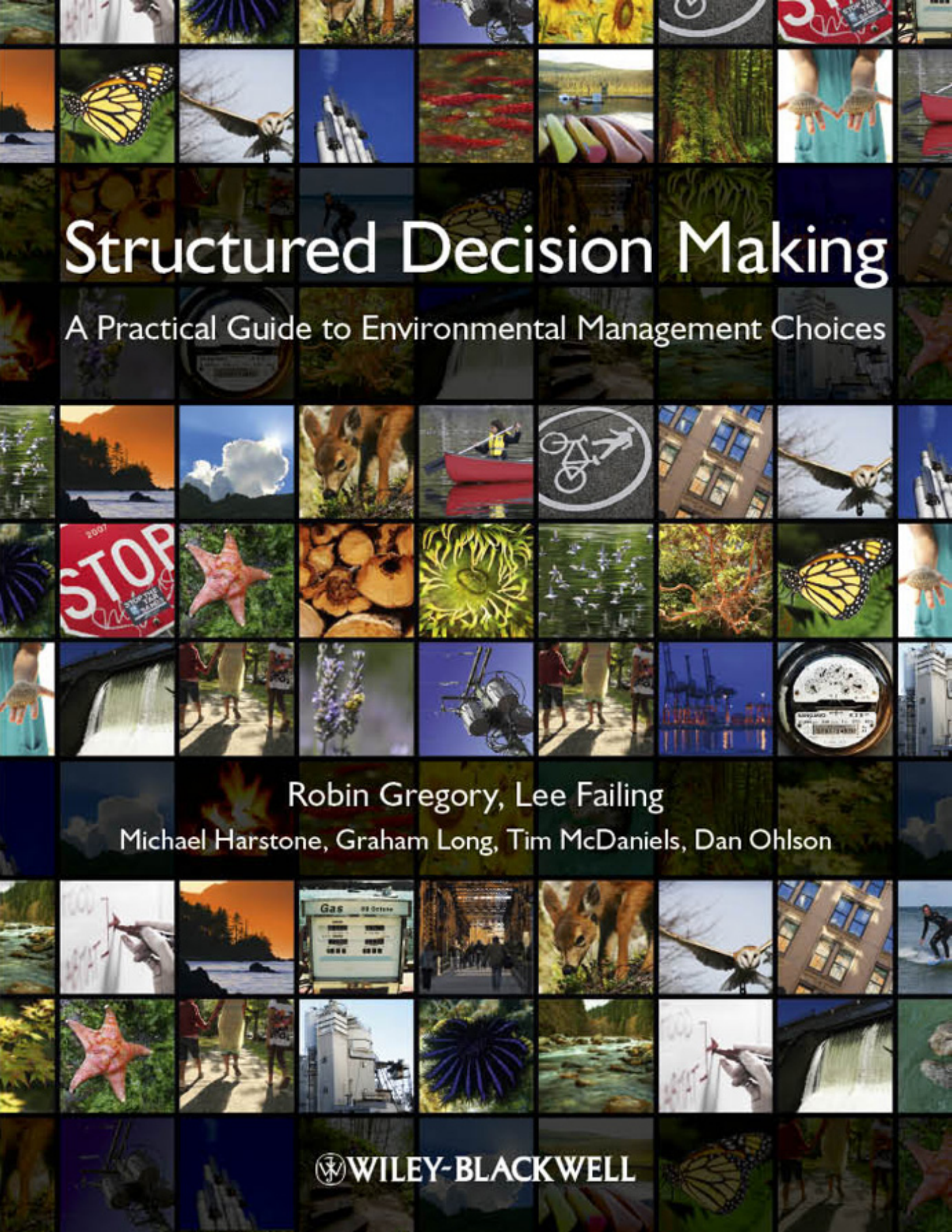
Structured Decision Making
A Practical Guide to Environmental Management Choices
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Robin Gregory, Lee Failing
Michael Harstone, Graham Long, Tim McDaniels, Dan Ohlson
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Foreword

This book is about the creative and messy process of making environmental-management decisions. The approach we describe is called Structured Decision Making, a distinctly pragmatic label given to ways for helping individuals and groups think through tough multidimensional choices characterized by uncertain science, diverse stakeholders, and difficult trade-offs. This is the everyday reality of environmental management, yet many important decisions currently are made on an ad hoc basis which lacks a solid value-based foundation, ignores key information, and results in selection of an inferior alternative. Making progress – in a way that is rigorous, inclusive, defensible, and transparent – requires combining analytical methods drawn from the decision sciences and applied ecology with deliberative insights from cognitive psychology, facilitation, and negotiation. We review key methods and discuss case-study examples based in our experiences in communities, boardrooms, and stakeholder meetings. Our goal is to lay out a compelling guide that will change how you think about making environmental decisions.

We gratefully acknowledge partial funding support from the Decision, Risk and Management Science program of the US National Science Foundation (Award No. 0725025). We also acknowledge intellectual support from many colleagues and clients over the years who – through a mix of interest, curiosity, and frustration with conventional methods – have seen fit to work with us on a wide range of environmental-management problems, including Joe Arvai, Trent Berry, Cheryl Brooks, Mark Burgman, Bob Clemen, Jean Cochrane, Alec Dale, Nate Dieckmann, Daryl Fields, Baruch Fischhoff, Bill Green, Nicole Gregory, Paul Higgins, Dan Kahneman,

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This book is dedicated to Ralph Keeney and Paul Slovic. Your enthusiasm for improving how society addresses environmental and risk-management decisions, and your continuing excitement over each new opportunity to learn a little more about how people join emotions with reason to make tough choices, informs and inspires us. Without your friendship and guidance, this book would not exist.

Preface

This book is about decisions. More specifically, it is about making decisions concerning the management of environmental resources. By ‘decision’ we don’t mean a routine i-dotting and form-filling exercise to fulfill an administrative requirement. We mean clear and considered decisions generated through working as part of a team to develop a resource-management plan, prepare an environmental assessment, design a policy framework, propose an infrastructure project, or engage in a host of other activities that may significantly influence the use or protection of valued natural resources.

Our goal in writing this book is to reset the guideposts – even, we might boldly hope, to propose a standard – for what constitutes defensible decision making for the management of environmental resources. In so doing, we are divulging a well-kept secret: there are ‘best practices’ in decision making. Every decision context is different. Yet there is an emerging consensus about what constitutes a responsible and defensible approach to difficult decision making about environmental resources. This book sets out a guide for people who want to lead or be part of such decision processes – whether as managers, facilitators, technical experts, decision makers, community residents, resource users, or as members of non-governmental organizations or interest groups.

The approach we describe is called *Structured Decision Making* (hereafter SDM). It is a distinctly pragmatic label that we believe captures the essence of the approach. We could equally have called it ‘a useful way to think about addressing tough environmental choices’, but this abbreviation would be unwieldy. An SDM approach combines analytical methods from the decision sciences and applied

ecology with insights drawn from cognitive psychology and the experience of facilitators and negotiators. People use SDM methods to organize complex issues in ways that help individuals and groups build common understanding, identify relevant information, and find innovative solutions to difficult environmental-management problems.

SDM is particularly helpful for *groups* of people working together on *solutions* in a way that is *rigorous, inclusive, defensible and transparent*. This framing profoundly changes how decisions are approached: who is involved, how the purpose is defined, how attention and resources are applied across different issues, and how success is gauged.

One of the distinguishing features of SDM is that it gives attention to both the values of people affected and factual information concerning the potential consequences of actions. This dual focus is the foundation of defensible decisions: explicit value-based choices based on the best available information. SDM neither should nor can ‘make’ decisions, but by linking values and facts it provides enormous insight to those charged with this task. To this end, we will introduce methods developed in the decision sciences, but tested and implemented in communities, boardrooms, and stakeholder meetings over the past decades in Canada, the United States, and other parts of the world. We emphasize how the fundamental goal of SDM processes – providing clear insights about possible courses of action to those charged with making a decision – can still be achieved in the midst of deadlines, resource constraints, limited attention, and overworked people with diverse perspectives.

Although we have a range of research and academic credentials, we are primarily practitioners and our experience is in applying SDM to environmental problems in the real world. Thus our approach in this book is unapologetically practical. Our goal is to bridge the gap

between theory and practice in environmental decision making. We've tried to synthesize an enormous amount of thinking by minds greater than ours into a volume that will be understandable and useful in the real world. To keep us grounded, we've used an abundance of examples to illustrate both the pros and cons of suggested methods. We include success stories from our own work and the work of others, as well as some of our favorite mistakes – from which we like to think we've learned a great deal.

Who should read this book? Our comments are addressed to a broad audience of resource managers, risk analysts, land-use planners, industry leaders, environmental NGOs, facilitators or negotiators, and government decision makers as well as concerned resource users and the residents of potentially affected communities. In our experience, all of these people can and should have the opportunity to participate in meaningful and productive decision-making processes about environmental resources that lead to the implementation of recommended actions. This book also is intended to be appropriate as supplementary reading for university courses in environmental decision making or for courses in planning, ecology, resource economics, and environmental management, at either advanced undergraduate or graduate levels.

Despite the emphasis on methods, this is not primarily a how-to text. It's meant to introduce you to a new way of thinking about problem solving and accountability in decisions that involve public resources and multiple interests. You don't need to master any fancy mathematics or complex technical tools to benefit from SDM. You may need to change how you think about choices. We hope this book provides a guide to this new way of thinking and gives you a set of tools that are useful for finding solutions to tough environmental-management problems, particularly

those that involve multiple stakeholders and choices over diverse and conflicting interests.

Structured Decision Making contains 12 chapters. The first documents why a new approach to environmental decision making is needed. The second outlines the philosophical and theoretical underpinnings of SDM, just enough to thank our predecessors and mentors and to allay any fears that we've made it all up. Chapter 3, on decision sketching, introduces the idea of structuring your resource management problem as a decision from the start. Chapters 4 through 9 cover core methods, emphasizing the role of behavioral considerations as well as analysis and deliberation. Chapter 10 discusses critical concepts of iteration, learning, and monitoring – keys to responsive decision making under uncertainty. Chapter 11 provides a reality check, meant to keep our feet on the ground and focus on what is possible in terms of people, institutions, legal constraints, information, and politics. The final chapter briefly summarizes key points. At the end of most chapters we also list key readings that provide additional details on concepts and methods.

Case studies are included in every chapter. These demonstrate SDM methods in practice and provide ideas, based on our collective experience, about which analytical techniques will work under what circumstances and how to deal with decision makers or other participants who may be hostile, bored, inflexible, or looking for miracles. Despite our emphasis on environmental-management problems, SDM is fundamentally about working with people. If a process to aid resource decision making and environmental management is going to be effective in this modern world of participatory democracy and stakeholder involvement, then it must be understandable and responsive to the needs of the participants.

The bottom line is that SDM, done properly, can help to clarify values, build a common understanding of the best available information, improve the quality of deliberations, and help to identify and implement better management alternatives. It can also save time and money, and – to the extent that the application of SDM methods helps resource management agencies to avoid litigation, lengthy negotiations, or costly remedial efforts to overcome management failures – these savings can be substantial. An SDM process requires knowledge of a mix of analytical and deliberative techniques, along with a willingness to learn and to be both frustrated and delighted by how people address tough environmental and societal choices. It also requires that the minds and hearts of participants (including SDM analysts and their clients) be open to restructuring environmental issues in ways that can lead to new and broadly acceptable management opportunities.

1

Structuring Environmental Management Choices

In late 1999, 24 people representing a variety of interests, perspectives, and agencies signed off on a consensus agreement that fundamentally changed water flows on a disputed stretch of a managed river in British Columbia, Canada. Up until then, hydroelectric facilities on the river had been operated primarily for power production, with limited consideration given to effects on fisheries, wildlife, recreation, and local communities. Relationships among the diverse stakeholders (BC Hydro, which produces electricity from the dam, the federal Department of Fisheries and Oceans, the provincial Ministry of Environment, and community members) were strained. Court actions were threatened by both the local aboriginal community and the federal Fisheries regulator. From the utility's perspective, water management options were complicated by an unclear regulatory environment that offered little guidance about how to involve other stakeholders, how to address trade-offs affecting water flows, or how to adapt management practices to public values that had changed over time.

Conventional thinking suggested a choice between negotiation and litigation. Instead, the utility, along with provincial and federal regulators, collaboratively developed and adopted a structured decision making (SDM) approach. In addition to achieving consensus agreements at all but one of 23 facilities, the SDM process produced a common understanding among key stakeholders about what could

and couldn’t be achieved with different management alternatives, about which trade-offs were acceptable, and about which uncertainties were most important. By focusing on mutual learning, it built trust and stronger working relationships among key stakeholders, and institutionalized a commitment to improving the information available for decision making over time. The process won a range of international awards for sustainability.

Although there are many reasons for the remarkable success of water-use planning in British Columbia, one key factor was the use of SDM methods to guide both analysis and deliberations[1]. Over 10 years later, SDM continues to play a prominent role in framing important environmental management decisions in the province. The provincial government regularly requests the use of SDM to help guide environmental assessment and project or program planning efforts. BC Hydro, the government regulated provincial energy utility, uses SDM approaches to assess its electricity generation options and incorporates SDM in its triple bottom-line approach to corporate purchasing policies. In both BC and the adjacent province of Alberta, several indigenous communities are using SDM as part of environmental management and ecosystem restoration initiatives[2]; one has adopted its own SDM guidelines as the overarching framework for planning and negotiations in its territory with the provincial and federal governments[3]. The federal fisheries regulator wrote SDM-based procedures into its Wild Salmon Policy[4] and has used the process to produce an interim agreement on the management of a widely recognized threatened species[5]. Forestry practitioners in western Canada recently used SDM to help assess climate-change vulnerabilities and adaption options for sustainable forest management[6].

In the United States, the Fish and Wildlife Service (USFWS) has adopted SDM as a standard of practice and is using SDM methods in a variety of environmental management contexts. In its technical guide for the conduct of adaptive management, the US Department of the Interior (USDOI) states that 'Adaptive management is framed within the context of structured decision making, with an emphasis on uncertainty about resource responses to management actions . . . '[7].

This interest in SDM is not limited to North America. In Australia, the Department of Agriculture, Fisheries and Forests has a community of practice in SDM and is using it to develop an approach to the management of agricultural pests and invasive species. SDM approaches have been used in New Zealand to aid recovery of the endangered Hector's dolphin[8] and the country is debating use of an SDM approach to help develop a risk framework for management of genetic organisms, with a special emphasis on ways to integrate concerns of the aboriginal Maori culture alongside concerns developed through western scientific studies.

Why all the interest? What's different about SDM? Fundamentally, SDM reframes management challenges as choices; not science projects, not economic valuation exercises, not consultation processes or relationship builders. You have a decision (or a sequence of decisions) to make. The context is fuzzy. The science is uncertain. Stakeholders are emotional and values are entrenched. Yet you – or someone you are advising – has to make a choice. This decision will be controversial. It needs to be informed, defensible, and transparent. This is the reality of environmental management. It has been said that reality is what we deal with when there are no other options. We think that SDM is a useful way to deal with the realities of everyday environmental management.

1.1 Three typical approaches to environmental decision making

Let’s look first at three dominant paradigms that guide how environmental management decisions are conventionally made: science-based decision making, consensus-based decision making, and analyses based in economics or multi-criteria decision techniques.

1.1.1 Science-based decision making

A file arrives on the desk of a resource manager working in government. A biologist by training, she learns that a species recovery plan for the recently listed split-toed frog will need to be in place in 18 months. This is a priority issue and she has been given lead responsibility. She pulls together an inventory of all the science on split-toed frogs and launches a science review and planning team. Within a few months, work is underway to produce a comprehensive risk assessment and a state of the art habitat model. The modeling is completed within 15 months, an extraordinary accomplishment. Our scientist heaves a big sigh of relief and settles down to develop a plan. Two months later, however, she is disillusioned, attacked by angry environmental activists who reject the recommended captive breeding options on ethical grounds, by local tourism operators who claim that the proposed road closures will ruin their businesses, and by frustrated recreationists who demand that recovery funding be used instead for the protection of more visible species. Faced with the impending deadline, her embattled boss pushes through a band-aid solution that slightly soothes stakeholders’ ruffled feathers but will never protect the frog. Everyone is frustrated and disillusioned with a world where, once again, politics trumps science.

This scenario is (perhaps) a little exaggerated, but it illustrates the deep-rooted reliance on science of many decision makers and resource managers and their desire to produce 'science-based' decisions. When a solution supported by scientific experts fails to receive wide support, environmental managers often throw up their hands and decry the vagaries of 'irrational' social values and power politics. The problem is not with the science: sound science must underlie good environmental management decisions. The problem is with society's tendency to ask too much of science in making decisions and to leave out too many of the other things that matter to people. First of all, science is not the only credible or relevant source of knowledge for many environmental management decisions. Secondly, social considerations and ethics and the quality of dialogue play important roles in shaping environmental management choices. Most importantly, rarely is there a single objectively right answer and science provides no basis for dealing with moral or value-based choices. The biologist Jane Lubchenco, in her Presidential Address to the American Association of the Advancement of Science, reminded the audience (in the context of environmental planning) that 'Many of the choices facing society are moral and ethical ones, and scientific information can inform them. Science does not provide the solutions . . . '[9].

There is increasing recognition that when management choices are characterized by a high degree of stakeholder controversy and conflict, the decision process must address the values held by key participants[10]. Unfortunately, most resource management agencies have little knowledge about how to deal constructively with value-based questions. Nor is it generally recognized that many so-called environmental initiatives also will have implications for economic, social, and other considerations. If a narrow, environmentally focused agency mandate means that these related concerns

have not been identified carefully, then progress in implementation may be blocked. The frequent result is an 11th-hour, behind closed-doors, largely ad-hoc capitulation to vaguely defined ‘social values’ and ‘political’ pressures – as in our scientist scenario.

One of the things we want to do in this book is to help scientists and scientifically trained managers figure out how to contribute usefully to public policy decisions that are as much about values as about science. Making good choices requires the thoughtful integration of science and values – the technical assessment of the consequences of proposed actions and the importance we place on the consequences and our preferences for different kinds of consequences – as part of a transparent approach to examining a range of policy options. While credible environmental management relies on carefully prepared technical analysis, it also relies on creating a deliberative environment in which thoughtful people can express their views in a collaborative yet disciplined way. Science alone will not make good environmental policy choices. But a values free-for-all will not get us there either.

For some types of problems the objectives are simple and clear, the range of alternatives is well understood, and the evaluation of them involves few and relatively uncontroversial value judgments. For example, if a policy decision has been made to reduce waste or emissions by 30%, then the task of deciding how to achieve that target might be quite technical, largely driven by cost-effectiveness or least-cost analysis (implement the lowest cost alternatives up to the point where the target is reached.) Scientific or technical analysis can perhaps provide ‘answers’ in this constrained decision context, with scientists acting as ‘honest brokers’[11]. For other, morally charged questions – regarding genetically modified foods, the hunting of baby seals, or lethal predator control, for

example – beliefs are so deeply entrenched that the influence of scientific or technical information on decisions may be small. These choices often end up in the hands of political leaders who will make a value-based choice with little reference to scientific information.

The problem for environmental managers is that the vast majority of environmental decisions fall into a messy middle ground where science plays a bounded but critical role and values and preferences, often strong and initially polarized, are also critical but not fixed. Research in behavioral decision making emphasizes that, particularly in less-familiar evaluation contexts, preferences are often 'constructed' based on information gained during a process[12], rather than uncovered or revealed as fixed pre-existing constructs. Factual information will never, by itself, make a decision, but it informs and shapes values, which do determine choices.

This clearly implies that what is needed is a framework for making environmental management choices that deals effectively with both science and values. Yet when managers and scientists – and most other people as well – talk about values, they find themselves tip-toeing around, more than a little uncertain how to proceed. Most often, efforts to resolve value-based conflicts focus on bargaining and negotiation or on consensus building. Unfortunately, an overemphasis on process, dialogue, and consensus can create its own problems.

1.1.2 Consensus-based decision making

As the name suggests, consensus-based decision-making processes are those that focus on the endpoint of bringing a group to a consensus agreement.

What could possibly be wrong with this? As an outcome, nothing; we're fans of consensus, just as we're fans of laughter or happiness. Our criticism arises whenever consensus is a *goal* of group deliberations, because we've often seen an emphasis on consensus take environmental management processes in the wrong direction. The biggest problem is that the group will often push too soon, too hard toward convergence, at the expense of a full exploration of minority views and creative solutions. An approach based on building consensus presumes that people have a good idea at the start of what they want to see happen, and that this reflects a good understanding of what the various alternatives will deliver. When addressing tough environmental management problems, this is rarely the case. Whenever decisions are characterized by multiple and conflicting objectives and a complex array of alternatives with uncertain outcomes – a nearly universal situation in environmental management – people are likely to enter into a decision-making process with plenty of emotions and strong positions but a poor understanding of relationships between actions and consequences. And as we discuss more fully in Chapter 2, it is naïve and misleading to assume that working with people in a group is a simple cure for the shortcomings of individual decision makers.

In addition, insufficient attention typically is given to dealing with uncertainty in the anticipated consequences of actions and to what this means for establishing an effective and robust management strategy. Although in some cases significant reductions in uncertainty are possible, at other times key sources of uncertainty will be irreducible, at least with available resources and within the time scale of management concern. Reaching agreement in these cases necessarily involves tackling directly the thorny issue of risk tolerance – how much risk people are willing to accept and to which of the things they value. Recovery plans often

bring these issues into the fore: with the split-toed frog, it's likely that some stakeholders will be highly risk averse ('we must guarantee long-term survival') and others will be more risk neutral ('we need to improve chances of survival'). Bargaining and negotiation frameworks offer little that will help groups work through these issues in a constructive and collaborative manner.

Finally, because of the emphasis on consensus as such, it is tempting for both participants and facilitators to ignore difficult trade-offs and to favor vaguely defined or relatively safe solutions so long as everyone agrees to them[13]. Questioning the motives or aspirations of the group, reminding them of the larger problem context, or introducing participants to demanding – albeit appropriate and insightful – analytical methods, is rarely attempted because the fragile consensus might well be upset. Little is done to combat insidious 'decision traps' that (as we'll discuss later) have been shown to foil the judgments of even sophisticated decision makers[14]. From a decision-making perspective, however, the goal is to reach beyond the least common denominator of a universally supported plan and, instead, to deliver one that is creative and demonstrably effective, that will survive further scrutiny from a wider audience, and that is likely to prove robust (to changing values, circumstances, and politics) over time. This requires that conflicting views be viewed not as problems to be hushed or appeased but as opportunities to clarify the reasons behind apparent differences in values and the various interpretations given to factual information.

1.1.3 Economics and multi-criteria analysis

Imagine if the split-toed frog project had landed on the desk of an economist rather than a scientist. An economist might

immediately see the need for a quantitative analysis that will yield a summary calculation showing the ratio of costs to benefits of the alternative courses of action. He is likely to take the list of initial management alternatives he's been given, calculate the expected values of key effects, and begin the process of monetizing a long list of ecological and social impacts. Knowing that this is a complex and controversial task, he is likely to allocate his 18 months to conducting benefit transfer studies, or perhaps to initiate a travel-cost study or contingent valuation survey[15] – tools that help to assign monetary values to non-monetary effects. There will be little constructive debate about the science and the uncertainties underlying estimates of ecological effects, as discussions are dominated by defense of the controversial monetization techniques. The final results are subject to wide-ranging criticism, as various participants either disagree with the monetization efforts or protest that important values have been left out of the analysis because they are too difficult to quantify. In the meantime, no alternative solutions have been generated.

This scenario demonstrates a more technocratic approach to decision making. The focus is on finding a formula that will calculate a summary answer: the analyst wants to do the right thing, but above all seeks a method that will yield a number (e.g. a net present value or a benefit-cost ratio) and provide the required answer. For the economist, the primary techniques are monetization, benefit transfer studies, and cost-benefit analysis, informed by a variety of specialized non-market valuation methods. This scenario could equally feature a decision analyst; the tools would be multi-attribute utility functions, normalization, weighting, and related techniques. Yet the effect would be the same – a formula-based score that identifies the preferred solution.

What is lost with these technocratic approaches is the focus on making sound decisions. If you're a manager, you

need solutions – creative solutions – that are directly responsive to stakeholders' perceptions and concerns and that are developed with their collaboration and support. Instead, a technocratic approach reduces the management task to a project valuation and selection exercise. The essence of good decision making lies in understanding the problem, gaining insight into what matters to people, and then generating responsive alternatives. In a cost-benefit process, there is little room for these tasks. The emphasis is on analyzing one preferred solution: rarely are alternatives compared explicitly or broken down into their components in hopes of combining elements to develop a new, better (i.e. more effective or cheaper or quicker or more widely supported) management alternative. As we discuss further in Chapter 2, economic and multi-criteria approaches might produce a decision, but it may not be one that addresses the real problem at hand and, without the involvement of key parties in a creative problem-solving process, it'sunlikely to enjoy broad-based support. Of course there are experienced practitioners in both economics and multi-criteria decision analysis who emphasize the need for good problem structuring, creative thinking and mutual learning. But in their conventional applications, both cost benefit analysis and multi-criteria methods lack the structuring and deliberative aspects of SDM and, to the extent that they represent expert-driven processes, are unlikely to generate broad-based community or stakeholder support.

1.2 Structured decision making

1.2.1 What is structured decision making and where does it come from?

We define SDM as the collaborative and facilitated application of multiple objective decision making and group deliberation methods to environmental management and public policy problems. It combines analytical methods drawn from decision analysis and applied ecology with insights into human judgment and behavior from cognitive psychology, group dynamics, and negotiation theory and practice. The primary purpose of an SDM process is to aid and inform decision makers, rather than to prescribe a preferred solution.

In more everyday terms, we think of SDM as an organized, inclusive, and transparent approach to understanding complex problems and generating and evaluating creative alternatives. It's founded on the idea that good decisions are based on an in-depth understanding of both values (what's important) and consequences (what's likely to happen if an alternative is implemented). Designed with groups in mind, it pays special attention to the challenges and pitfalls that can trap people working together on emotionally charged and technically intensive problems – mental shortcuts and biases, groupthink, positioning, and a host of difficult group dynamics and communication challenges. Because it has decisions about public resources in mind, it emphasizes decision structuring approaches that can contribute to consistency, transparency, and defensibility, particularly in the face of technical and value-based controversy.

Although SDM approaches could be applied to a range of public policy and management applications, our focus in this book is on problems involving environmental management and policy choices[16]. The examples we discuss span challenges related to the management of competing water uses, air quality, climate change, species at risk, pest outbreaks, cumulative effects, wildfire risks, parks and recreation, fish and wildlife harvest policies, oil and gas

development, mining, water supply options and infrastructure investment. An SDM process can't guarantee great outcomes – both politics and uncertainty will influence what takes place – but it provides a sensible decision-making process for multi-dimensional choices characterized by uncertain science, diverse stakeholders, and difficult trade-offs.

Decision-making methods are often grouped into three categories[17]. 'Normative' methods define how decisions should be made, based on the theory of rational choice. The problem, of course, is that only rarely are people truly rational; instead, decisions usually reflect a mix of cognitive and intuitive or experiential responses. 'Descriptive' methods describe how people actually make decisions. They provide helpful insights about how and when decision-making processes need to be modified in light of how people typically form and express judgments. 'Prescriptive' approaches, such as SDM, suggest ways to help individuals or groups to make better decisions, based on decision theory but adapted for the practical needs and constraints facing real decision makers operating in the real world. This emphasis on practical, real-world solutions – to ensure concepts are understood, or analyses are undertaken promptly, or recommendations are implemented rather than stalled or ignored – is a theme that will recur throughout the book.

Although there are different types of environmental management decisions and different deliberation contexts, the use of an SDM approach usually requires that each of the following questions is addressed:

1 What is the context for (scope and bounds of) the decision?

2 What objectives and performance measures will be used to identify and evaluate the alternatives?

3 What are the alternative actions or strategies under consideration?

4 What are the expected consequences of these actions or strategies?

5 What are the important uncertainties and how do they affect management choices?

6 What are the key trade-offs among consequences?

7 How can the decision be implemented in a way that promotes learning over time and provides opportunities to revise management actions based on what is learned?

None of this should look surprising – you may recognize these as the most basic of steps in developing or evaluating almost any significant choice: from buying a home, to choosing a name for a company, to developing effective public policy. The difference with an SDM approach is that each of these steps is undertaken formally, openly, and in a way that supports collaborative learning and defensible decision making.

In SDM, these core steps are used to structure and guide thinking about complex choices. Sometimes, the steps are used quite literally as a guide: an explicit step-by-step process that a group agrees to follow. This has the benefit of ensuring that everyone knows where they are and what comes next. At other times, they are used just to inform constructive thinking about complicated management problems – an individual manager or stakeholder with these steps in mind, learns to ask ‘what are our objectives?’, and so on.

The steps are supported by structuring tools and techniques that have been developed in the decision sciences over the past 50 years. These structuring tools are designed to help individuals and groups deal with technically complex decisions and difficult group dynamics. Key SDM structuring tools that are almost universally applicable (and discussed later in this book) include