

# EVOLVING STRATEGIES FOR TWENTY-FIRST CENTURY NATURAL RESOURCE PROBLEMS

ADAPTIVE GOVERNANCE AND WATER CONFLICT: NEW INSTITUTIONS FOR COLLABORATIVE PLANNING. Edited by John T. Scholz\* and Bruce Stiftel.\*\* Washington, D.C.: Resources for the Future Press, 2005. Pp. ix, 274. \$75.00 (hardcover); \$29.95.†

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## INTRODUCTION

East Central Florida sits atop the Floridan Aquifer, an underground water source covering 100,000 square miles and spanning Alabama, South Carolina, Georgia, and Florida (Berardo, pp. 64–65). As the population soars in this region, demand for water will likely increase dramatically, and average water consumption may reach 926 million gallons per day by the year 2020, a sixty percent increase from 1995 levels (Berardo, pp. 64–65). Increasing withdrawals have led to

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† *Adaptive Governance and Water Conflict* features nineteen authors, excluding its editors. In the order they appear in the book, chapter authors and titles are: John T. Scholz & Bruce Stiftel, *Introduction: The Challenges of Adaptive Governance*; Richard Hamann, *Florida's Water Management Framework*; Aysin Dedekorkut, *Suwanee River Partnership: Representation Instead of Regulation*; Simon A. Andrew, *Fenholloway River Evaluation Initiative: Collaborative Problem-Solving Within the Permit System*; Aysin Dedekorkut, *Tampa Bay Water Wars: From Conflict to Collaboration?*; Ramiro Berardo, *The East Central Florida Regional Water Supply Planning Initiative: Creating Collaboration*; Steven Leitman, *Apalachicola-Chattahoochee-Flint Basin: Tri-State Negotiations of a Water Allocation Formula*; Michael R. Boswell, *Everglades Restoration and the South Florida Ecosystem*; Mellini Sloan, *Ocklawaha River Restoration: The Fate of the Rodman Reservoir*; Eberhard Roeder, *Aquifer Storage and Recovery: Technology and Public Learning*; Donald J. Polmann, *Adaptability and Stability: A Manager's Perspective*; Richard Hamann, *The Power of the Status Quo*; B. Suzi Ruhl, *Representation, Scientific Learning, and the Public Interest*; Martha Rhodes Roberts, *Adaptive Challenges Facing Agriculture*; Lawrence Susskind, *Resource Planning, Dispute Resolution, and Adaptive Governance*; John Forester, *Policy Analysts Can Learn from Mediators*; Robert M. Jones, *Leadership and Public Learning*; Mark Lubell, *Public Learning and Grassroots Cooperation*; Connie P. Ozawa, *Putting Science in its Place*; Paul Sabatier, *Linking Science and Public Learning: An Advocacy Coalition Perspective*; Paul J. Quirk, *Restructuring State Institutions: The Limits of Adaptive Leadership*; Lawrence S. Rothenberg, *Incentives and Adaptation*; and Bruce Stiftel & John T. Scholz, *Conclusions: The Future of Adaptive Governance*.

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unsustainable levels of use and threaten environmental degradation—saltwater intrusion, reduced spring flows, drying lakes and wetlands—and political conflict (Berardo, p. 65). The principal governmental body in charge of water consumption<sup>1</sup> has designated the area a Priority Water Resource Caution Area, but it is unable to unilaterally solve this impending problem for several reasons. First, the potential causes and impacts of unsustainable use extend beyond its jurisdiction. Second, the diverse array of stakeholders<sup>2</sup> will be reluctant to accept a top-down, dictated solution concerning the sensitive issue of water resources. Third, scientists do not completely understand the potential impacts on the aquifer, and changing scientific understanding may alter potential solutions. How can this natural resource problem be addressed, when the solutions—and even the problems—are poorly understood, and no single administrative body is competent to develop and implement solutions?

One group of authors suggests that the solution lies in “adaptive governance.”<sup>3</sup> *Adaptive Governance and Water Conflict: New Institutions for Collaborative Planning (Adaptive Governance)* examines a new generation of decisionmaking institutions and identifies five challenges to their successful implementation.<sup>4</sup> Although the book focuses only on Florida water issues, the editors contend that adaptive governance can be used to combat a wide variety of natural resource problems (p. 4). The book is a useful contribution to a developing field that productively explores challenges to implementing adaptive governance solutions. However, the authors do not address the fundamental question of whether adaptive governance is a viable alternative to traditional forms of natural resource management. In particular, the book does not directly examine the applicability of adaptive governance to different types of natural resource problems, its relationship to policy tools used to implement solutions, or the potential success of those solutions once implemented. These topics require further exploration before public officials and natural resource agencies put adaptive governance into wide practice.

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<sup>1</sup> The St. Johns River Water Management District (Berardo, p. 64).

<sup>2</sup> This group includes regulatory agencies, public supply utilities, municipalities, conservation organizations, developers, and citizen activists (Berardo, p. 66).

<sup>3</sup> See *infra* text accompanying note 13 (defining “adaptive governance”).

<sup>4</sup> These challenges are representation, process design, scientific learning, public learning, and problem responsiveness. See *infra* notes 17–21 and accompanying text.

## I

## THE CONFLUENCE OF TWO STREAMS

Adaptive governance is largely the synthesis of two streams of thought—collaborative management and adaptive management. Until 1990, collaborative solutions were largely absent from natural resource literature, and the only solutions offered were central government control and privatization.<sup>5</sup> In 1990, Elinor Ostrom noted that communities have been sustainably managing common resources for thousands of years and suggested a third solution to natural resource problems—durable, cooperative institutions that the resource users organize and govern themselves.<sup>6</sup> The past fifteen years have seen an outpouring of literature further defining the use of collaboration in natural resource management.<sup>7</sup> Scholars have sought to identify the factors that encourage or impede stakeholders from collectively deciding on beneficial management strategies for natural resources and to explain how to improve the process and overcome difficulties. Their literature constitutes part of the stream that informs *Adaptive Governance*.

The other component of adaptive governance is adaptive management, a resource management paradigm that focuses on the inter-

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<sup>5</sup> Garrett Hardin, *Extensions of "The Tragedy of the Commons,"* 280 *Sci.* 682, 683 (1998) ("A 'managed commons' describes either socialism or the privatism of free enterprise."). Thirty years earlier, Garrett Hardin famously described the tragedy of the commons. Garrett Hardin, *The Tragedy of the Commons*, 162 *Sci.* 1243, 1243–48 (1968). While the theory has had great resonance in the field of natural resource management, both the model and the proposed solutions have been widely recognized as an oversimplification. Thomas Dietz, Elinor Ostrom & Paul C. Stern, *The Struggle to Govern the Commons*, 302 *Sci.* 1907, 1907 (2003).

<sup>6</sup> ELINOR OSTROM, *GOVERNING THE COMMONS: THE EVOLUTION OF INSTITUTIONS FOR COLLECTIVE ACTION* 16 (1990). Ostrom explored "how a group of principals who are in an interdependent situation can organize and govern themselves to obtain continuing joint benefits when all face temptations to free-ride, shirk, or otherwise act opportunistically." *Id.* at 29.

<sup>7</sup> See generally, e.g., EUGENE BARDACH, *GETTING AGENCIES TO WORK TOGETHER: THE PRACTICE AND THEORY OF MANAGERIAL CRAFTSMANSHIP* (1998) (exploring methods and value of interagency collaboration and providing recommendations on more effective collaboration); JULIA M. WONDOLLECK & STEVEN L. YAFFEE, *MAKING COLLABORATION WORK: LESSONS FROM INNOVATION IN NATURAL RESOURCE MANAGEMENT* (2000) (exploring benefits of and challenges to collaboration in resource management, drawing lessons from past experiences, and providing guidance to practitioners). For background on collaborative process and a review of existing literature on arguments for and against its utilization, see Douglas S. Kenney, *Arguing About Consensus: Examining the Case Against Western Watershed Initiatives and Other Collaborative Groups Active in Natural Resources Management* (Univ. of Colo. Law Sch. Natural Res. Law Ctr., Research Report No. 23, 2000), <http://www.colorado.edu/law/centers/nrlc/publications/RR23.pdf>.

action of resource management and science.<sup>8</sup> Adaptive management recognizes that, because science is constantly evolving, our understanding of natural systems or the effect of human interactions on these systems is rarely, if ever, complete. It reflects a recognition that scientific answers are not purely objective: In reality, they are largely socially constructed, especially in the field of natural resource management, where theories and values are often intertwined.<sup>9</sup> Instead of using science to predict outcomes far into the future and set onetime static policies, adaptive management monitors outcomes and maintains flexibility so that policies can be altered should predictions prove inaccurate or scientific understanding advance.<sup>10</sup> Surprises—an important part of science, but typically an undesirable aspect of decisionmaking—can be used to improve policy and outcomes. This gradual, iterative learning process can lead to superior natural resource management decisions over the long term.

Each stream in adaptive governance responds to major critiques of the predominant natural resource management regime. Collaborative management is a reaction to the problems and limitations of the conventional, top-down management approach to environmental problems, where solutions are dictated from above and imposed on resource users. *Adaptive Governance* explores problems for which the solutions, the editors contend, exceed the “authority, competence, and interest of existing authorities” (p. viii). For example, specialized water authorities were very successful at exploiting unused water resources (indeed, their success largely contributed to the problems we see today (p. 1)), but they are unwilling or unable to address emerging conflicts between diverse stakeholders or between development, public health, and the environment.

The editors also contend that solutions imposed by political or judicial institutions are inadequate (p. viii), given the tremendous complexity of the human and natural systems involved (p. 5).<sup>11</sup> The

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<sup>8</sup> See Jonathan Z. Cannon, *Adaptive Management in Superfund: Thinking Like a Contaminated Site*, 13 N.Y.U. ENVTL. L.J. 561, 569 (2005) (describing origins of adaptive management).

<sup>9</sup> See generally Alvin M. Weinberg, *Science and Trans-Science*, 10 MINERVA 209 (1972) (developing theory of trans-science questions that involve science, but that cannot be answered by scientists because they are value-laden).

<sup>10</sup> See generally CARL WALTERS, *ADAPTIVE MANAGEMENT OF RENEWABLE RESOURCES* (Blackburn Press 2002) (1986) (arguing that scientific understanding will come from experience of management as ongoing, adaptive, and experimental process, rather than through basic research or development of ecological theory).

<sup>11</sup> The editors call these complicated problems “wicked problems” (p. 5). See generally Horst W.J. Rittel & Melvin M. Webber, *Dilemmas in a General Theory of Planning*, 4 POL’Y SCI. 155, 160–67 (1973) (developing theory of “wicked problems”). “Wicked problems” are those in which the goals of management policies and the means of achieving

adaptive component of adaptive governance responds to the limitations of a static regulatory framework. Once policies are set, they are difficult to alter, even if evolving scientific understanding shows that the policy is unable to solve the targeted problem or is even counterproductive. Flexibility in natural resources management allows science to play a more meaningful and useful role in the decisionmaking process. Adaptive governance is thus a natural evolution in natural resource management, and *Adaptive Governance and Water Conflict* is at the forefront of this emerging field.<sup>12</sup>

## II

### DEFINING ADAPTIVE GOVERNANCE AND IDENTIFYING CHALLENGES

The editors, John Scholz, a political scientist, and Bruce Stiftel, an urban planner, use their introduction to both define adaptive governance and outline the major challenges facing implementation of adaptive governance solutions. The editors define adaptive governance institutions as those “capable of generating long-term, sustainable policy solutions” to complex and dynamic natural resource problems through collaboration among diverse resource users and governmental agencies (p. 5).<sup>13</sup> These governance structures would continue

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them are inseparable, and the policy and science components of the decision cannot be compartmentalized. *Id.* at 166.

<sup>12</sup> As early as 1993, a scholar in the adaptive management field envisioned using a collaborative process for stakeholders to frame the questions to be answered through policy experimentation, and to select among potential goals. KAI N. LEE, COMPASS AND GYROSCOPE: INTEGRATING SCIENCE AND POLITICS FOR THE ENVIRONMENT 104–14 (1993); see also Kai N. Lee, *Appraising Adaptive Management*, 3 CONSERVATION ECOLOGY (1999), <http://www.ecologyandsociety.org/vol3/iss2/art3> (“[A] collaborative structure should be in place *before* an adaptive exploration of the landscape gets underway.”). The exact term “adaptive governance” first appeared in similar form in an article in *Science* from December 2003. Dietz et al., *supra* note 5, at 1911 n.28. The authors, including Elinor Ostrom, used the term adaptive governance rather than adaptive management in order to stress the “difficulty of control, the need to proceed in the face of substantial uncertainty, and the importance of dealing with diversity and reconciling conflict among people and groups who differ in values, interests, perspectives, power, and the kinds of information they bring to situations.” *Id.*

Another book, *Adaptive Governance: Integrating Science, Policy, and Decision Making*, was published contemporaneously with the book I examine. Its authors explore the same topic using case studies addressing a broader array of natural resource problems in a different part of the country. ADAPTIVE GOVERNANCE: INTEGRATING SCIENCE, POLICY, AND DECISION MAKING (Ronald D. Brunner et al. eds., 2005) (using case studies and analysis to examine adaptive governance institutions emerging to handle varied natural resource issues in American West, including endangered species and forestry).

<sup>13</sup> As a concrete example, the stakeholders in East Central Florida, discussed *supra* pp. 101–102, launched an initiative centered on two “water summits” attended by diverse interested parties and designed to identify cooperative and flexible solutions and avoid unnecessary conflict and litigation (Berardo, p. 66).

to exploit natural resources while ensuring the sustainability of both human and natural systems (p. viii).<sup>14</sup> More concretely, they would use collaborative management techniques, often derived from the field of conflict resolution (p. 2). Ideally, these efforts would bring together and earn support from all affected users, thereby enhancing total welfare while minimizing the costs of an adversarial system (pp. 2, 5). Equally important, the structures would be adaptable. The editors seek to extend adaptive management's flexible, iterative approach beyond natural systems to human systems (p. 2). An ideal adaptive governance structure would react to surprises not only from the ecological system but also from human institutions. Finally, the editors see ecological sustainability as the sine qua non of adaptive governance: "[R]esolution of conflict in the human system is valuable only if it leads to sustainable use of the natural system" (p. 2).<sup>15</sup>

After defining the subject, the editors make two connected arguments that constitute the thrust of *Adaptive Governance*. First, "successful governance of water and other natural resources in the twenty-first century depends on our ability to create adaptive institutions" (p. 5).<sup>16</sup> Second, "this ability will depend on resolving five challenges to adaptive governance" (p. 5). Nineteen authors (excluding the editors) mold their case studies and analysis, sometimes awkwardly, into this five-challenge framework.

The five challenges identified by the editors are representation, process design, scientific learning, public learning, and problem responsiveness (pp. 6–10). Representation asks who should be represented in the new institutions, with what resources, and with what authority.<sup>17</sup> Process design asks what decisionmaking frameworks

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<sup>14</sup> Human systems refer to the elements of natural resource management not related to the environment: for example, the relationships among and between natural resource users and agencies, or the legitimacy of decisionmaking bodies composed of diverse resource users.

<sup>15</sup> While the editors introduce some common attributes of an adaptive governance institution, they do not, nor could they, identify an "ideal" adaptive governance structure. These structures must be tailored to the details of a conflict; what helps in one situation may exacerbate problems in another (p. 11).

<sup>16</sup> The force of this assertion depends on how clearly distinguished adaptive governance is from other natural resource management strategies. Not all of the authors have as coherent a definition of adaptive governance in mind as the editors. One author, for example, suggests that the legislature is in fact a forum for adaptive governance, with committee hearings, public debates, and citizen involvement as part of the process (Roeder, pp. 111–13). Ultimately, the more capacious the term, the less meaningful the contention.

<sup>17</sup> The editors argue that diverse representation brings the decisionmaking process closer to the "democratic ideal" of equal access (p. 6). Furthermore, it helps obtain needed resources, reduces challenges from represented interests, makes administrative, legislative, and judicial reversal less likely, and makes broader, mutually advantageous tradeoffs possible (p. 6).

allow authorities and stakeholders to reach positive policy agreements.<sup>18</sup> Scientific learning asks how participants can develop and use scientific knowledge effectively in the face of uncertainty.<sup>19</sup> Public learning asks how resource users and the affected public can develop common understandings as to the nature of the problem, potential solutions, and the processes by which those solutions were produced.<sup>20</sup> Finally, problem responsiveness asks how well decisions and decision-making processes achieve natural resource management goals.<sup>21</sup> While the first four elements evaluate the adaptive governance process, problem responsiveness evaluates the substance of the outcome.

After introducing their solution to natural resource problems and the challenges to its implementation, the editors present chapters by an array of researchers and practitioners. The body of *Adaptive Governance* contains two sections,<sup>22</sup> combining experiences in Florida water management with academic theory and practical analysis. The first section features eight case studies of various adaptive governance attempts in Florida, ranging in topic from excessive demand on groundwater resources by municipalities (Dedekorkut, pp. 52–63; Berardo, pp. 64–73), to a failed multistate compact to resolve water allocation (Leitman, pp. 74–88), to agricultural nonpoint source pollution in surface water (Dedekorkut, pp. 25–39), to the monumental and well-examined undertaking to restore the Everglades (Boswell, pp. 89–99). Each case study recounts the management difficulties that led to the emergence of a new institution, examines the new institution, and discusses how it addressed (or failed to address) challenges. The next twelve chapters draw diverse lessons from the case studies. Some expand on the literature of collaborative decisionmaking or

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<sup>18</sup> The editors see process design as key to connecting participation and the legitimacy of the outcome (pp. 6–7) and suggest that well-designed adaptive governance will “elicit a reasonable understanding of what represented groups prefer, translate those preferences into policy, gain necessary approvals, and assemble sufficient resources and skills to implement the preferred policies” (p. 227).

<sup>19</sup> According to the editors, processes that complement the norms of science—in particular, building flexibility into policy decisions as envisioned by adaptive management—are more likely to use science effectively (p. 8).

<sup>20</sup> Long-term resolution of conflicts will often require a more fundamental transformation of beliefs, a goal of public learning (p. 9).

<sup>21</sup> The editors identify three goals: efficiency, equity, and sustainability (pp. 9–10). Efficiency looks to whether the policy outcome achieves the utilitarian goal of the greatest good for the greatest number, both in the short- and long-term (p. 10). Equity looks to whether the solution accommodates differences in wealth, race, and geographic distribution, while recognizing legitimate interests of rival water-user communities (p. 10). Sustainability refers to both the environment and social institutions (p. 10).

<sup>22</sup> Technically, the book is broken into three sections, with a “Researcher’s” and a “Practitioner’s” analytical section. For purposes of my analysis, however, these two sections can be treated as one.

adaptive governance, examining and proposing suggestions for various case studies; others identify forces acting on adaptive governance institutions, either internal, natural, or political; still others offer a particular perspective for analyzing these processes.

The editors do not try to identify a universally applicable solution to natural resource problems; nor could they, given the diverse array of environmental problems they hope to address with adaptive governance. Instead, they contribute “a better understanding of the tradeoffs involved in different institutional designs and their ability to tackle the[se] challenges” (p. 11). They suggest, in turn, that the lessons learned from both the successes and failures presented in the book can be applied “throughout the nation and across all natural resource issues” (p. 4).

### III

#### UNRESOLVED QUESTIONS

The editors strive to start a dialogue about different forms of adaptive governance and the challenges faced by various institutional designs. Through case studies and rigorous analysis, they are largely successful. Water practitioners, environmental students and academics, and even politicians in areas with contentious natural resource management problems can learn from the case studies and analysis contained in this book.

However, in focusing on the detailed internal mechanisms of adaptive governance, the editors may have missed an opportunity to explore some more fundamental questions raised by any new form of natural resource management: Which natural resource problems are appropriate for resolution through adaptive governance institutions?<sup>23</sup> What policy instruments are available to implement adaptive governance solutions, and how do they differ from other forms of natural resource management? Are adaptive governance solutions likely to be superior to alternative forms of natural resource management? Although the authors often confront these questions at the margins, for the most part they do not critically reflect upon them.

With adaptive governance only in its infancy, addressing these questions directly is an important initial step. Doing so will allow

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<sup>23</sup> It is surprising that the book does not focus more directly on this question, given the editors' contention that successful governance of water disputes in the twenty-first century depends on these adaptive governance institutions (p. 5). In the conclusion, the editors hedge when they suggest that “[a]daptive governance institutions can play a significant but *limited* role” (p. 237, emphasis added). However, the limitation referred to is not a limit on *when* adaptive governance institutions are appropriate, but rather on the institutions' ability to “fully resolve conflicts” (p. 237).

better allocation of limited resources toward implementation of adaptive governance. It will help identify which policy tools should be considered when adaptive governance is used. Finally, it will convince skeptics that the additional time and effort involved in reaching adaptive governance solutions is well spent. Without such answers, it is difficult for the reader to evaluate the importance of these new institutions.

The book does not directly address these questions, although the case studies, and to a lesser extent the analytical chapters, provide a basis for answering some of them.<sup>24</sup> Some answers are not yet available because adaptive governance is a recent development. In the remainder of the review, I attempt to discern answers to these questions where possible, identify where it is not possible to do so, and indicate where future research is needed.

#### A. *Which Natural Resource Problems Are Appropriate for an Adaptive Governance Solution?*

Many authors in *Adaptive Governance* obliquely suggest which characteristics of a natural resource problem make it a good or poor candidate for an adaptive governance resolution.<sup>25</sup> It is worth identifying these factors explicitly and determining whether there are more that can be added. Most of these factors affect the likelihood of success of the *collaborative* element of adaptive governance.<sup>26</sup>

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<sup>24</sup> There are some possible explanations for this omission: The book was meant only to be an introduction to the institutions of adaptive governance for the practitioner community, not an argument for its widespread use; it predates any significant research on the subject and thus cannot provide any empirical answers to these questions; or perhaps the five-challenge framework imposed by the editors constrained the authors from answering these questions more directly.

<sup>25</sup> To be clear, the authors do focus directly on internal characteristics of adaptive governance institutions that make success more or less likely, and which fit comfortably within the five-challenge framework created by the editors. However, they do not systematically examine the features prior or external to the adaptive governance process. While a number of authors look collectively at historical, external, and internal factors in determining the likelihood of the process's success or failure, they do not apply these components to a determination of whether adaptive governance was appropriate in the first place. Paul Sabatier, for example, considers the elements making "cross-coalition learning" most likely, including historical, external, and internal factors (Sabatier, pp. 198–200).

<sup>26</sup> One author directly examines "features that militate against cooperative resolution" (Quirk, p. 206), suggesting that the "necessary policy and administrative conditions" are not yet in place for water disputes to be resolved through consensus processes (Quirk, p. 204). For example, he questions the wisdom of attempting collaboration to resolve water quantity problems given the intractable "water wars" taking place elsewhere in Florida, noting that "the [East Central Florida Regional Water Supply Planning] Initiative looks like an effort to overcome the difficulties of a large, complex negotiation by creating an even larger, more complex negotiation" (Quirk, pp. 209–10).

Numerous authors suggest that a credible threat of regulatory, legislative, or judicial action serves as an important incentive to collaborate (e.g., Rothenberg, pp. 217–18). This incentive is even more pronounced when combined with financial rewards. For example, in efforts to reduce nonpoint source pollution into the Suwannee River, both the potential for EPA regulation and generous financial assistance helped to encourage a large percentage of farmers to adopt best management practices (Dedekorkut, p. 37).<sup>27</sup> The absence of such a threat, on the other hand, can stymie collaboration.

A number of authors also point to the presence of a “hurtful stalemate”—where no party benefits from the status quo and the refusal to enter negotiations (Sabatier, p. 199)—as an important factor.<sup>28</sup> In the case of the Fenholloway River and a polluting paper mill, the 2000 election of George W. Bush provoked concern among environmentalists that the EPA’s prior position on permitting would change, undermined their reliance on the status quo, and drew them to the negotiating table (Andrew, p. 43; Sabatier, p. 202). On the other hand, where one party benefits from delaying decisionmaking, it may be difficult to use collaborative management. For example, one of the states in a tristate water dispute was unwilling to negotiate because it could continue to withdraw ever larger quantities of water, and those uses would receive protection in future water allocation decisions (Hamann, p. 128).<sup>29</sup> These cases suggest that a problem is ripe for an adaptive governance solution when (1) no party benefits from delaying decisionmaking efforts, and (2) an unpalatable solution is threatened by a higher authority.

Another factor influencing the likelihood of successful collaboration is the heterogeneity of the interests involved. The more stakeholder groups<sup>30</sup> and the more divergent their values,<sup>31</sup> the more

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<sup>27</sup> Likewise, in the Tampa Bay water wars, where municipalities have long fought over water supply, the threat of an imposed legislative solution helped keep parties at the negotiating table until they could agree on a viable intermunicipal water authority (Dedekorkut, p. 62).

<sup>28</sup> The editors also note that “hurting stalemates” can be important to adaptive governance, placing this contention under the challenge of public learning (p. 231).

<sup>29</sup> Indeed, if the other two states had not managed to block action benefiting that state, it would likely not have entered negotiations at all (Hamann, p. 128). Similarly, in the Tampa Bay water wars, counties and cities that systematically benefited from inequitable prices and amounts of water were more difficult to bring to the table (Dedekorkut, p. 61).

<sup>30</sup> See Elinor Ostrom et al., *Revisiting the Commons: Local Lessons, Global Challenges*, 284 *Sci.* 278, 281 (1999) (“Having larger numbers of participants in a [common pool resource] increases the difficulty of organizing, agreeing on rules, and enforcing rules.”).

<sup>31</sup> See Cary Coglianese, *Is Consensus an Appropriate Basis for Regulatory Policy?*, in *ENVIRONMENTAL CONTRACTS: COMPARATIVE APPROACHES TO REGULATORY INNOVATION IN THE UNITED STATES AND EUROPE* 96, 106 (Eric W. Orts & Kurt Deketelaere eds., 2001) (“[E]ven though consensus may be suitable for the governance of small groups of

difficult reaching consensus will be. Collaboration, the editors note, gives us “the ability to bring opposing sides together . . . for the joint exploration of a considerably larger search space to find mutually advantageous policies” (p. 235). For some conflicts, however, it is possible that such space simply does not exist. For example, in one case study, environmentalists and scientists sought to remove a dam to return a river to its natural state, while waterfront residents who enjoyed the dam’s recreational benefits fought for its retention (Sloan, pp. 100–05). It is difficult to see what mutual space could be created between these two diametrically opposed perspectives.

There are other possible factors that might affect the likely success of collaboration in adaptive governance institutions. Perhaps the nature of the problem itself is important—the best strategy to address nonpoint source agricultural pollution of surface water may be different from that needed to address excessive drawdown of groundwater and water wars, and different still from that needed to address conflicting land uses. Or perhaps the scope of the resource or the level of agency authority is important. It is difficult to draw any conclusions on these factors from *Adaptive Governance*. Further research could help identify the extent to which these and other factors make collaborative management suitable or inappropriate for resolving problems.

The authors focus less on whether and when the *adaptive* element of adaptive governance is appropriate in resolving natural resource problems. Because the editors define the relevant natural resource problems as those in which both the solution and the natural resource problem itself are in dispute (Jones, p. 166 tbl.16-1), adaptive management will always seem to be appropriate for managing ecological systems. If these ecological systems inherently include tremendous scientific uncertainty, then they provide an ideal forum for adaptive governance.

Whether it is appropriate to apply adaptive management to every human system is less clear. Donald Polmann cautions against a “radically adaptive legal, administrative, and political structure” to govern humans, while expressing no such reservations against experimenting with means and methods affecting the natural system (pp. 122–24). He suggests that instability in human systems will compromise the effectiveness and efficiency of investment decisions (p. 123). Thus, natural resource problems such as diminished municipal water sup-

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individuals who have ongoing relationships and common interests, it is not suitable for governance of large nation-states or in highly conflictual settings.”); Ostrom et al., *supra* note 30, at 281 (“[D]iversity can decrease the likelihood of finding shared interests and understandings.”).

plies, which require long-term investments in infrastructure (for example, desalinization plants), may be poor candidates for adaptive governance resolution. It is important to explore this and other factors to determine when the adaptive aspect of adaptive governance, particularly as it applies to human systems, is in fact appropriate.

*B. Which Policy Tools Can Be Used to Implement Adaptive Governance Solutions?*

The editors and authors are ultimately unclear about what policy tools should be used to implement and enforce the decisions that emerge from adaptive governance institutions. To some extent, the editors disclaim this goal, suggesting that there is no ideal mechanism for adaptive governance of natural resource problems (p. 11). Nonetheless, any gains from adaptive governance efforts will be compromised or even nullified if not followed by efficient and effective implementation and enforcement. Practitioners should identify the extent to which adaptive governance changes the policy options available to address natural resource problems.

Some solutions, such as voluntary compliance with technological standards (Dedekorkut, pp. 25–39), clearly relate to the collaborative aspect of adaptive governance. However, as one author points out, “cooperative solutions are attractive, although not the only, means of adaptive governance” (Rothenberg, p. 217). The relationship between adaptive governance and other policy options is far more ambiguous.

The editors discount administratively imposed command and control solutions to the problems discussed in the book, believing that “the ability of central authorities to impose water policy on passive user communities is a thing of the past . . . [U]ser communities would not sit still for proposals that came from [the U.S. Army Corps of Engineers, the Environmental Protection Agency, or the Florida Department of Environmental Protection]” (p. 224). Indeed, by defining the natural resource problem as one that exceeds the “authority” and “competence” of existing authorities (p. viii), the editors preclude a unilateral administrative solution.

However, this fact does not justify excluding agencies from participation in implementing solutions, given an adaptive governance approach to formulating policies. For example, an agency can flexibly allocate limited groundwater to different municipalities and make investment decisions, so long as the goals of its operation are set by

consensus among the affected parties.<sup>32</sup> Alternatively, an agency can impose and enforce mutually agreed-upon regulatory standards, combining collaboration with command and control, a strategy that may bring environmentalists into the discussion. Practitioners should not be so quick to dismiss agency participation and should instead regard agencies as a viable component of adaptive governance solutions, even if they were unable to unilaterally resolve the underlying problem.

The editors also suggest that Congress and state legislatures will be unable to resolve water problems because of resistant user communities (p. 224). Compliance may be a problem, but legislatures, unlike agencies, often have the power to resolve a dispute, even if their solutions are inferior to those available through collaborative means. While one author contends that natural resource legislation may actually be an adaptive governance solution (Roeder, pp. 111–13), legislative action is really an alternative path to resolving natural resource disputes. In addition, the credible threat of an independent and unpopular resolution of the natural resource problem can encourage collaboration.<sup>33</sup> Thus, legislatures still have a role to play.<sup>34</sup>

Another potential solution that is virtually ignored, although it is available as both an alternative to, and a policy instrument for, adaptive governance, is the use of economic incentives.<sup>35</sup> Only one author

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<sup>32</sup> Indeed, this form of cooperative management absolutely requires consensus, as consent of stakeholders is necessary before converting individual property rights to communal property rights. Similarly, the Army Corps of Engineers, largely responsible for the current poor health of the Everglades, can help in its restoration by working from the collaboratively developed Comprehensive Everglades Restoration Plan.

<sup>33</sup> See *supra* Part III.A.

<sup>34</sup> Resort to a judicial forum is another alternative for resolving natural resource disputes, although it is more likely to produce endless litigation than comprehensive resolution. See Craig Anthony (Tony) Arnold, *Litigation as Dispute Non-Resolution: Lessons from Case Studies in Water Rights Disputes*, in *BEYOND LITIGATION: CASE STUDIES IN WATER RIGHTS DISPUTES* 1, 2 (Craig Anthony (Tony) Arnold & Leigh A. Jewell eds., 2002) (“[L]itigation is frequently an important but insufficient component in the process toward dispute resolution.”). Litigation, like legislation, is also important as an incentive to collaborate or to break up the status quo (Hamann, p. 129).

<sup>35</sup> See generally Bruce A. Ackerman & Richard B. Stewart, *Reforming Environmental Law*, 37 *STAN. L. REV.* 1333 (1985) (introducing new generation of environmental policies that account for varying individual costs of environmental protection and can achieve same level of environmental quality for less cost). This omission is somewhat surprising given the editors’ observation that water prices are kept artificially low, with the result that “[o]verconsumption is encouraged; efficiency is not particularly prized; externalities abound” (p. vii). It is even more anomalous considering that the book is published by Resources for the Future (RFF), a strong proponent of applying economic analysis to natural resource problems. See *Resources for the Future*, RFF Today, <http://rff.org/rff/About> (last visited June 14, 2006) (“RFF pioneered the research methods that allow for critical analysis of environmental and natural resource policies, enabling researchers to evaluate their true social costs and benefits.”).

explicitly suggests economic solutions to these natural resource problems (Rothenberg, pp. 213–23), noting that in addressing Florida's natural resource problems, all "solutions are bureaucratic and all regulatory instruments are to some degree command-and-control" (p. 220). He provides two alternate regulatory instruments that are not command and control: a water tax and a tradable permit scheme for nonpoint source pollutants. Both economic instruments could be applied unilaterally by a legislature or combined with adaptive governance, using a collaborative process to set tax levels or aggregate pollution limits and providing flexibility in their implementation.

Despite this almost complete absence of discussion, the editors suggest in their conclusion that "[u]ltimately, adaptive governance institutions may be most successful as governing bodies overseeing market-like systems, monitoring the expected behavior of both the market and natural systems, adjusting incentives when necessary, and adapting the system to unexpected results" (p. 234). This sweeping statement is inconsistent with the dearth of discussion devoted to this option. Given the popularity of economic incentives as a means of addressing environmental problems, their relationship with adaptive governance is an important avenue to explore. The case studies in *Adaptive Governance* only obliquely suggest what policy tools might be used to implement adaptive governance solutions. However, even if the authors had focused on this question, it is doubtful they could have provided any definitive answers: Again, more research is needed.

### C. *Is Adaptive Governance Superior to Alternative Forms of Natural Resource Management?*

Finally, the authors do not evaluate whether the substantive solutions produced by adaptive governance institutions are superior to alternatives. Even if collaboration is successful, this success is to no avail if the arrived-at solution is poorly tailored to the problem.<sup>36</sup> In some ways, this evaluation may have been an impossible task: Because the adaptive governance movement is only nascent, and envi-

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<sup>36</sup> One exception is when the current state of the problem is a hopeless stalemate. In this case, ecological degradation will continue unabated, and any progress will be an improvement over the status quo. But if resolution is possible by any other means, be it legislative resolution or non-collaboratively designed economic instruments, then the adaptive governance solution must be superior to justify the effort.

ronmental results, in particular, take so long to gauge,<sup>37</sup> the answers are still not available.

However, without such evaluation, parties involved in natural resource disputes may understandably be reluctant to abandon traditional forms of management. Thus, before adaptive governance will receive widespread endorsement, more research is necessary. A good framework for this inquiry may be to ask whether solutions are efficient, equitable, and sustainable, as the editors suggest.<sup>38</sup> Despite this suggestion, few authors considered whether adaptive governance led to better substantive outcomes, perhaps because of insufficient data, space constraints, or misunderstanding.<sup>39</sup>

### CONCLUSION

The water problems explored in *Adaptive Governance* are by no means unique. Problems of sufficient water quantity, degraded water quality, and environmental harms are becoming more and more commonplace anywhere "exuberant population growth and economic development" meet "fragile groundwater stocks and delicate ecosystems" (p. 3). They represent only a few of the rising number of natural resource conflicts for which existing regulatory solutions seem inadequate and innovative institutions are needed. *Adaptive Governance* is timely in this regard and will only become more relevant as diverse stakeholders in natural resource dilemmas are forced to respond to uncertain ecological harm in innovative ways. The book helps define a new form of institution that can meaningfully respond to the weaknesses of conventional approaches, by providing flexibility in the face of scientific uncertainty, and by providing an alternative to imposing top-down solutions on resistant resource users.

However, because of *Adaptive Governance's* narrow focus on the internal mechanisms of adaptive governance, it ultimately misses an opportunity to take a broader view of the role of adaptive governance in addressing natural resource problems. The reader is left wondering whether adaptive governance is always appropriate, how it interacts with various policy instruments, and whether its solutions are superior

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<sup>37</sup> See Lee, *supra* note 12 ("[T]he time scales for ecosystem response are typically long, and it is too early to know how or even if changes in human management policies have made an unambiguous difference. Most natural indicators yield one data point a year; even a simple trend takes patience . . .").

<sup>38</sup> See *supra* text accompanying note 21 (providing editors' definition of problem responsiveness).

<sup>39</sup> In some cases, this failure can be explained by the fact that no policy solution or outcome was ever reached (Leitman, pp. 74-88; Sloan, pp. 100-05). In others, the authors examined tangentially related features, such as what each stakeholder might consider an equitable solution (for example, Andrew, p. 50).

to alternative forms of resolving natural resource problems. While some answers were already available to the authors, many were not and still are not. Therefore, practitioners advocating widespread acceptance of adaptive governance ought to conduct more research to bolster their claims of its strengths and advantages.

