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A (SOCIAL) SCIENTIFIC LOOK AT ECOSYSTEM-BASED MANAGEMENT

*Porter Hoagland**

NATURAL EXPERIMENTS: ECOSYSTEM-BASED MANAGEMENT AND THE ENVIRONMENT. By Judith A. Layzer. Cambridge, Massachusetts, MIT Press, 2008.

A recent book,¹ a number of articles,² a consensus statement,³ a web page,⁴ and an interim framework for coastal and marine spatial planning in the United States,⁵ signal the maturation of the movement to spread the word of ecosystem-based management (EBM). According to a 2005 scientific consensus statement, EBM is an integrated, place-based management approach that focuses on maintaining the integrity or enhancing the resilience of an entire ecosystem, including its structure,

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1. ECOSYSTEM-BASED MANAGEMENT FOR THE OCEANS (Karen L. McLeod & Heather M. Leslie eds., Island Press 2009).

2. See, e.g., Heather Tallis et al., *The Many Faces of Ecosystem-Based Management: Making the Process Work Today in Real Places*, 34 MARINE POLICY 340 (2009); Katie K. Arkema et al., *Marine Ecosystem-Based Management: from Characterization to Implementation*, 4 FRONTIERS IN ECOLOGY AND ENVIRONMENT 525 (2006); and Anne D. Guerry, *Icarus and Daedalus: Conceptual and Tactical Lessons for Marine Ecosystem-Based Management*, 3 FRONTIERS IN ECOLOGY AND ENVIRONMENT 202 (2005).

3. KAREN L. MCLEOD ET AL., SCIENTIFIC CONSENSUS STATEMENT ON MARINE ECOSYSTEM-BASED MANAGEMENT (2008), www.compassonline.org/pdf_files/EBM_Consensus_Statement_v12.pdf.

4. Ecosystem-Based Management Tools Network, About Ecosystem-Based Management, http://www.ebmtools.org/about_ebm.html (last visited Jan 11, 2010).

5. INTERAGENCY OCEAN POLICY TASK FORCE, INTERIM FRAMEWORK FOR EFFECTIVE COASTAL AND MARINE SPATIAL PLANNING 7 (2009), <http://www.whitehouse.gov/sites/default/files/microsites/091209-Interim-CMSP-Framework-Task-Force.pdf> (“[Coastal and Marine Spatial Planning] would use an ecosystem-based management approach that addresses cumulative effects to ensure the protection, integrity, maintenance, resilience, and restoration of ocean, coastal, and Great Lakes ecosystems, while promoting multiple sustainable uses.”).

functioning, processes, and dynamics.⁶ EBM accounts explicitly for both intra-system and inter-system linkages, considers cumulative impacts, and is adaptive.⁷ Importantly, according to the web-based EBM Tools Network, EBM “engages multiple stakeholders in a collaborative process to define problems and find solutions.”⁸

EBM should be contrasted with the failed management approaches that focus on single species or single sectors.⁹ It has now become commonplace to criticize the governance of large-scale environments, such as the coastal ocean, as being too centralized but also too fragmented.¹⁰ Commentators have argued that single-species fishery management and myopic alignments of special interests with captured agencies (the so-called “single sectors”) have been the norm, and policies and politics have led to inefficient and inequitable outcomes.¹¹ EBM has now been put forward as a science-based solution to the problems of governing large-scale environments or ecosystems.¹²

With all of its promise, however, there has been little evidence to date of the effectiveness of EBM.¹³ Scientific complexities and the need to establish novel institutions for governance pose significant

6. McLeod & Leslie, *supra* note 1, at 4.

7. Intra-system linkages would comprise biological relationships, such as predator-prey, competition, commensalism, among many others, as well as dependencies on environmental conditions. Inter-system linkages would comprise connections among distinguishable ecosystems in the air, in the water, and on the land.

8. ECOSYSTEM-BASED MANAGEMENT TOOLS NETWORK, *supra* note 4.

9. Guerry, *supra* note 2, at 209 (citing the impossibility of managing components of marine ecosystems in isolation).

10. *See generally* INTERAGENCY OCEAN POLICY TASK FORCE, *supra* note 5, at 1-2; JOINT OCEAN COMMISSION INITIATIVE, FROM SEA TO SHINING SEA: PRIORITIES FOR OCEAN POLICY REFORM (2006), http://www.jointoceancommission.org/resource-center/1-Reports/2006-06-13_Sea_to_Shining_Sea_Report_to_Senate.pdf; US COMMISSION ON OCEAN POLICY, AN OCEAN BLUEPRINT FOR THE 21ST CENTURY (2004), http://oceancommission.gov/documents/full_color_rpt/000_ocean_full_report.pdf; PEW OCEANS COMMISSION, AMERICA’S LIVING OCEANS: CHARTING A COURSE FOR SEA CHANGE (2003), http://www.pewtrusts.org/uploadedFiles/wwwpewtrustsorg/Reports/Protecting_ocean_life/env_pew_oceans_final_report.pdf.

11. Ellen K. Pikitch et al., *Ecosystem-based Fishery Management*, 305 SCIENCE 346 (2004).

12. *E.g.*, Heather M. Leslie & Karen L. McLeod, *Confronting the Challenges of Implementing Marine Ecosystem-Based Management*, 5 FRONTIERS IN ECOLOGY AND ENVIRONMENT 540 (2007).

13. *E.g.*, Tony J. Pitcher et al., *An Evaluation of Progress in Implementing Ecosystem-based Management of Fisheries in 33 Countries*, 33 MARINE POLICY 223 (2008); Tallis et al., *supra* note 2, at 340.

challenges.¹⁴ More significantly, beneath EBM's distinctively scientific façade, there may be poor justification for some of its underlying general principles.¹⁵ Of special concern is the purported value of stakeholder collaboration in planning for and implementing EBM.

In *NATURAL EXPERIMENTS*, Judith A. Layzer, an Associate Professor of Environmental Policy in the Department of Urban Studies and Planning at the Massachusetts Institute of Technology, takes a systematic look at the implementation of EBM in a wide range of contexts.¹⁶ Employing a case study approach, she questions especially the effectiveness of the collaborative planning aspect of EBM.¹⁷ (At least two of her cases, the Florida Everglades ["South Florida's river of grass"] and the San Francisco Bay—Sacramento-San Joaquin Delta [the "California Bay-Delta"] should be of particular interest to specialists in coastal and ocean law and policy.) She concludes that encouraging collaborative planning may in fact hinder the goals of EBM to conserve and restore ecosystems. This striking result should make her book required reading for any serious student or practitioner of coastal or ocean governance.

EBM is about the governance¹⁸ of large-scale environments or ecosystems, which may be defined on the basis of their distinctive ecological features. Notably, the study of what constitutes good governance is gaining popularity in the social sciences. For example, the award of the 2009 Nobel Prize in Economics to Elinor Ostrom of Indiana

14. *E.g.*, Heather M. Leslie et al., *Is a New Mandate Needed for Marine Ecosystem-Based Management?*, 6 *FRONTIERS IN ECOLOGY AND ENVIRONMENT* 43 (2008).

15. *See, e.g.*, Augustin Berghöfer et al., *Stakeholder Participation in Ecosystem-Based Approaches to Fisheries Management: A Synthesis from European Research Projects*, 32 *MARINE POLICY* 243 (2008) (finding that information flows, legitimacy, and social dynamics in EBM for fisheries are made more difficult because competent regulatory authorities and stakeholders are positioned in different sectors and at different governance levels).

16. *See* JUDITH A. LAYZER, *NATURAL EXPERIMENTS: ECOSYSTEM-BASED MANAGEMENT AND THE ENVIRONMENT* (MIT Press 2008).

17. Layzer considers three "core attributes" of EBM: addressing problems at a regional scale; collaborative planning; and flexible, adaptive implementation. Together, these three attributes facilitate the conservation and restoration of ecosystem health. *Id.* at 22-23. Collaborative planning is defined as an assembly of public officials, private stakeholders, and scientists who voluntarily seek consensus of a solution that promises joint gains.

18. Governance comprises the policies, norms, responsibilities, decisions, and actions of a governing institution, including government agencies, nonprofit organizations, public-private organizations, and private firms. In other words, governance is both the purpose of an institution and the carrying out of that purpose.

University¹⁹ signifies a growing importance to social scientists—especially economists—of understanding what constitutes good governance.²⁰ Layzer's book is a good example of the kind of social scientific research urgently needed for developing insights into the design and implementation of effective EBM approaches in the future.

In strict terms, governance *per se* involves the transactions costs of managing individuals or groups in the non-market setting found within a government agency or a corporate firm.²¹ Unlike the simplistic characterizations that find their way into much political rhetoric, there is no real ideological choice between either governments or markets.²² The relevant policy question is: what is the best *combination* of the two in any particular circumstance?²³ In theory, the appropriate mix of institutions should evolve in a way that economizes transaction costs.²⁴ In practice, history, laws, cultural norms, the distribution and exercise of political power, technologies, and a host of other factors may interact to influence tradeoffs affecting the nature of governance.²⁵

Ostrom's work helps elucidate the appropriate mix of institutions in the context of common-pool resource exploitation. Common-pool resources are quasi-public resources for which potential users cannot be excluded but the resource can be over-used or even used up. In 1968,

19. The Nobel Foundation, Elinor Ostrom: The Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel, http://nobelprize.org/nobel_prizes/economics/laureates/2009/ostrom-lecture.html (last visited Jan. 11, 2010).

20. Good governance defines and secures property rights, allows the enforcement of contracts, and supplies public goods or mitigates public bads. These three features of governance are undeniably essential for the proper functioning of markets and therefore deserving of the attention of economists and other social scientists. Avinash Dixit, *Governance Institutions and Economic Activity*, 99 AMERICAN ECONOMIC REVIEW 5 (2009).

21. Transactions costs—especially in industrial organization—have been studied extensively by Oliver E. Williamson, the co-recipient of the 2009 Nobel Prize in Economic Sciences. The Nobel Foundation, Oliver E. Williamson: The Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel, http://nobelprize.org/nobel_prizes/economics/laureates/2009/williamson-lecture.html (last visited Jan. 11, 2010).

22. AVINASH K. DIXIT, *THE MAKING OF ECONOMIC POLICY: A TRANSACTIONS-COST POLITICS PERSPECTIVE* 28-31 (MIT Press 1996) (characterizing transactions-cost politics as a dynamic, evolutionary process). Steven A. Murawski, NOAA's Chief Science Advisor for Fisheries, also argues that EBM is a continually evolving form of governance. Steven A. Murawski, *Ten Myths Concerning Ecosystem Approaches to Marine Resource Management*, 31 MARINE POLICY 681, 689 (2007).

23. Dixit, *supra* note 20, at 8.

24. DIXIT, *supra* note 22, at 32.

25. *Id.*

Garrett Hardin's portrayal of the "tragedy of the commons" implied that centralized government control was one logical solution to the over-exploitation of common-pool resources.²⁶ This model was readily adopted in many jurisdictions, providing justification for the centralized regulation of fisheries, the control of water pollution, and the governance of other common-pool resources in the United States and other jurisdictions.²⁷ In contrast, Ostrom's work showed that when certain community and environmental characteristics are obtained, a common-pool resource can be managed sustainably by the users.

What is remarkable is the generalizability of Ostrom's self-governance result across many peoples in many economic circumstances who use many different types of resources.²⁸ A critical aspect of Ostrom's argument is the uniqueness of the socio-ecological context; self-governing institutions are better at handling the relevant transaction costs involved in managing local common-pool resources. For these resources, centralized governance appears incapable of dealing with the idiosyncrasies of micro-environments and the peculiar interests of users.²⁹

For a self-governing system to arise, however, certain conditions ("general principles") must exist.³⁰ In broad terms, the transaction costs of dealing with other entities must be low enough that individual entities (typically members of the same community) can consult with one another in order to agree to conserve the resource sustainably. Other conditions include agreement among users on how individual actions affect the resource as well as other users and low levels of uncertainty about resource stocks, flows, and distribution in time and space. It helps if users are able to trust one another, perhaps because they have similar preferences and interests, live in the same community, or must engage in repeated interactions.

26. Garrett Hardin, *The Tragedy of the Commons*, 162 *SCIENCE* 1243 (1968). Hardin also posited the assignment of property rights and the establishment of a market in those rights as an alternative solution.

27. See U.S. COMMISSION ON OCEANS POLICY, *REVIEW OF U.S. OCEAN AND COASTAL LAW: THE EVOLUTION OF OCEAN GOVERNANCE OVER THREE DECADES* (2004), http://oceancommission.gov/documents/full_color_rpt/append_6.pdf (reviewing the evolution of coastal and ocean law and policy during the last three decades).

28. See Jules Pretty, *Social Capital and the Collective Management of Resources*, 302 *SCIENCE* 1912 (2003) (finding that nearly one-half million groups have been established worldwide since the 1990's to sustainably manage common-pool resources).

29. Elinor Ostrom et al., *Revisiting the Commons: Local Lessons, Global Challenges*, 284 *SCIENCE* 278, 281 (1999).

30. *Id.* at 281.

Self-governing common-pool resource management is a logical progenitor of the EBM concept.³¹ This relationship is especially evident where advocates for the latter call for the engagement of multiple stakeholders in a collaborative process of problem definition and the identification of solutions.³² Such language clearly channels common-pool resource self-governance. An important—and testable—question, however, is whether or not the conditions that give rise to effective self-governance for common-pool resources also occur for the large-scale ecosystems to which EBM might be applied.

In her book, Layzer seeks to determine whether such conditions are indeed comparable with regard to what she considers to be the three “core attributes” of EBM: addressing problems at a regional scale; collaborative planning; and flexible, adaptive implementation.³³ Her findings with respect to collaborative planning are especially noteworthy. Layzer refers to collaborative planning as one aspect of an “optimistic model” of EBM.³⁴ She interprets the findings of her case studies to show the differences between the “optimistic model” and a more “pessimistic model” in which differences among stakeholders perpetuate conflict and reduce the likelihood that EBM will conserve ecosystems.³⁵

Layzer shows that there are few long-term benefits to collaborative planning, finding, in contrast to the “optimistic model,” that, even where collaboration is achieved, it is both inconsequential and attenuates over time.³⁶ There are several reasons for this finding. First, stakeholders tend to avoid the thorny issues that cause disagreement, such as evidence of ecological decline. Instead, they redefine ecological problems in ways that tend to perpetuate the historical overuse of resources. In particular, stakeholders tend to avoid incorporating local knowledge where it would highlight difficult tradeoffs and lead to choices favoring one user over another. Almost by definition, stakeholder consensus cannot be built over issues where one user must relinquish political advantage. In addition to these findings, Layzer uncovers little evidence of the use of adaptive management, increased stewardship, or durability of plan

31. See, e.g., Thomas Dietz et al., *The Struggle to Govern the Commons*, 302 SCIENCE 1907 (2003) (arguing that promising strategies for addressing environmental problems at non-local scales include “dialogue among interested parties, officials, and scientists”).

32. *Id.* at 1910.

33. LAYZER, *supra* note 16, at 22-23.

34. *Id.* at 23-28.

35. *Id.* at 28-32.

36. *Id.* at 272.

implementation. Stakeholders appear to lean toward least-common-denominator agreements:

In cases where policymakers deferred to stakeholders to set goals, the policies and practices that emerged appear unlikely to conserve or restore ecological health because, to gain consensus, planners skirted tradeoffs and opted instead for solutions that promised something for everyone. . . . By contrast, when policymakers—elected officials, administrators, or judges—endorsed an environmentally protective goal and used regulatory leverage to prevent development interests from undermining that objective, the resulting policies and practices are more likely than their counterparts to conserve or restore ecological integrity.³⁷

This result is quite damning for EBM as it is currently understood, for it suggests that a centralized approach to governance may be superior to the stakeholder collaboration approach for large-scale ecological systems. Given her conclusion, one clearly has to wonder about the ultimate fate of the brand new “Interim Framework for Effective Coastal and Marine Spatial Planning,” which has called for “frequent and continuous” stakeholder engagement in all phases from development to implementation of coastal and marine spatial planning.³⁸

A superficial reading of Layzer’s work might lead one to wonder whether the cases were hand-picked to justify the result or whether there is not yet enough experience with EBM to understand its logic. Layzer may have sacrificed breadth for depth, as each of the case studies is quite carefully researched, but there are only seven of them. It would have been interesting to have included other cases, such as the management of the Chesapeake Bay estuary, which Layzer argues was too incomparable due to the multiplicity of jurisdictions.³⁹ In any case, the reader is left wanting more because even a moment’s reflection comes up with ocean examples that arguably could fit Layzer’s “pessimistic model.” Among

37. *Id.* at 284.

38. INTERAGENCY OCEAN POLICY TASK FORCE, *supra* note 5, at 14.

39. LAYZER, *supra* note 16, at 33. Layzer does include a brief discussion of the ineffectiveness of management efforts to restore the Chesapeake, which after more than 30 years of efforts remains seriously degraded. *Id.* at 17, 287. Interestingly, Layzer cites Bradley Karkkainen as one source of inspiration for the use of the term “natural experiments” in her book’s title. *Id.* at xii. In contrast to Layzer’s interpretation, Karkkainen has pointed to the Chesapeake Bay program as a successful example of ecosystem governance. Bradley Karkkainen, *Marine Ecosystem Management and a Post-Sovereign Transboundary Governance*, 6 SAN DIEGO INT’L L.J. 113, 127 (2004).

these are President George W. Bush's proclamation of the Papahānaumokuākea Marine National Monument in Hawaii, overriding years of stakeholder deliberations,⁴⁰ and the difficulties of finalizing a management plan for the Stellwagen Bank National Marine Sanctuary, a draft of which has been crafted through stakeholder deliberations.⁴¹

These and other examples confirm what Ostrom and her colleagues characterize as the "scaling-up problem" in which larger numbers of stakeholders increase the difficulty of organizing the governance of a common-pool resource and agreeing to and enforcing rules for access, take, and investment.⁴² It is sensible to read Layzer's conclusion not as a refutation of the important body of work on common-pool resource management but instead as an illustration of the inappropriateness of blindly borrowing outcomes from that field to apply to circumstances where they may be unlikely to hold. Large-scale ecological problems are complex, involving a significant degree of uncertainty. There are multiple interacting resources of varying quality to be managed, and the users are diverse and may not share similar preferences or reside within a well-defined community. And as Layzer points out, "trying to coordinate numerous entities with no single agency or jurisdiction at the helm diffuses authority in ways that can impede progress."⁴³

Layzer's book should draw the attention of those who are serious about designing and implementing EBM. Indeed, her stated purpose is not to disparage EBM but to increase the likelihood that, eventually, it can be utilized to advance ecological conservation. The critical keys to this end are the promotion of a protective regulatory framework and strong pro-environmental leadership, both of which require a more centralized form of governance. In this way, Hardin's point about government control of the commons could be read as a broader metaphor for the governance of large-scale ecosystems. With the right policies and

40. Brian N. Tissot et al., *Hawaiian Islands Marine Ecosystem Case Study: Ecosystem- and Community-Based Management in Hawaii*, 37 *COASTAL MANAGEMENT* 255 (2009), available at http://www.coralreefnetwork.com/kona/Tissot_Walsh_Hixon_2009.pdf (finding that challenges to EBM in Hawaii include the limited extent of community involvement, the complexity of conflicts among diverse stakeholders, the weak enforcement of fishery regulations, and questions about the sustainability of synergy among government entities and scientists).

41. The revision of the management plan was initiated in July 2002 and a 388 page draft plan is still being reviewed by NOAA as of December 2009. Stellwagen Bank National Marine Sanctuary, Draft Management Plan, <http://stellwagen.noaa.gov/management/mpr/draftplan.html> (last visited Jan. 11, 2010).

42. Ostrom et al., *supra* note 29, at 281.

43. LAYZER, *supra* note 16, at 284.

leadership, Layzer argues that negotiations among stakeholders could occur within a “hospitable” context.⁴⁴ While this final statement provides some hope for EBM, Layzer realizes that political officials will continue to promote stakeholder collaboration precisely because it reduces their own political risks.⁴⁵ “The trick for EBM initiatives,” according to Layzer, “is to capture the purported advantages of working at a landscape scale while harnessing at least some of the benefits of engaging stakeholders.”⁴⁶

44. *Id.* at 292.

45. *See, e.g.*, INTERAGENCY OCEAN POLICY TASK FORCE, *supra* note 5, at 14.

46. LAYZER, *supra* note 16, at 4.