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Article

Adaptive Federalism: The Case Against Reallocating Environmental Regulatory Authority

David E. Adelman[†] and Kirsten H. Engel^{††}

A hallmark of environmental federalism is that neither federal nor state governments limit themselves to what many legal scholars have deemed to be their appropriate domains. The federal government continues to regulate local issues, such as remediation of contaminated industrial sites, which have few direct interstate connections and few benefits from federal uniformity. At the same time, state and local governments are not content to confine their attention to issues of local concern, but are developing policies on environmental issues of national or even international scale, such as global climate change. Nor do environmental issues “stay” in the control of any particular level of government, but rather tend to pass back and forth between them like the proverbial football.

The current system of environmental federalism is thus a dynamic one of overlapping federal and state jurisdiction. This dynamic system is threatened, however, by federal legislation and Supreme Court rulings. A wave of preemptive legislation has emerged from Congress in recent years.¹ For example, an

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1. PAUL TESKE, REGULATION IN THE STATES 4–5 (2004) (enumerating preemptive federal statutes and noting that “more federal preemptions have occurred in recent decades than over the rest of U.S. history”). In addition, several federal agencies have recently claimed in the preambles to regulations in the Federal Register that their regulatory actions preempt state statutory and common law. William W. Buzbee, *Asymmetrical Regulation: Risk, Preemption, and the Floor/Ceiling Distinction*, 82 N.Y.U. L. REV. 1547, 1573 (2007).

early version of an energy bill now pending in Congress would have preempted state actions to reduce greenhouse gas emissions that contribute to climate change.² Numerous other bills would preempt state action on issues related to climate change and energy efficiency.³ At the same time, the Supreme Court has not hesitated to preempt state auto pollution regulations, despite, at best, ambiguous statutory language.⁴ Such decisions

2. See Edmund L. Andrews, *Auto Chiefs Make Headway Against a Mileage Increase*, N.Y. TIMES, June 7, 2007, at C1 (reporting that a House bill would prevent the Environmental Protection Agency (EPA) from authorizing states to regulate vehicle greenhouse gas emissions, thus preempting rules promulgated by California and adopted by other states). The two powerful House sponsors, Representatives John Dingell and Rick Boucher, ultimately abandoned the preemption effort. *California Congressional Leaders Defeat Effort to Preempt State's Climate Change Legislation*, CAL. CAPITOL HILL BULL. (Cal. Inst. for Fed. Pol'y Res., Wash., D.C.), June 22, 2007, at 6, available at <http://www.calinst.org/2007Bullpdf.shtml>.

3. See, e.g., H.R. 2927, 110th Cong. § 2(a) (2007) (preempting any state law or regulation on consumer tire fuel efficiency information that is different from requirements imposed by the Department of Transportation); Alternative Fuel Standard Act of 2007, S. 1158, 110th Cong. § 2 (2007) (preempting state and local laws and regulations relating to the renewable or alternative energy content of fuels when the Administrator of the EPA issues a waiver during an "extreme or unusual fuel supply circumstance"); Gasoline for America's Security Act of 2005, H.R. 3893, 109th Cong. §§ 101, 102, 107 (as presented in House, Oct. 7, 2005) (preempting state authority regarding the siting and operation of oil refineries on federal lands within a state and authorizing the establishment of a Federal Fuels List of approved fuels and blends); Engine Coolant and Antifreeze Bittering Agent Act of 2005, S. 1110, 109th Cong. § 2 (2005) (preempting state or local laws that impose requirements different from that of the federal government relating to the inclusion of a bittering agent in retail engine coolant or antifreeze). A review of bills currently pending before Congress reveals a heated debate over preemption; several bills on similar topics expressly reject preemption. See Carbon-Neutral Government Act of 2007, H.R. 2635, 110th Cong. § 104 (2007) ("Nothing in this Act . . . shall be interpreted to preempt or limit the authority of a State to take any action to address global warming."); Future Fuels Act, H.R. 2296, 110th Cong. § 304(d)(6) (2007) ("Nothing in this chapter shall be construed to preempt State law relating to higher fuel economy standards applicable to replacement tires designed for use on passenger cars and trucks."); H.R. 2215, 110th Cong., § 711 (2007) (adding a title to the Clean Air Act providing a reduction in greenhouse gas emissions from vehicles and aircraft and stating that "nothing in this title shall be interpreted to preempt or limit State actions to address climate change").

4. *Engine Mfrs. Ass'n v. S. Coast Air Quality Mgmt. Dist.*, 541 U.S. 246, 258–59 (2004) (holding that section 209(a) of the Clean Air Act preempts California regulations prohibiting the purchase or lease by various public and private fleet operators of vehicles that do not comply with stringent emission requirements); see also Erwin Chemerinsky, *Empowering States When It Matters: A Different Approach to Preemption*, 69 BROOK. L. REV. 1313, 1314–15 (2004).

follow a long line of cases in which the Court has preempted a variety of state actions designed to protect the public.⁵

This dynamic system is also antithetical to the prevailing economic orthodoxy of federalism scholars. Legal academics have long maintained that an optimal level of government exists for regulating a given environmental problem. The orthodox view, which we refer to as the “matching principle,” is premised on the elementary economic theory that efficient regulation is possible only when the regulating entity fully internalizes the costs and benefits of its policies.⁶ A corollary of this principle is that the regulatory authority should reside at the level of government that roughly “matches” the geographic scope of the subject environmental problem. Hence regulation of intrastate groundwater ought to be regulated by state and local governments,⁷ whereas climate change should be addressed at the international level. This static model is incompatible with the existing dynamic system, as it precludes overlapping and shifting regulatory authority between the states and federal government.

We reject the traditional static optimization model for an adaptive one. Our approach draws on an emerging trend in le-

5. *E.g.*, *Am. Ins. Ass'n v. Garamendi*, 539 U.S. 396 (2003) (addressing the disclosure of insurance policies sold in Europe between 1920 and 1945); *Lorillard Tobacco Co. v. Reilly*, 533 U.S. 525 (2001) (cigarette smoking); *Geier v. Am. Honda Motor Co.*, 529 U.S. 861 (2000) (state tort law).

6. *See, e.g.*, Jonathan H. Adler, *Jurisdictional Mismatch in Environmental Federalism*, 14 N.Y.U. ENVTL. L.J. 130, 157 (2005) (arguing that the division of authority in environmental law is inefficient as it fails to comport with an analytical framework that reserves issues of national scope to the federal government and issues of local effect to state governments); Henry N. Butler & Jonathan R. Macey, *Externalities and the Matching Principle: The Case for Reallocating Environmental Regulatory Authority*, 14 YALE L. & POL'Y REV. 23, 25 (1996) (“The Matching Principle suggests that, in general, the size of the geographic area affected by a specific pollution source should determine the appropriate governmental level for responding to the pollution. There is no need for the regulating jurisdiction to be larger than the regulated activity.”); Daniel C. Esty, *Revitalizing Environmental Federalism*, 95 MICH. L. REV. 570, 587 (1996) (“Whenever the scope of an environmental harm does not match the regulator’s jurisdiction, the cost-benefit calculus will be skewed and either too little or too much environmental protection will be provided.”); Richard O. Zerbe, *Optimal Environmental Jurisdictions*, 4 ECOLOGY L.Q. 193, 245 (1974) (“[W]hile the arguments show the case for local jurisdiction [over environmental regulation] to be strong, important exceptions remain . . . where there is undue political influence at local levels, where there is sufficient interjurisdictional pollution, and where technological considerations give substantially greater efficiency to larger jurisdictions.”).

7. Adler, *supra* note 6, at 135 (“[M]ost environmental problems are local or regional.”).

gal scholarship that calls for a dynamic model of federalism.⁸ We start with the unremarkable observation that environmental problems are multifaceted. Sources of environmental harm may be the manifestation of numerous failures, market as well as regulatory, that arise along numerous dimensions and at widely variant temporal and spatial scales. Further, the initiative to address environmental problems will originate from more than one level of government based upon a variety of political, socioeconomic, and environmental factors, each differing from the other in the mix of these variables.⁹ This diversity of contexts proves to be an essential asset in a complex and dynamic world.

The simplicity of the matching principle, in this light, comes at a significant price because it assumes away much of the inherent complexity of environmental problems. Further, the static nature of the matching principle's economic model ignores the constantly shifting landscape in which environmental policy is set, with its disruptions from both natural processes and human interventions.¹⁰ Rigid adherence to the

8. See, e.g., Chemerinsky, *supra* note 4, at 1329; Renee M. Jones, *Dynamic Federalism: Competition, Cooperation and Securities Enforcement*, 11 CONN. INS. L.J. 107, 109 (2004); Robert A. Schapiro, *Polyphonic Federalism: State Constitutions in the Federal Courts*, 87 CAL. L. REV. 1409, 1411–13 (1999).

9. The divergent stands that states have taken on regulating greenhouse gases reflect this variation, with some states seeking to regulate them aggressively (e.g., California, Oregon, New Jersey) and others formally opposing the Kyoto Protocol and, in at least one case, barring state regulators from working with the EPA on voluntary climate-change programs. Tom Arrandale, *The Pollution Puzzle*, GOVERNING, Aug. 2002, at 22, 23; see also Brian J. Gerber & Paul Teske, *Regulatory Policymaking in the American States: A Review of Theories and Evidence*, 53 POL. RES. Q. 849, 856 (2000) (“[S]tates vary considerably in terms of their populations, political cultures, and political institutions.”); Matthew Potoski, *Clean Air Federalism: Do States Race to the Bottom?*, 61 PUB. ADMIN. REV. 335, 338–39 (2001) (finding a correlation between the “political climate” in a state and whether a state enacts more stringent standards than mandated by the EPA under the Clean Air Act); Evan J. Ringquist & David H. Clark, *Issue Definition and the Politics of State Environmental Justice Policy Adoption*, 25 INT’L J. PUB. ADMIN. 351, 364 (2002) (“[T]he general political and economic characteristics of a state exert terrific influence over the type of policies that a state will adopt.”).

10. For example, rigorous fire suppression appeared to be a logical policy for many years, but it gradually became evident that fire serves an important ecological function, so policy shifted to embrace prescribed burns. However, in part because of this earlier policy, human development had extended into many forested regions, raising the stakes of prescribed burns. See, e.g., William L. Baker, *Restoration of Landscape Structure Altered by Fire Suppression*, 8 CONSERVATION BIOLOGY 763, 767 (1994) (asserting that extensive pe-

matching principle, we will show, is counterproductive in such an environment because it increases the risks of freezing policies in local maxima (dead ends) and decreases responsiveness to changing environmental conditions.

We will use ecosystems, one of the best-known adaptive systems, as an exemplar of our adaptive model.¹¹ Ecosystems embody two seemingly incompatible processes: (1) weeding out less-fit organisms, in essence a process of biological optimization, and (2) maintenance of the biological diversity essential to long-term adaptability to environmental change.¹² Adaptive systems sustain these dueling objectives by operating on multiple geographic and temporal scales, such that environmental conditions are aggregated at different levels and along different dimensions.¹³ These basic characteristics already exist in the federal system. We will argue they are essential to sustaining innovative and responsive environmental policymaking.

To avert any misperceptions, we renounce two of the more extreme implications of our adaptive model. We do not believe that a single model can account for all aspects of the federal system or, for that matter, the many legal doctrines that it implicates. Our use of adaptive systems, and ecosystems in particular, as a model for federalism does not presume—and we do not maintain—that adaptive systems are inherently normative.¹⁴ We argue that an adaptive model of federalism is well

riods of fire suppression may require a return to the presettlement fire regime in order to restore landscape structures).

11. Here we draw upon an example from the natural world as a repository of the characteristics that contribute to the successful maintenance of a system over long time periods and in the face of change. In doing so, we use natural adaptive systems in a manner similar to the use of evolution in the work of E. Donald Elliott and others on the evolution of environmental statutes. E. Donald Elliott et al., *Toward a Theory of Statutory Evolution: The Federalization of Environmental Law*, 1 J.L. ECON. & ORG. 313, 314–15 (1985) (modeling development of environmental statutes using evolution as a metaphor for influences of the political and organizational environment).

12. Simon A. Levin, *Complex Adaptive Systems: Exploring the Known, the Unknown and the Unknowable*, 40 BULL. AM. MATHEMATICAL SOC. 3, 5–6 (2002) (observing that in complex adaptive systems, “[t]he winnowing of variation must be balanced against the appearance of new variation; else the systems will run down”).

13. C.S. Holling, *From Complex Regions to Complex Worlds*, 7 MINN. J.L. SCI. & TECH. 1, 2–4 (2005); Levin, *supra* note 12, at 4 (pointing out that “[natural] selection is manifest on multiple interacting scales”).

14. The multilevel structure of an adaptive model also mirrors the current system of environmental federalism. But one must be careful not to take the analogy too far. Clearly, many features of the federal system have no analogue in the natural world. Ecosystems, for instance, have nothing akin to a national

suites to the complexity of the problems native to environmental policy. Nor do we believe that an adaptive model captures everything worth saying about environmental federalism. To the contrary, we accept that the matching principle has its merits, particularly generality and simplicity (although its accuracy is often seriously wanting). Instead, we intend to show that an adaptive model is superior to the matching principle as an organizing framework for environmental federalism.

An adaptive model also represents an important conceptual advance. It fills a void in the legal literature by providing a robust theoretical grounding for dynamic federalism, which to date has been justified primarily on the basis of its capacity to generate a diverse range of policies and to protect state autonomy.¹⁵ Further, while an adaptive model reinforces many aspects of the existing framework for environmental federalism, it calls for several key doctrinal and legislative principles that would provide an antidote to the troubling rise in assertions of federal preemption by Congress and the courts. These prescriptions include adopting a judicial presumption and a corresponding principle of legislative drafting against federal preemption. The model also calls for a more specific presumption against federal regulations that preclude states from establishing more stringent standards.¹⁶ We further advocate tempering uniform federal standards by allowing a small number of competing state standards.

The Article is organized into three parts. Part I reviews the legal literature on environmental federalism and the emerging support for a dynamic model of federalism. Part II describes the

government with hierarchical authority over their subdivisions, and natural systems are not “designed” to achieve societal ideals, such as justice or economic efficiency. As we will show, these differences do not diminish the value of an adaptive model; its basic structure is uniquely suited to sustaining a diverse range of environmental policy options and processes for winnowing and refining them that a federal system would do well to duplicate.

15. See Chemerinsky, *supra* note 4, at 1315–16; Erwin Chemerinsky, *Empowering States: The Need to Limit Federal Preemption*, 33 PEPP. L. REV. 69, 74–75 (2005) [hereinafter Chemerinsky, *Empowering States*]; Jones, *supra* note 8, at 107; Schapiro, *supra* note 8, at 1411–13; Robert A. Schapiro, *Justice Stevens’s Theory of Interactive Federalism*, 74 FORDHAM L. REV. 2133, 2135 (2006) [hereinafter Schapiro, *Justice Stevens*]; Robert A. Schapiro, *Toward a Theory of Interactive Federalism*, 91 IOWA L. REV. 243, 248–50 (2005) [hereinafter Schapiro, *Interactive Federalism*].

16. See Pietro S. Nivola, *Does Federalism Have a Future?*, PUB. INTEREST, Winter 2001, at 44, 46 (noting the prevalence of federal preemption and observing that businesses seek “compulsory ceilings on the possible excesses of zealous states”).

basic features of an adaptive system and explains how our adaptive model differs from the static model that underlies the matching principle, as well as existing dynamic theories. Part III advocates three new legal presumptions and legislative principles designed to sustain the dynamic attributes of environmental federalism. It concludes with two examples—brownfields regulation and climate change—to illustrate the benefits of a federal structure that contemplates dynamic and overlapping federal-state regulatory jurisdiction.

I. THE ENVIRONMENTAL FEDERALISM DEBATE

The debate over environmental federalism is very much in flux.¹⁷ Two schools of thought, which we will refer to as “classical” and “dynamic” federalism, dominate the current debate. The classical school is largely defined by its commitment to the matching principle as a means of selecting the level of government at which an environmental problem should be regulated.¹⁸ The dynamic school prizes governmental regulatory autonomy, the virtues of multiple regulatory approaches, and the benefits of a dynamic give-and-take among regulatory officials across different jurisdictions.¹⁹ Both conceptions raise challenges to the system of cooperative federalism that dominates environmental law in the United States.

Calls for devolving environmental regulation to the states figure prominently in this discourse. Devolution emerged as a rallying cry among mostly conservative scholars and political activists in the 1990s,²⁰ and it was initially embraced by the

17. Wallace E. Oates & Paul R. Portney, *The Political Economy of Environmental Policy*, in 1 HANDBOOK OF ENVIRONMENTAL ECONOMICS 326, 346 (Karl-Göran Mäler & Jeffrey R. Vincent eds., 2003) (“Environmental federalism thus remains a highly contentious issue, both in terms of theory and practice.”).

18. The term “matching principle” is a relatively recent one in the federalism literature, as it was first coined in a 1996 article. Butler & Macey, *supra* note 6, at 25 (suggesting a “Matching Principle,” according to which “the size of the geographic area affected by a specific pollution source would determine the appropriate governmental level for responding to the pollution,” and asserting that “[t]here is no need for the regulating jurisdiction to be larger than the regulated activity”). For a similar view, see Adler, *supra* note 6, at 157.

19. Schapiro, *Interactive Federalism*, *supra* note 15, at 285–88.

20. As one commentator has observed, support and opposition to devolution

shows some interesting contradictions. Most generally, conservatives hoped that the combination of federal deregulation and devolution of powers to the states would lead to a greatly reduced regulatory role at both levels. Instead, federal deregulation and reduced social regulato-

administration of George W. Bush.²¹ The Bush administration soon backtracked, though, and sought both to centralize control over environmental policymaking at the federal level and to preempt state initiatives.²² We believe this move has gone too far.

In the Sections that follow, we examine both schools of federalism and describe the evolution of the environmental federalism debate. Although the classical school currently has the upper hand, the dynamic school is challenging long-held assumptions and gaining ground. We also address the distinctive position of cooperative federalism, which incorporates elements of dynamic federalism into a classical regime, in the pantheon of federalism scholarship.

A. CONFLICTING PERSPECTIVES ON STATIC MODELS OF ENVIRONMENTAL FEDERALISM

The modern scholarly debate over environmental federalism focuses on the proper allocation of regulatory authority between the states and the federal government. It begins with a very simple insight: regulation would be inefficient if its costs and benefits were not fully internalized by the regulating authority. The matching principle emerges naturally from this static economic argument.²³

Early scholarship followed a framework set forth by Richard Stewart. He argued that while state regulation should be

ry enforcement created a gap that some state actors have moved to fill. And while conservatives generally applaud the idea of different state and local jurisdictions pursuing different policy approaches, they get quite concerned when one or a few states or local jurisdictions are able to leverage their policies into, in effect, national policies. On the other hand, from the historical lessons of segregation policies by the states, halted only by federal policy intervention, many liberals retain strong skepticism about state policymaking even in an era when it often seems to their advantage, at least in regulatory policy.

TESKE, *supra* note 1, at 238.

21. Barry Rabe, *Environmental Policy and the Bush Era: The Collision Between the Administrative Presidency and State Experimentation*, 37 *PUBLICLIUS* 413, 413 (2007).

22. *Id.* at 421 (observing that the Bush administration has imposed numerous “federal rules and mandates that expanded the state government workload and narrowed its ability to pursue priorities”).

23. *See supra* note 6 and accompanying text; *see also* Oates & Portney, *supra* note 17, at 342 (observing that a central tenet of environmental economics “is that the responsibility for providing a particular service should be placed with the smallest jurisdiction whose boundaries encompass the various benefits and costs associated with the provision of the service”).

preferred, important exceptions exist to this traditional model of federalism.²⁴ In line with the matching principle, Stewart claimed that environmental regulation should be elevated to the federal level when local decision makers would not internalize all of the costs and benefits of regulatory action or inaction (for example, interstate water or air pollution spillovers).²⁵ Stewart further argued that federal regulation was appropriate for certain intrastate environmental problems. State standards, he argued, might be suboptimally lax due to the influence of powerful interest groups—so-called public-choice problems—or to competition between states for mobile industries that precipitate a “race to the bottom” in standard setting among states.²⁶

Stewart’s economic framework inspired a generation of writing on environmental federalism, and virtually every element of it has been dissected. The theoretical bases upon which he argued for federal regulation of intrastate environmental harms, however, have been the most controversial. The race-to-the-bottom hypothesis and the relative importance of public-choice dynamics at the state and federal levels have received most of the attention.²⁷ While initially accepted as dogma, both theories have come under close scrutiny, and some scholars now claim that neither interstate competition nor public-choice

24. Richard B. Stewart, *Pyramids of Sacrifice? Problems of Federalism in Mandating State Implementation of National Environmental Policy*, 86 YALE L.J. 1196, 1210 (1977). Stewart’s preference for local decision making was broader than simple cost-internalization, and included the opportunity to reap the benefits of policy experimentation and nonutilitarian values of self-determination. *Id.* at 1215–16.

25. *Id.* at 1215.

26. *Id.* at 1210 (“As a nation, we have traditionally favored noncentralized decisions regarding the use and development of the physical environment.”); see also Butler & Macey, *supra* note 6, at 25 (“[T]he size of the geographic area affected by a specific pollution source should determine the appropriate governmental level for responding to the pollution [W]hen a particular polluting activity is limited to a particular locality or state, there is very little justification for federal environmental regulation.”); Richard L. Revesz, *Rehabilitating Interstate Competition: Rethinking the “Race-to-the-Bottom” Rationale for Federal Environmental Regulation*, 67 N.Y.U. L. REV. 1210, 1222 (1992) (“Given our system of federalism, in which state and local governments have broad police powers, and in which, throughout most of our history, they have had primary responsibility for health-and-safety regulation, there ought to be an affirmative justification for federal intervention.”).

27. See, e.g., Kirsten H. Engel, *State Environmental Standard-Setting: Is There a “Race” and Is It “to-the-Bottom”?*, 48 HASTINGS L.J. 271, 274–76 (1997); Revesz, *supra* note 26, at 1210–12; Zerbe, *supra* note 6, at 245.

dynamics support a reversal of the traditional preference for state-level regulation.²⁸

The race to the bottom is an exception to the matching principle that, depending on its prevalence, could transform that principle from the rule to the exception. In a regulatory race to the bottom, states will sacrifice environmental standards to attract new industries to their jurisdiction, just as they lure companies through direct economic incentives such as tax breaks.²⁹ This strategy makes state regulations suboptimal even with respect to fully internalized, intrastate environmental problems, such as protection of groundwater or land use controls.³⁰ A principal point of disagreement is whether state environmental standard setting is best characterized by static models of perfect competition, in which case state standards will be efficient,³¹ or by a game-theoretic model of the “Prisoner’s Dilemma,” in which case state standards will be suboptimal.³²

The importance of public-choice dynamics is similarly contested. Most scholars agree that political processes tend to generate suboptimally lax environmental regulation and that this bias exists in large part because diffuse environmental interests are out-lobbied by more concentrated and powerful business interests.³³ Little consensus exists, however, over whether

28. Adler, *supra* note 6, at 157 (arguing that the division of authority in environmental law is inefficient as it fails to comport with an analytical framework that reserves issues of national scope to the federal government and issues of local effect to state governments); Butler & Macey, *supra* note 6, at 25; Revesz, *supra* note 26, at 1238–42 (arguing that the race-to-the-bottom rationale for federal regulation of intrastate environmental issues is unsupported and federal regulation in such contexts inefficient).

29. Engel, *supra* note 27, at 275.

30. *Id.*

31. See Revesz, *supra* note 26, at 1238–42. Applying a model developed by economists Wallace Oates and Robert Schwab, Revesz argues that regulators choose environmental standards and capital rates that maximize the utility of their residents. He assumes, among other things, that the number of participants in the market for industrial firms is sufficiently large that no single decision maker is able to influence the actions of any other decision maker. *Id.*

32. Engel, *supra* note 27, at 314–15, 356–59 (analogizing states to the prisoners in game theory’s “prisoner’s dilemma,” and contending that one state’s environmental choices are not immunized from the influence of other states and hence, left to their own devices, states may establish suboptimal environmental standards in an interstate regulatory race to the bottom).

33. See Richard L. Revesz, *Federalism and Environmental Regulation: A Public Choice Analysis*, 115 HARV. L. REV. 553, 571 n.95 (2001) (listing sources that discuss the powerful business lobby); see also Gerber & Teske, *supra* note 9, at 862–63 (observing that studies “definitely show that interest group pres-

the size of the power disparity between environmentalists and business interests differs between the state and federal levels of government. The traditional view favors federal regulation because the achievable economies of scale in organizing at the federal level might mitigate coordination disadvantages faced by environmental groups.³⁴ Revisionist thinking counters that there is no inherent reason to believe that public-choice pathologies affecting environmental regulation will be any worse or better at the state versus the federal level.³⁵

Other scholars have avoided such generalizations altogether in favor of a highly contextual, case-by-case approach to applying the matching principle. Professor Dan Esty, for instance, argues for a multifactor approach that considers the particular ecological or public health harms, technical complexity, time lags, threshold effects, and influence of special interest groups.³⁶ Esty further recognizes that a seemingly simple environmental problem may itself have multiple dimensions, some of which are best addressed at the national level while others call for local control.³⁷ He argues that in such circumstances, regulatory responsibility should be divided between different levels of government.³⁸ Esty's primary objective is nevertheless to identify the "optimal fit" between the scope of an environmental problem and the regulating entity. In essence, Esty's approach is a more nuanced application of the matching principle. Its most distinctive features include rejection of presumptions in favor of one level of government over another and a willingness to disaggregate environmental problems.³⁹

sure shapes state regulation," but interest group "influence may vary by state . . . as interest group power in particular industries . . . and interest group density generally . . . vary").

34. Esty, *supra* note 6, at 650–51; Stewart, *supra* note 24, at 1213.

35. Revesz, *supra* note 33, at 578. Indeed, recent assessments of lobbying at the state level suggest that "the stakes in state policy are high enough that they are now inundated with requests from interest groups to develop favorable public policies." TESKE, *supra* note 1, at 203. There are now "five registered state lobbyists for every state legislator" for a total of "37,000 registered lobbying organizations at the state level"; collectively, those organizations spent one billion dollars in 2000. *Id.*

36. Esty, *supra* note 6, at 652; see also Daniel C. Esty, *Toward Optimal Environmental Governance*, 74 N.Y.U. L. REV. 1495, 1554–56 (1999) [hereinafter Esty, *Governance*].

37. Esty, *Governance*, *supra* note 36, at 1555.

38. *Id.*

39. More recently, Esty seems to be leaning more toward a dynamic model that reflects the "diversity and complexity of the world" and "requires a flexible mix of competition and cooperation between government actors as well as

The classical school of environmental federalism provides a simple framework that draws on standard economic metrics to determine the level of government at which regulation should take place. As discussed above, this simplicity has proved to be superficial. Scholars have unearthed a number of complicating theoretical and empirical pitfalls, which are hotly contested even among the classical school's adherents. Deeper problems lurk beyond the debate within the classical framework. Most importantly, the classical school ignores the benefits of concurrent jurisdiction by state and federal authorities, as well as the characteristics of environmental problems that belie efforts to identify the single "efficient" level of government from which to regulate.⁴⁰

B. RISING SUPPORT FOR A DYNAMIC CONCEPTION OF FEDERALISM

Against the backdrop of the classical debate, a new trend in federalism scholarship is emerging that is alternatively referred to as "empowerment federalism,"⁴¹ "polyphonic federalism,"⁴² "interactive federalism,"⁴³ "dynamic federalism,"⁴⁴ and

between government and non-governmental actors, along both horizontal and vertical dimensions." Daniel C. Esty & Damien Geradin, *Regulatory Co-Optation*, 3 J. INT'L ECON. L. 235, 235 (2000).

40. Interestingly, although arguing that efficiency calls for standard setting by one or the other level of government, scholars within this school nonetheless recognize some of the many examples in which the level of government presumed to be efficient has failed in practice to live up to expectations. For instance, Richard Revesz has extensively criticized both the design and the implementation of the federal statutory provisions for reducing interstate air and water pollution spillovers. Richard L. Revesz, *Federalism and Interstate Environmental Externalities*, 144 U. PA. L. REV. 2341, 2342-47 (1996); see also Adler, *supra* note 6, at 162; Rena I. Steinzor, *EPA and Its Sisters at 30: Devolution, Revolution, or Reform?*, 31 ENVTL. L. REP. 11,086, 11,092 (2001). Yet, rather than viewing these examples as a reason to question either the general assumption that each environmental problem can be correlated with an optimizing level of government or that their chosen level is the correct one, these scholars simply argue for tweaks to the existing allocation of authority. See Adler, *supra* note 6, at 143-45 (explaining that the existence of national public goods may, but does not necessarily, justify federal regulation); Revesz, *supra*, at 2410 (suggesting interstate spillovers be reduced through a federal scheme of marketable permits in environmental degradation).

41. See Chemerinsky, *supra* note 4, at 1313-16; Chemerinsky, *Empowering States*, *supra* note 15, at 1013-18.

42. See Schapiro, *supra* note 8, at 1411-17; Schapiro, *Interactive Federalism*, *supra* note 15, at 250-62.

43. Schapiro, *Interactive Federalism*, *supra* note 15, at 285-317.

44. See Jones, *supra* note 8, at 108-10.

even “vertical regulatory competition.”⁴⁵ This movement began as a response to a dualist model of federalism premised on preserving state sovereignty by delimiting spheres of state authority immune from federal interference. Finding the task as difficult as it is fruitless, early scholars have advocated strong, overlapping state and federal jurisdiction. Some scholars have gone so far as to argue that all regulatory matters should be presumptively within the authority of both the federal and state governments.⁴⁶

Dynamic federalism scholars acknowledge the problems inherent in their multijurisdictional approach to federalism’s many conflicts. As one scholar notes, concurrent jurisdiction has significant costs in the form of uniformity, finality, and hierarchical accountability.⁴⁷ Indeed, the Supremacy Clause builds hierarchy into the very fabric of our constitutional framework of government and accountability has emerged as an important determinant of the Supreme Court’s federalism jurisprudence.⁴⁸ In response, scholars of dynamic federalism argue that the alternative values it promotes, such as plurality, dialogue, and redundancy, are worth the sacrifice and that the dualist approach fails no better in meeting these legislative norms.⁴⁹

Scholars arguing for a dynamic conception of federalism typically do not focus on specific fields of law,⁵⁰ and no central framework currently exists to link the various theories and approaches together. A few scholars, however, have used a dynamic model of federalism as a framework for examining and reassessing current modes of environmental regulation. We review three examples of this approach to illustrate how dynamic theories are being applied to environmental federalism.

45. *Id.* at 122.

46. Schapiro, *Interactive Federalism*, *supra* note 15, at 295 (“In the polyphonic conception, courts should apply a background presumption that state power and federal power can coexist.”).

47. *Id.* at 290–92.

48. *See* *United States v. Lopez*, 514 U.S. 549, 576 (1995); *New York v. United States*, 505 U.S. 144, 168 (1992); Schapiro, *Interactive Federalism*, *supra* note 15, at 291.

49. Schapiro, *Interactive Federalism*, *supra* note 15, at 292–93 (arguing that preserving clear channels of political accountability between the states and the federal government is all but impossible in a complex commercial society like the United States).

50. *See, e.g., id.* at 248–49 (describing a dynamic model of federalism that is independent of the substantive legal issues).

William Buzbee has long argued that a dynamic interplay exists between state and federal regulatory efforts, and that these interactions have been crucial to innovations in environmental regulation throughout the country.⁵¹ Buzbee highlights one particularly important dynamic: the opportunities for state government officials to make their names by promoting and implementing aggressive environmental regulatory initiatives when the federal government fails to act.⁵² He provides an elegant illustration using so-called brownfield sites—contaminated industrial sites abandoned in urban areas.⁵³ Through this example, Buzbee exposes the shifts between federal and state innovations and the important synergies that emerge from this dynamic back-and-forth. Buzbee touts the virtues of overlapping jurisdiction in facilitating knowledge transfer and learning, counteracting pressures to succumb to a race to the bottom, and enhancing citizen enforcement through multiple fora.⁵⁴

Complementing Buzbee's work, Kirsten Engel and Scott Saleska have emphasized the power of regulation at one level of government to prompt regulation at another.⁵⁵ The benefit of

51. See, e.g., William W. Buzbee, *Brownfields, Environmental Federalism, and Institutional Determinism*, 21 WM. & MARY ENVTL. L. & POL'Y REV. 1, 44–46 (1997).

52. William W. Buzbee, *Contextual Environmental Federalism*, 14 N.Y.U. ENVTL. L.J. 108, 114, 115–16 (2005) (“[W]hen federal environmental action appears to be ‘underkill’ of what written laws and regulations have historically allowed or required, it creates opportunities for environmentally oriented citizen and state actors (such as state attorneys general) to supplement federal enforcement or challenge the legal adequacy of the newly relaxed regulatory environment.”).

53. Buzbee, *supra* note 51, at 1–2.

54. Buzbee, *supra* note 52, at 125–26. Buzbee has also pointed out the accountability risk that comes with regulatory overlap: namely, the potential that it will appear that no one is in charge and hence regulatory inaction will result. See William W. Buzbee, *Recognizing the Regulatory Commons: A Theory of Regulatory Gaps*, 89 IOWA L. REV. 1, 30–33 (2003) [hereinafter Buzbee, *Regulatory Commons*]. He nevertheless argues that regulatory overlap contains an “antidote” to this very problem by ensuring that those most interested in addressing a given environmental problem can assess what might be the appropriate level of government to address it. These interested parties hope that, in the long term, the association that will develop between a particular problem and a regulatory jurisdiction will erase the “ownership” problem that results from too many potential regulators. Buzbee, *supra* note 52, at 126. For another analysis of the benefits of overlapping jurisdiction in the environmental field, see Kirsten H. Engel, *Harnessing the Benefits of Dynamic Federalism in Environmental Law*, 56 EMORY L.J. 159, 160–63 (2006).

55. Kirsten H. Engel & Scott R. Saleska, *Subglobal Regulation of the Global Commons: The Case of Climate Change*, 32 ECOLOGY L.Q. 183, 189

this “domino effect,” they argue, is that regulation stalled at one level of government may be ripe for action at a different level of government where the political environment is more favorable.⁵⁶ Movement to regulate in one state, for example, can establish a precedent that prompts regulation horizontally in other states or vertically at the federal level.⁵⁷ Moreover, because this dynamic is often useful in drawing attention to issues of national importance and thereby putting them on the federal agenda, Engel argued in a subsequent article that federal preemption should be narrowly construed so as not to cut off this important dynamic among the states and between state and federal regulation.⁵⁸

Other scholars have advocated a more radical departure from the classical model. They focus on institutional impediments to effective environmental regulation, at both the state and federal levels.⁵⁹ According to this view, current institutional models delimited by traditional jurisdictional boundaries are ineffective.⁶⁰ Jody Freeman and Daniel Farber, in particular,

(2005).

56. Empirical evidence exists supporting this hypothesis from both the Reagan era and the current Bush administration, where political scientists have observed a marked shift to progressive policymaking at the state level. *See, e.g.*, TESKE, *supra* note 1, at 16–17 (noting the push by “regulatory activists” to enact reforms at the state level relating to nutrition, the environment, and ATM charges when the federal government’s enthusiasm for such reforms waned in the 1980s and again in the 2000s).

57. Engel & Saleska, *supra* note 55, at 253; *see also* Engel, *supra* note 54, at 162–63 (arguing that giving states the freedom to develop environmental policy will create a “regulatory dialogue” between state and federal government and improve environmental regulation).

58. Engel, *supra* note 54, at 161; *see also* Roderick M. Hills, Jr., *Against Preemption: How Federalism Can Improve the National Legislative Process*, 82 N.Y.U. L. REV. 1, 20 (2007) (“State laws . . . are an important influence on Congress’s agenda.”).

59. *See* Jody Freeman & Daniel A. Farber, *Modular Environmental Regulation*, 54 DUKE L.J. 795, 809 (2005) (asserting that institutional limits on jurisdiction lead to challenges, at both the state and federal level, to government efforts to formulate environmental policy); *see also* J.B. RUHL ET AL., *THE LAW AND POLICY OF ECOSYSTEM SERVICES* 284–88 (2007) (advocating an “institutional structure” for ecosystem management that integrates authority at the state, regional, and local level); Bradley C. Karkkainen, *Collaborative Ecosystem Governance: Scale, Complexity, and Dynamism*, 21 VA. ENVTL. L.J. 189, 193 (2002) (advocating the acceptance of a “collaborative ecosystem governance” model that “recognizes the need for integrated, holistic management of ecosystems as systems, and grapples with questions of scale and complexity in ecosystem management, emphasizing locally or regionally tailored solutions within broader structures of coordination and public accountability”).

60. Freeman & Farber, *supra* note 59, at 797–98.

contend that efficient, more responsive environmental regulation depends on overcoming cross-agency coordination problems at all levels of government.⁶¹ They argue that the complexity and uniqueness of many environmental problems demands flexible institutional frameworks that can be tailored to a specific problem.⁶² The authors use the CalFed program, a joint federal, state, and local government effort to manage the San Francisco Bay-Delta, as an example of their modular theory. Their approach is distinctive in its use of a negotiated process for setting regulatory and management goals, which then form the basis for fashioning a unique multijurisdictional institutional apparatus tailored to the specific problem.⁶³

As the preceding discussion shows, scholars of dynamic federalism have identified many examples of beneficial overlap between state and federal environmental regulation, as well as the many advantages of maintaining dynamic, overlapping jurisdiction between the states and federal government. Several are also experimenting with more ambitious models for restructuring regulatory institutions to enhance the benefits of overlapping state-federal jurisdiction.

C. CRITIQUES OF THE COOPERATIVE FEDERALISM FRAMEWORK

Cooperative federalism, the dominant model for federal environmental statutes, differs in important respects from both the classical matching principle and a dynamic model of federalism. The policy recommendations we make must thus consider the implications for cooperative federalism.⁶⁴

In its simplest form, cooperative federalism is a system of shared authority between the federal and state governments.⁶⁵ Typically, Congress delegates broad regulatory authority to a federal agency (such as standards setting, enforcement, and permitting) and authorizes the agency to delegate program im-

61. *Id.* at 798–99.

62. *Id.*

63. *Id.* at 836–37; *see also id.* at 799 (“[T]he goal of modularity is to let the solutions to environmental problems determine institutional arrangements as much as possible.”).

64. *See* Denise Scheberle, *The Evolving Matrix of Environmental Federalism and Intergovernmental Relationships*, PUBLIUS, Winter 2005, at 69, 72 (noting that, under a cooperative federalism framework, “[b]y 2000, states ran about three-fourths of all environmental programs, up from 41 percent in 1993”).

65. RUHL ET AL., *supra* note 59, at 282–83.

plementation to states that satisfy certain requirements.⁶⁶ An important requirement is that state programs adopt environmental standards at least as stringent as the federal program. Further, to ensure adequate state implementation, the federal government retains oversight authority.⁶⁷ This residual authority enables the federal government to bring enforcement actions within a delegated state and to unilaterally withdraw a state's delegated powers for failing to meet federal standards.⁶⁸

Cooperative federalism is at odds with both the classical and dynamic schools of federalism, although the incongruity is most pronounced with the former. Among advocates of the matching principle, cooperative federalism unjustifiably expands the role of the federal government by sanctioning federal intervention irrespective of whether an environmental problem is wholly intrastate.⁶⁹ This makes cooperative federalism "both a blessing and a curse."⁷⁰ Although states can largely control the regulatory programs delegated to them, most of the costs of the programs are fixed by immutable federal standards.⁷¹ The devolutionist wing of the classical school is particularly incensed by the "federalizing" of local issues, and has singled out national safe drinking water standards as an especially egregious example of federal overreaching.⁷² At the same time, environmental problems of truly national scope that warrant federal regulation are hobbled by the inadequacies of state implementation.⁷³

A cooperative framework fares somewhat better with the dynamic school. The overlapping authority, although asymme-

66. Scheberle, *supra* note 64, at 71 (describing cooperative federalism as a "partial-preemption approach" under which "the EPA or other federal agency would delegate day-to-day programmatic responsibilities back to the states with approved programs").

67. *Id.*

68. RUHL ET AL., *supra* note 59, at 283.

69. Joseph Zimmerman, *National-State Relations: Cooperative Federalism in the Twentieth Century*, PUBLIUS, Spring 2001, at 15, 24–25 (arguing that the partial preemption aspect of cooperative federalism "increase[es] its complexity and rais[es] accountability issues"); see RUHL ET AL., *supra* note 59, at 283 (noting that the complexity created by cooperative federalism can lead to "uncoordinated and ineffective" distributions of power).

70. RUHL ET AL., *supra* note 59, at 283; see also Michael S. Greve, *Against Cooperative Federalism*, 70 MISS. L.J. 557, 559 (2000) (calling cooperative federalism a "rotten idea").

71. Scheberle, *supra* note 64, at 71–73.

72. *Id.* at 72–73.

73. Stewart, *supra* note 24, at 1215–16.

tric, at least has the trappings of a dynamic system. Cooperative federalism nonetheless falls short from the point of view of the dynamic school. The federal laws and regulations are often, but not always, so comprehensive as to exclude for all practical purposes alternative approaches by the states.⁷⁴ Viewed from the perspective of either classical or dynamic theory, cooperative federalism entails misconceived compromises that sacrifice either too much efficiency or too much diversity and innovation.

II. AN ADAPTIVE MODEL FOR ENVIRONMENTAL FEDERALISM

We use the term “adaptive system” descriptively and normatively in this Article. It is used descriptively as a model of environmental systems, particularly ecosystems, and it is used normatively as a framework for understanding environmental federalism.⁷⁵ We argue further that it provides compelling support for a dynamic conception of federalism.

This Part will argue that the strength of adaptive systems derives from their capacity to maintain optimizing and diversifying processes, which are inherently in opposition to each other. We will show that both are essential to effective policymaking because environmental problems are complex and time-variant. Drawing on evolutionary models of democracy, we argue that environmental federalism must have institutional mechanisms to sustain policy innovation and resist forces, particularly powerful interest groups, that undermine its adaptability.⁷⁶ The Part begins by describing adaptive systems

74. See, e.g., Robert L. Glicksman, *From Cooperative to Inoperative Federalism: The Perverse Mutation of Environmental Law and Policy*, 41 WAKE FOREST L. REV. 719, 800–03 (2006) (arguing that cooperative federalism binds the hands of both the federal government and the states). Nevertheless, some scholars sympathetic to the dynamic framework cite cooperative federalism approvingly. See, e.g., Buzbee, *supra* note 52, at 122–26 (discussing the advantages of “regulatory overlap”).

75. Other scholars have drawn on theories about complex adaptive systems. See generally J.B. Ruhl, *The Fitness of Law: Using Complexity Theory to Describe the Evolution of Law and Society and Its Practical Meaning for Democracy*, 49 VAND. L. REV. 1406, 1409–11 (1996) (attempting to explain how and why law “evolves”). As we will argue, however, the lessons we draw from adaptive systems and the policy recommendations we make differ substantially from this prior work.

76. Glenn Harlan Reynolds, *Is Democracy Like Sex?*, 48 VAND. L. REV. 1635, 1646 (1995) (“Just as the randomizing factor of sex creates a ‘moving target’ for parasites, preventing them from becoming too well adapted to their hosts, so the randomizing factor of democratic politics creates a ‘moving target’

and then turns to examining how their basic features are already reflected in environmental federalism and how these features can be enhanced to strengthen U.S. environmental law.

A. THE MERITS OF AN ADAPTIVE MODEL OVER THE MATCHING PRINCIPLE

Environmental policymaking must contend with complex and unpredictable problems. To anyone remotely familiar with environmental law and policy, this is stating the obvious. It is nevertheless an important starting point, as the discussion that follows is premised on it. An adaptive model, which is designed to manage unpredictable change, is better suited to the complexities of environmental policymaking than the matching principle, which assumes many of them away.

Given the complexity and variability of environmental problems, the number of potential regulatory options inevitably will be overwhelming, and only limited grounds will exist for discriminating between them. Our rejection of the matching principle in favor of an adaptive model thus turns on two variants of this basic problem: (1) the difficulty of identifying the efficient (i.e., optimal) regulatory approach, and (2) the undefined scale of most environmental problems. We discuss both in turn as they apply to the matching principle and then examine how the structure of an adaptive model mitigates them and manages unpredictable change.

1. The Practical Limits of the Matching Principle

One need only consider a sampling of environmental problems to appreciate their intricacies. Prairie potholes, depression wetlands found in the Upper Midwest, function as critical watering holes for migratory birds and protect against local flooding.⁷⁷ Thus, although geographically localized, their biological importance is national if not international in scope.⁷⁸ Similarly, mercury emissions from coal-fired power plants have local and global impacts. Mercury is emitted in two reactive

for special interests, keeping their relationships with lawmakers from being too comfortable or mutually beneficial.”).

77. See U.S. Environmental Protection Agency, Wetlands, <http://www.epa.gov/owow/wetlands/types/pothole.html> (last visited Apr. 28, 2008).

78. See *id.* (describing the Upper Midwest as “one of the most important wetland regions in the world” and “home to more than 50 percent of North American migratory waterfowl, with many species dependent on the potholes for breeding and feeding”).

states.⁷⁹ One is of only local significance because it quickly precipitates from the atmosphere.⁸⁰ The other persists in the atmosphere and is a major contributor to rising mercury levels in ocean mammals globally.⁸¹ In both of these examples, the problem does not exist on a single geographical or even temporal scale, but on multiple scales simultaneously.⁸²

These technical challenges have both natural and human dimensions. The complexity of natural systems is by now well known, and the examples of misdirected federal and state programs abound. For instance, government officials for many years believed that a strict regime of fire suppression would protect forests.⁸³ It took decades for foresters to appreciate the important role that fire plays in maintaining the biological diversity and resilience of forest ecosystems and for them to alter their policies.⁸⁴ Analogous stories could be told about the environmental effects of intensive agriculture, the dynamics of groundwater and surface water management, and the many challenges of assessing the risks of industrial pollutants.⁸⁵ In all of these cases, the phenomena are complex, the data are scarce, and understanding is thin.

Many human actions are adding to this complexity. Rural land use patterns have proved particularly challenging in this respect, as evidenced by growing forest management problems associated with increasing numbers of homes located on the boundaries of state and national forests.⁸⁶ Protection of wet-

79. See Lisa Heinzerling & Rena I. Steinzor, *A Perfect Storm: Mercury and the Bush Administration*, 34 ENVTL. L. REP. 10,297, 10,303–05 (2004) (discussing mercury contamination and noting that it is both a local and a global problem).

80. *Id.*

81. *Id.*

82. See Stephen R. Carpenter et al., *Millennium Ecosystem Assessment: Research Needs*, 314 SCIENCE 257, 257 (2006) (“Local processes sometimes spread to become important regionally or globally, but ecosystem services at more aggregated scales are seldom simple summations of the services at finer scales. . . . We need robust, manageable frameworks for analyzing ecosystem services at multiple scales.”); Holling, *supra* note 13, at 7 (“Adaptive cycles in ecosystems occur in scales ranging from . . . centimeters and days to hundreds of kilometers and millennia.”).

83. George Busenberg, *Wildfire Management in the United States: The Evolution of a Policy Failure*, 21 REV. POL’Y RES. 145, 146 (2004).

84. *Id.* at 147–48.

85. ROBERT PERCIVAL ET AL., ENVIRONMENTAL REGULATION: LAW, SCIENCE, & POLICY 230–33 (5th ed. 2005) (noting the challenges of risk assessment and the frequency with which regulators get it wrong).

86. Jesse McKinley & Kirk Johnson, *On Fringe of Forests, Homes and*

lands has lost out to similar conflicts between development pressures and environmental preservation.⁸⁷ At the same time, commercial globalization expands international connections, adding another layer of interactions.⁸⁸ The dramatic rise in invasive species, transport of hazardous wastes internationally, and the growing national and international markets for drinking water are exemplary of these changes.⁸⁹

The complexity of environmental problems does not lend itself to standard optimization methods. Whereas an idealized optimization problem is akin to locating the peak of a single isolated mountain, say Kilimanjaro, environmental policies are set in a domain analogous to the Himalayas, where the number of peaks (potential optima) is so large that it would be impossible to explore all of them to identify the highest peak among them. The complexity of ecosystem management exemplifies this point, but many other environmental problems ranging from pollution control to land use to waste management raise issues of similar difficulty.⁹⁰ It is therefore implausible that a single government entity, including the federal government, could identify the efficient regulatory solution. Although the probability of success improves with multiple, independent state regulators, success is far from guaranteed even then.

Our second objection challenges the assumption implicit in the matching principle that eliminating all, or even most, externalities is possible. One of the basic features of ecosystems, for example, is that they operate on multiple spatial, organizational, and temporal scales.⁹¹ A single forest ecosystem will

Wildfires Meet, N.Y. TIMES, June 26, 2007, at A1.

87. TIFFANY WRIGHT ET AL., CTR. FOR WATERSHED PROT., DIRECT AND INDIRECT IMPACTS OF URBANIZATION ON WETLAND QUALITY, at i–ii (2006), <http://www.cwp.org/wetlands/articles/WetlandsArticle1.pdf>.

88. Holling, *supra* note 13, at 15 (arguing that globalization and dramatic wealth accumulation “could trigger a rare and major pulse of social transformation”); Jianguo Liu et al., *Complexity of Coupled Human and Natural Systems*, 317 SCIENCE 1513, 1516 (2007) (“As globalization intensifies, there are more interactions among even geographically distant systems and across scales.” (citations omitted)).

89. PERCIVAL ET AL., *supra* note 85, at 34–38.

90. Karkkainen, *supra* note 59, at 200. Forest ecosystems, for example, are designed to adapt to unpredictable change and thus incorporate structural features that belie strategies premised solely on optimization. *See also* Levin, *supra* note 12, at 11 (“[T]he number of local optima in real situations may be enormous. . . . [E]volution is a historically constrained process, shaped in large parts by frozen accidents of times past.”).

91. *See* RUHL ET AL., *supra* note 59, at 20–22 (discussing the difficulties of identifying well-delineated boundaries of ecosystems); *see also* Carpenter et

contain tiny microbial species with brief lives and small territories, large mammals with moderate life spans and large territories, and trees with very long lives and modest, but sizable territories. Moreover, specific environments or species may have impacts that extend beyond state or national jurisdictions. As mentioned above, prairie potholes appear to be purely local, but their importance transcends local, state, and national boundaries because of their importance to migratory birds.⁹²

The matching principle fails because no systematic way exists to bound most environmental problems, and thus to ensure that all of the costs and benefits are internalized by the regulating entity.⁹³ Static economic models work because their predictions can be updated and refined according to a predetermined scale of the problem. Economists, for example, make useful predictions about U.S. market trends in part because they understand the different scales of the system. This knowledge bounds their use of the models—they would never put much faith in predictions about an individual stock over the next six months or about the U.S. market in ten years. In both cases, the time variance of the system nullifies the reliability of the model over the time scales of these predictions. Although such limits do not invalidate economic models—no model is accurate under all conditions—they do significantly circumscribe when and how they can be used.

2. The Power of an Adaptive Model to Contend with Unpredictable Change

Adaptive systems operate through a mix of optimizing and diversifying processes; optimization is not the overriding objec-

al., *supra* note 82, at 257 (identifying difficulties in monitoring changes in ecosystems due to differences in scale); Holling, *supra* note 13, at 3, 7 (noting the ranges of ecosystem adaptation).

92. U.S. Environmental Protection Agency, *supra* note 77. This position should not be read as the stale platitude that everything is linked together in nature. That view is an overstatement, if not a mischaracterization, of how natural systems are interconnected. Our point is that *individual* components of natural systems are linked across a very broad range of scales, although, as one would expect, the larger the spatial scale, the fewer and weaker the connections.

93. See Esty, *supra* note 6, at 587 (noting “structural mismatches” related to inexact jurisdictional boundaries); Holling, *supra* note 13, at 15–17 (making the point that under the current conditions of significant social unrest and environmental disruption, “[t]he scale of the issues is such that they are beyond the reach of any one” institution or jurisdictional authority).

tive.⁹⁴ An adaptive model of environmental federalism would embrace existing processes for refining environmental policy, but reject the presumption that the optimal solution can be identified.⁹⁵ The model also recognizes that while efficiency is clearly important, it also has its downside—to the extent that a system is optimized to a specific set of conditions, it may be less resilient to change.⁹⁶ The challenge for environmental federalism is to maintain processes of optimization that promote policy refinement and efficiency, while cultivating a diversity of policies at different levels of government.

An adaptive model has two central elements that set it apart from the static model underlying the matching principle. First, it is premised on optimization being relative and not absolute.⁹⁷ As a result, it incorporates mechanisms, or takes advantage of external forces, that mitigate the tendency for systems to become stalled in local optima or dead ends.⁹⁸ This propensity is a frequent criticism of government bureaucracies, and is evident in nature too—species retain many traits despite the potential for superior alternatives to evolve.⁹⁹ The antidotes in evolutionary biology are disruptive events and processes that generate random genetic variation.¹⁰⁰ Through such exogenous

94. Stuart Kauffman & Simon Levin, *Toward a General Theory of Adaptive Walks on Rugged Landscapes*, 128 J. THEORETICAL BIOLOGY 11, 12–13 (1987) (observing that the adaptive landscape is a very rugged one, implying that so many peaks exist that global maximization is impossible, and as a result, noting that these systems are path-dependent and historically contingent).

95. Donald T. Hornstein, *Complexity Theory, Adaptation, and Administrative Law*, 54 DUKE L.J. 913, 942 (2005) (discussing the balance that must be struck between “exploration and exploitation” in the context of perpetually refining existing processes).

96. SIMON A. LEVIN, FRAGILE DOMINION: COMPLEXITY AND THE COMMONS 173 (1999) (“[R]esilience and resistance to change are two sides of the same coin. What is desirable in some systems (resilience) is the opponent of modernization in others”); Holling, *supra* note 13, at 14 (“[T]he longer the system is ‘locked in,’ the greater the vulnerability and the bigger and more dramatic its collapse will be.”).

97. Kauffman & Levin, *supra* note 94, at 24–26.

98. *Id.*

99. See Sewall Wright, *Evolution in Mendelian Populations*, 16 GENETICS 97, 97–100 (1931) (explaining that many factors influence evolution, and consequently, evolution of new characteristics does not always follow from availability of higher-level traits).

100. *Id.* at 97–100, 102–04 (observing that maintenance of diversity preserves inferior types against selective extinction and, in doing so, safeguards the potential for genetic combinations that allow evolutionary jumps). In ecosystems, for example, genetic diversity within a species and maintenance of a

and endogenous processes, adaptive systems sacrifice relative efficiency for unrealized potential.¹⁰¹

Second, adaptive systems protect diversity against the winnowing effects of optimizing processes through a fragmented structure and disruptive events. Ecosystems once again provide a simple explanatory case. Fragmentation, both geographical and temporal (hibernation is a variant of the latter), creates a diverse range of environments in which competition for resources occurs.¹⁰² As a consequence, selective pressures vary within an ecosystem and, because of this variation, the most competitive and successful species will vary too.¹⁰³ Loosely speaking, diversity will track with the degree of fragmentation and differences in localized conditions.¹⁰⁴ The resulting functional redundancy buffers adaptive systems from the inevitable losses of individual components.¹⁰⁵

These two elements work in tandem. Ecosystems, for example, are subject to disturbances from fires, droughts, and storms that disrupt the existing competitive environment(s), often transforming an affected area into a system dominated by opportunistic species well-adapted to harsher, high-risk conditions.¹⁰⁶ By contrast, if natural selection dictated ecosystem dynamics entirely, it would cause a steady loss of species diversity and ultimate domination by the most competitive species—the strong would inexorably win out.¹⁰⁷ Yet, by creating a patchwork of local states, disruptive events create niches for

diverse range of species provide a storehouse of genetic traits and species, some of which may be well adapted to unforeseeable changes in environmental conditions. See Kauffman & Levin, *supra* note 94, at 15 (pointing out that complex problems have an infinite set of potential answers).

101. LEVIN, *supra* note 96, at 18, 68–69 (observing that evolution works through “the continual generation and exploration of randomly generated innovations, and the reinforcement of some at the expense of others,” but noting that the process is imperfect in part because of its nonlinearities).

102. JOHN H. HOLLAND, *HIDDEN ORDER: HOW ADAPTATION BUILDS COMPLEXITY* 29 (1995).

103. *Id.* at 27–31 (describing how the process of local disturbances and variability maintains diversity and ensures resilience).

104. *Id.* at 27.

105. *Id.* at 28–29.

106. LEVIN, *supra* note 96, at 88 (“The small local disturbances not only maintain the character of the system by maintaining the species that are early colonists but poor competitors; they also maintain the *resiliency* of the system, preserving the opportunistic species that thrive under the conditions accompanying the unpredictable but inevitable environmental changes that occur at broader spatial scales, such as massive windthrows or fire.”).

107. *Id.* at 159.

organisms that can survive under a variety of conditions, ranging from harsh environments with few competitors to attractive ones subject to intense competition.¹⁰⁸ Opportunistic species, in particular, play a unique role in allowing ecosystems to adapt to large-scale events or changes.¹⁰⁹

An adaptive model can be viewed as a variant of a balanced-portfolio strategy, but with some important twists. In both cases, short-term growth potential—that is, pure optimization—is sacrificed for the more stable dynamics and diminished risk of catastrophic loss that diversification provides.¹¹⁰ However, adaptive models do not fetishize stability, which alone would threaten adaptability.¹¹¹ The unique power of adaptive models is that their fragmented, multilevel structure allows diversifying and optimizing processes to coexist.¹¹² Equally importantly, rather than treating unpredictability as an unavoidable evil, adaptive models harness it to maintain diversity and, paradoxically, to support resiliency.¹¹³ Thus, whereas the matching principle rests on the slim hope that efficiency alone is critical and that it can be reliably resolved, an adaptive model accepts, and even tries to exploit, unpredictability while preserving the benefits of small-scale efficiencies and diversification.

B. AN ADAPTIVE FRAMEWORK FOR ENVIRONMENTAL FEDERALISM

Adaptive systems provide an alternative framework for examining environmental federalism. Similar to traditional theories of federalism,¹¹⁴ this framework views the multilevel jurisdictional structure of the federal system as critical to sustaining a diversity of environmental laws and policies. Jurisdictional fragmentation functions as the analogue of ecological niches in a forest, sustaining loosely self-contained areas of

108. *Id.* at 162–67.

109. *Id.* at 165–67 (describing the important role “keystones” play in an ecosystem).

110. *Id.* at 159.

111. *Id.* at 156 (“[E]cosystem structure and dynamics emerge from selection operating at lower levels, and[] feedbacks from higher levels are weak because of the individualistic distribution of species.”).

112. *Id.* at 159.

113. Simon A. Levin & R.T. Paine, *Disturbance, Patch Formation, and Community Structure*, 71 PROC. NAT’L ACAD. SCI. 2744, 2744 (1974).

114. See, e.g., Stewart, *supra* note 24, at 1210–11 (noting the importance of decentralized decision making to environmental policy).

policy development that are dominated by localized competition and selection pressures (for example, socioeconomic, political, and environmental).¹¹⁵ Just as selection pressures—both natural and human—allow diversity to survive, the myriad horizontal and vertical interconnections between jurisdictions allow innovations to spread.¹¹⁶

1. Competition and Diversity in Environmental Policymaking

Battles over environmental policy occur at every level of government. This competition to exploit limited legislative and administrative resources is environmental policy's analogue of natural selection.¹¹⁷ Two primary groups populate the competitive landscape of environmental policy: environmentalists and regulated business interests.¹¹⁸ We use public-choice theory as a model of their competitive interactions.¹¹⁹ Consistent with the general consensus among federalism scholars, we assume that concentrated business interests are better positioned to organize and lobby for or against legislation than diffuse, heterogeneous public-oriented environmentalists.¹²⁰ Restated in biological terms, we treat business interests as the fittest lobbying group.¹²¹

The scholarly debate over environmental federalism has focused on the structural differences between the state- and federal-level legislative processes that facilitate or impede passage of environmental regulations. Scholars have considered whether the importance of party affiliation rather than issues in state elections impedes lobbying for environmental regulations, whether the larger and more heterogeneous range of interests at the federal level exacerbates public-choice problems, and whether the parochial economic concerns of state officials and legislators create a distinctive bias against environmental

115. *Id.* at 1211.

116. *Id.* at 1210.

117. *Id.* at 1211.

118. *Id.* at 1213.

119. Revesz, *supra* note 33, at 559–63 (describing the central claim about public-choice theory as it applies to environmental federalism).

120. *See, e.g.,* Stewart, *supra* note 24, at 1213.

121. *See* Reynolds, *supra* note 76, at 1642–43 (observing that the resilience of a political system derives in no small part from its ability to resist political parasites, such as special interest groups sucking resources off of the government in an unproductive manner). Even academics who challenge traditional public-choice theory acknowledge that “[i]nterest groups matter in shaping regulatory policy, and it is difficult to imagine an environment in which they would not have a strong degree of influence.” TESKE, *supra* note 1, at 196.

measures.¹²² As discussed in Part I, the objective of this debate has been to ascertain the appropriate balance of regulatory authority between the states and federal government.

Remarkably little attention has been paid to the importance of differences among the states. This is a striking oversight. While structural differences between the state and federal levels of government remain highly debatable, the wide variability in conditions among the states that influence the success or failure of legislative efforts is not.¹²³ From the perspective of an adaptive framework, the state-federal debate ought to be a sideshow. What counts most is the diversity that is sustained by the variation in factors driving legislation within the states.¹²⁴ California's environmental policies, for example, are not a product of subtle public-choice dynamics, but primarily of local political, environmental, and socioeconomic factors that dictate whether legislative activity on environmental issues is successful.¹²⁵

Diversity in environmental policy is also preserved by localized and large-scale disturbances. Just as fires restart the successional process in a forest,¹²⁶ so too can socioeconomic, environmental, or political shifts disrupt the dominance of concentrated interest groups in a political system.¹²⁷ The rapid emergence of federal environmental laws during the 1970s is the most striking example of this dynamic.¹²⁸ Dramatic environmental events, political opportunism, and grassroots activism were among the key driving factors.¹²⁹ More recently, the emergence of climate change represents a major environmental disturbance that threatens the dominance of the energy and transportation lobbies over environmental regulation in these

122. *E.g.*, Buzbee, *supra* note 51, at 45–46.

123. *See supra* note 9.

124. *See Hills, supra* note 58, at 17 (“State and local politicians . . . are natural policy entrepreneurs who can significantly influence what sorts of conditions are publicly recognized as problems.”).

125. *See Potoski, supra* note 9, at 339.

126. *See LEVIN, supra* note 96, at 88 (explaining how fires can maintain the character of an ecosystem).

127. Such disturbances clearly occur at different times and to different degrees between jurisdictions.

128. Daniel A. Farber, *Politics and Procedure in Environmental Law*, 8 *J.L. ECON. & ORG.* 59, 67 (1992); Robert Repetto, *Introduction to PUNCTUATED EQUILIBRIUM AND THE DYNAMICS OF U.S. ENVIRONMENTAL POLICY* 1, 1–2 (Robert Repetto ed., 2006).

129. Elliott et al., *supra* note 11, at 316–17.

sectors.¹³⁰ The inherent unpredictability of the political system is just one of many randomizing forces that can dethrone entrenched interest groups.¹³¹

The virtues of an adaptive model go beyond sustaining diversity; they also enable regulators to address multifaceted environmental problems. Ecosystems, as we have discussed, operate simultaneously at multiple scales.¹³² Regulation at multiple levels of government allows regulators to focus on issues operating at different scales and to draw on different fields of expertise and experience.¹³³

A forest ecosystem, once again, offers a simple example to illustrate this point. We will assume that the forest is wholly contained within a single county jurisdiction. The forest provides numerous environmental services. At a global level, for example, the forest sequesters carbon and thus mitigates climate change, and it is a repository of biological diversity. At the local level, it is a source of wood products, a recreational space, and a buffer to commercial and residential development.¹³⁴

Each of these services may have local, state, regional, and national implications, depending on the circumstances, so the division of responsibilities cannot turn on the matching principle. In addition, the depth of interest and ability to effectuate a policy response will not necessarily track presumptive jurisdictional lines, and environmental regulation itself often has unexpected outcomes. These factors indicate that environmental regulation should be allowed to emerge fluidly based on the level of interest, resources, and expertise that the different government players bring to an issue. Federal involvement, for example, may prove critical to addressing local aspects of some environmental problems, such as the transportation component of suburban sprawl. State and local governments, as we discuss below in the context of climate change policy, may have the po-

130. See Micheline Maynard, *Politics Forcing Detroit to Back New Fuel Rules*, N.Y. TIMES, June 20, 2007, at A1. Climate change also has important local dimensions, as not all states are equally vulnerable to it and thus under equivalent pressures to adapt.

131. Reynolds, *supra* note 76, at 1646.

132. LEVIN, *supra* note 96, at 159.

133. Stewart, *supra* note 24, at 1210.

134. DOUGLAS J. KRIEGER, THE WILDERNESS SOCIETY, THE ECONOMIC VALUE OF FOREST ECOSYSTEM SERVICES: A REVIEW, at iii–iv (2001), available at <http://www.wilderness.org/Library/Documents/upload/Economic-Value-of-Forest-Ecosystem-Services-A-Review.pdf>.

litical will to address a global problem when it is lacking at the national level.

2. The Distinctive Role of the Federal Government

The authority of the federal government, particularly its supremacy power, introduces a critical asymmetry between federal and state governments,¹³⁵ as well as a fundamental difference between the federal system and an adaptive model. Adaptive systems do not have anything equivalent to a hierarchy of institutional powers. Different aggregate levels of an ecosystem, for example, may be connected, but their interactions are not hierarchical in the sense that large-scale divisions can dictate the functions of smaller ones. Similarly, competition occurs between species, not at higher levels of organization, and fitness is solely a species' attribute.

Institutional hierarchy is unique to human systems, but it has been embraced only reluctantly. Traditional theories of federalism are premised on limiting the role of the federal government, and thus expect federal assertions of regulatory power to be justified.¹³⁶ In modern environmental law, federal regulation is premised on several standard grounds, including the need for uniform regulations for interstate commerce, the economies of scale that come with federal-level regulation, and the distorting effects of externalities on state laws.¹³⁷ Thus, unlike natural adaptive systems, which emerge from the ground up, humans have the temerity to assert control from the top down.

An important benefit of this structure is that the federal government can facilitate the spread of regulatory innovations.¹³⁸ The value of innovation is one of the oldest justifica-

135. See Schapiro, *Interactive Federalism*, *supra* note 15, at 291 (describing the difficulties in determining which government entity to hold accountable when federal and state laws govern the same issue).

136. *Id.* at 257.

137. Robert L. Glicksman & Richard E. Levy, *A Collective Action Perspective on Ceiling Preemption by Federal Environmental Regulation: The Case of Global Climate Change*, 102 NW. U. L. REV. (forthcoming 2008) (manuscript at 13, available at <http://ssrn.com/abstract=1007021>); Stewart, *supra* note 24, at 1211–16.

138. Gerber & Teske, *supra* note 9, at 870–71 (“[T]he federal government can ‘force’ states to adopt policy innovations by writing them into federal requirements. This strong federal presence may also facilitate policy diffusion through federal coordination of policy innovations.”); Susan Welch & Kay Thompson, *The Impact of Federal Incentives on State Policy Innovation*, 24 AM. J. POL. 715, 716–17 (1980) (finding that policies with federal incentives

tions for a federalist system, encouraging, as it does, the role of states as “laboratories of democracy.”¹³⁹ However, even if most innovations originate at lower levels of government, the federal level is uniquely positioned to disseminate these innovations. The capacity of the federal government to do so far outstrips that of the states by virtue of its unique relationship with each state, as well as the status of the national government as the top regulator. While regulators in Maine may communicate only rarely with those in Oregon about water quality issues, they will interact regularly with federal regulators. This hub-and-spokes network facilitates the transfer of innovations in Maine to Oregon, either on the strength of the federal EPA’s suggestion or mandate, or simply through more effective knowledge transfer.¹⁴⁰

These points do not denigrate the traditional justifications for federal regulation that have animated debate over environmental federalism. The benefits of regulatory uniformity, the race-to-the-bottom rationale, and the possible disparity in public-choice dynamics between legislative processes at the state and federal levels are all important.¹⁴¹ The hierarchy inherent in the federal system thus clearly has its place. Yet, as the Founders understood from the outset, it poses many risks as well. From the standpoint of adaptive systems and traditional theories of federalism, the most obvious risk is the dramatic loss in diversity that can result from preemptive federal regulation.¹⁴² This loss may be a direct result of a strict preemptive standard or may arise more subtly from the highly aggregated level at which federal regulators view environmental problems.¹⁴³

The potential dynamic implications of a dominant federal role also may be important. If policymaking gravitates to the federal level to the exclusion of the states, it risks triggering

attached to them diffuse more rapidly than policies that emerge entirely from the state level).

139. Schapiro, *Interactive Federalism*, *supra* note 15, at 267.

140. *See, e.g.*, Buzbee, *supra* note 51, at 41–42 (discussing the case of brownfields regulation under CERCLA in which regulatory innovation started at the state level but was subsequently adopted and spread through EPA regulatory changes); Engel, *supra* note 27, at 170–72 (describing the transfer of vehicle emissions standards from California through the EPA to the country as a whole).

141. *See* Buzbee, *supra* note 52, at 45–46.

142. Buzbee, *supra* note 1, at 1599–1600; Engel, *supra* note 54, at 184–86.

143. Engel, *supra* note 54, at 184–86.

powerful feedback effects.¹⁴⁴ Such a shift would increase the attractiveness of the federal government for lobbying efforts, intensifying competition and further marginalizing less powerful interest groups.¹⁴⁵ These effects would in turn encourage powerful interests to direct even more resources to lobbying at the federal level and to elevating more issues.¹⁴⁶ Moreover, because business interests are by broad consensus substantially fitter at playing this game,¹⁴⁷ they would be likely to benefit disproportionately from such feedback effects.

A parallel concern is that resting too much authority in the federal government would unduly increase the inertia of the regulatory system.¹⁴⁸ One of the great strengths of natural selection is that by operating at a small scale, the feedback between the benefits and costs of individual variation are relatively strong and swift, in part because individual species are inherently more vulnerable than ecosystems collectively.¹⁴⁹ These tight feedback effects are essential to adaptive change, as buffering mechanisms, by their very nature, diminish sensitivity to exogenous pressures.¹⁵⁰ Accordingly, while increasing the scale at which a problem is addressed may promote certain efficiencies, it may also increase the inertia of legislative processes and undermine the responsiveness of the federal sys-

144. See Per G. Fredriksson & Noel Gaston, *Environmental Governance in Federal Systems: The Effects of Capital Competition and Lobby Groups*, 38 ECON. INQUIRY 501, 502 (2000) (discussing the impacts of lobbying in the European Union and observing that “the move to centralized regulation stimulated industry lobbying” and that “industry lobbying may be stronger at the federal level”); Hills, *supra* note 58, at 22–23 (commenting on a similar point about business interests’ incentives to seek preemption legislation). Hills goes on to argue that

[t]he task of the courts ought to be to create a default rule that will force Congress to squarely confront the question, even when members of Congress might be anxious to evade such a confrontation. A default rule against preemption places the onus on the interest groups most capable of promoting this debate—the pro-preemption groups.

Id. at 26.

145. See Buzbee, *supra* note 1, at 1609–10.

146. *Id.* at 1610 (“[I]f there is one regulator, then all sides will seek to persuade or capture that regulator.”); see also JERRY L. MASHAW, GREED, CHAOS, AND GOVERNANCE: USING PUBLIC CHOICE TO IMPROVE PUBLIC LAW 15–16 (1997) (explaining the dynamics of interest-group politics).

147. Stewart, *supra* note 24, at 1213.

148. *Id.* at 1219 (describing the “diseconomies of scale” that arise when an issue is elevated to the federal level).

149. LEVIN, *supra* note 96, at 203.

150. *Id.* (“[T]ight reward and punishment loops are essential for any adaptive change.”).

tem to changing conditions. Setting aside the 1970s, this dynamic is reflected in the slow progress of environmental regulation at the federal and international levels,¹⁵¹ which also derives in significant part from the more abstract posture of environmental problems that comes with addressing them at a higher governmental level.

A central challenge for environmental federalism therefore is to cabin federal regulatory power without nullifying its many benefits. An optimal point of balance does not exist. Instead, we argue that an adaptive model of federalism suggests several doctrinal and regulatory strategies that limit federal power by reducing the opportunities for powerful interest groups to succeed in enacting broadly preemptive federal legislation that subverts the federal system. Our goal is not first and foremost to limit federal power, although that is clearly a byproduct of our approach, but to establish several presumptions that protect against the unique power embodied in the federal government from being coopted in a manner that will be difficult for the political process to correct.

C. ADAPTIVE FEDERALISM AS A HYBRID OF CLASSICAL AND DYNAMIC FEDERALISM

The adaptive model of federalism we advocate is a variant of dynamic federalism and, as such, rejects the pure optimizing principle of the classical school. It goes beyond current scholarship on dynamic federalism, though, insofar as it provides a robust theoretical framework for dynamic federalism. Adaptive federalism differs further in its structural focus on managing complex, time-variant problems that are characteristic of environmental policy. This Section analyzes these distinctions to clarify the unique virtues of adaptive federalism.

Adaptive federalism, like its dynamic counterparts, rejects the exclusive focus of the matching principle on optimization.¹⁵² It recognizes that static optimizing strategies, on their own, are a prescription for turgid policymaking that is prey to the complexities of environmental problems.¹⁵³ Rather than engaging in the charade of identifying the one putatively “efficient” level of government for environmental policymaking,¹⁵⁴ an adaptive

151. Repetto, *supra* note 128, at 2.

152. Schapiro, *Interactive Federalism*, *supra* note 15, at 285.

153. Engel & Saleska, *supra* note 55, at 191–93; Karkkainen, *supra* note 59, at 200–01.

154. Engel, *supra* note 54, at 161.

model is structurally designed to contend with unpredictable change. The basic philosophies of the two approaches could not be more different—one is premised on stable equilibrium conditions and rigid control; the other seeks to exploit disruptive change as a source of resilience and adaptability.¹⁵⁵

The basic elements of an adaptive model—fragmented operation on multiple scales—are clearly evident in the multilevel jurisdictional structure of the federal system.¹⁵⁶ The overlapping state-federal regulatory authority of dynamic federalism follows naturally from this arrangement. Similarly, the existence of multiple jurisdictions at a variety of geographic scales mirrors the fragmented structure of adaptive systems that is essential to maintaining diversity.¹⁵⁷ Adaptive federalism simultaneously sustains competitive legislative and administrative processes that promote policy refinement and processes that produce a diverse range of policy options. This pluralistic model supports the open-ended innovation and testing essential to managing unpredictable change, without ignoring the importance of regulatory efficiency. It is therefore a hybrid of the classical and dynamic schools because it incorporates the principle of efficiency of the former, while balancing it against the need for diversity found in the latter.

Adaptive federalism would support and enhance the dynamic, multijurisdictional elements of the current system of environmental federalism. As we have seen, this approach is incompatible with the single-level framework dictated by the classical matching principle.¹⁵⁸ For putatively local issues, such as those related to drinking water standards or land use, an adaptive model would allow for a significant federal role. Conversely, for putatively national (or international) issues, such as biodiversity or climate change, it would encourage state and local policy innovation.¹⁵⁹

The multilevel approach of adaptive (and dynamic) federalism is not costless. Uniformity, accountability, and finality are all sacrificed to some degree by allowing multiple jurisdictions to address environmental problems simultaneously.¹⁶⁰ Howev-

155. Engel & Saleska, *supra* note 55, at 191–92.

156. Engel, *supra* note 54, at 166.

157. HOLLAND, *supra* note 102, at 29.

158. Engel & Saleska, *supra* note 55, at 191–93.

159. Schapiro, *Interactive Federalism*, *supra* note 15, at 267.

160. See, e.g., *United States v. Lopez*, 514 U.S. 549, 576 (1995) (Kennedy, J., concurring) (“The theory that two governments accord more liberty than

er, in many, if not most, areas of environmental regulation, uniformity is as much a problem as it is a virtue. Consider widespread calls from regulated industries for “flexible” standards, such as those found in market-based regulations, and the vehement opposition to command-and-control regimes.¹⁶¹ Finality, which is often in opposition to adaptability, is also a double-edged sword in constantly changing natural, technological, and commercial environments.

Accountability is possibly the most troublesome of these factors.¹⁶² Yet, in practice, important factors mitigate public confusion. Legislative action is challenging at any level of government, and there are always more legislative opportunities than time permits. Typically, when legislators make the effort to pass a law—particularly when it is public spirited, as opposed to narrow and interest-group driven—legislators want credit, establishing or strengthening their reputations.¹⁶³ This motive is clearly evident in the recent spate of climate change initiatives at the state and local government levels, and it is certainly true of environmental legislation at the federal level.¹⁶⁴ Further, it is not as though the matching principle is a model of clarity for public accountability. Dan Esty’s multifaceted, disaggregated approach, for instance, anticipates intricate intergovernmental arrangements that, at least in the abstract, raise precisely the same problems with accountability.¹⁶⁵

one requires for its realization two distinct and discernable lines of political accountability”); *New York v. United States*, 505 U.S. 144, 168 (1992) (“[W]here the Federal Government compels States to regulate, the accountability of both state and federal officials is diminished.”); Erwin Chemerinsky, *In Defense of Judicial Review: A Reply to Professor Kramer*, 92 CAL. L. REV. 1013, 1018–22 (2004) (discussing the importance of judicial finality); Oates & Portney, *supra* note 17, at 345 (discussing the importance of uniformity in promoting the free flow of goods).

161. Arrandale, *supra* note 9, at 25 (describing the many complaints of mayors and stakeholders about the rigidity of EPA regulations).

162. Some legal scholars have argued that lawyers need to place less weight on accountability as a necessary aspect of environmental regulatory systems, and to recognize that nontraditional legal theories and approaches will be essential to address complex environmental problems. Karkkainen, *supra* note 59, at 225–26.

163. See, e.g., Buzbee, *Regulatory Commons*, *supra* note 54, at 32–33; Elliott et al., *supra* note 11, at 327 (discussing the importance of the passage of federal environmental laws to political entrepreneurs and their jockeying to obtain credit for passage of the laws).

164. Scheberle, *supra* note 64, at 77 (commenting on the “scope, intensity, and very public nature” of state environmental lawsuits, particularly with regard to climate change).

165. Esty, *Governance*, *supra* note 36, at 1554–55.

Adaptive federalism also differs in important respects from current conceptions of dynamic federalism set forth by Robert Schapiro, Erwin Chemerinsky, and others.¹⁶⁶ Dynamic federalism is premised on empowering states, that is, treating them as coequal with the federal government and then letting them determine which policy prevails when the policy preferences of the two levels of government conflict.¹⁶⁷ Thus, rather than avoiding conflict by preserving enclaves of exclusive state jurisdiction (the outdated dualism approach), dynamic federalism embraces it.¹⁶⁸ States gain autonomy but must win battles over policy on the merits.¹⁶⁹ By contrast, adaptive federalism emphasizes the critical role that a multijurisdictional framework of government plays in allowing policy diversification and optimization to coexist.

Although cooperative federalism is itself a hybrid, it poses certain challenges for an adaptive model. Cooperative federalism establishes a relatively fixed framework for the states and the federal government to address environmental problems through a system of shared authority.¹⁷⁰ In doing so, it breaks regulatory regimes into two distinct categories: standard setting, which is delegated to the federal government; and implementation and enforcement, which is delegated to state and local governments.¹⁷¹ An adaptive model eschews such rigid designations and prizes independence of action, which strict federal standards can drastically limit. Federal command-and-control regimes, in particular, can leave little room for state experimentation.¹⁷²

Adaptive federalism would allow multiple jurisdictions to address a problem independently without circumscribing their roles or strategies. This would by no means preclude interjurisdictional coordination. To the contrary, an adaptive model contemplates innovative experimentation with regional initiatives and other midlevel regimes. The point is to allow this to occur more organically based on the specific attributes of the problem, as well as surrounding political currents and socioeconom-

166. See *supra* text accompanying notes 41–45.

167. Schapiro, *Interactive Federalism*, *supra* note 15, at 285.

168. *Id.*

169. *Id.*

170. RUHL ET AL., *supra* note 59, at 282–83.

171. *Id.* at 283.

172. See Arrandale, *supra* note 9, at 22 (providing a real-world example of how the EPA's strict regulations resulted in states being unable to address local problems with innovative solutions).

ic factors. The current system of cooperative federalism relies on forced coordination mediated through the federal government over the structural innovation-oriented approach of an adaptive model.¹⁷³

III. IMPLICATIONS FOR ENVIRONMENTAL FEDERALISM

A previous Section characterized the existence of federal authority as a double-edged sword.¹⁷⁴ On the one hand, federal policies can respond to environmental and resource issues that are national or multiregional in scope.¹⁷⁵ This might include global or national pollution problems, such as climate change and acid rain, as well as the preservation of local resources that provide national benefits, such as unique wetlands. Further, in addition to quickly disseminating information about innovative proposals, federal authority can speed the adoption of innovative policies first developed by the states, establish rules of uniformity needed for further innovation (and commerce) to flourish, and eliminate the problematic effects of interstate competition for industry.¹⁷⁶ On the other hand, the attractiveness of the federal supremacy power—particularly in its negative, preemptive mode—threatens policy diversity at the state and local levels that is essential to the adaptability of a federal system.¹⁷⁷

This Part draws on our adaptive framework to ground several policy recommendations for sustaining overlapping state and federal jurisdiction. We begin by describing and defending our policy proposals. This analysis leads us to consider two distinct contexts in which legislative action takes place: (1) periods of business as usual, where public-choice dynamics dominate, and (2) periods of dramatic change, where volatile political currents dominate. An adaptive model, which is premised on periods of disruptive change, proves useful in addressing the legislative processes in both regimes. Finally, drawing on specific initiatives related to Superfund and climate change, we examine the implications of our recommendations and, more generally, of a dynamic system of overlapping state and federal jurisdiction for environmental policy.

173. RUHL ET AL., *supra* note 59, at 282–83.

174. *See supra* text accompanying notes 144–51.

175. *See supra* text accompanying note 140.

176. *See supra* text accompanying notes 138–40.

177. Engel, *supra* note 54, at 184–86.

A. PREVENTING FEDERAL DOMINANCE

The central challenge for environmental federalism is limiting federal authority to a level that is not overly destructive of policy diversity and innovation. Others have struggled with this same goal, but have concluded that broad devolution of authority to the states is the only viable option.¹⁷⁸ Among them, J.B. Ruhl, who also draws on theories of adaptive systems, argues that the current federal system of environmental regulation is far too top-heavy and that, as a consequence, it has become rigid and lost much of its ability to adapt.¹⁷⁹ Similar to Bradley Karkkainen and Jody Freeman and Daniel Farber, Ruhl decries the fragmentation and lack of coordination between regulating entities.¹⁸⁰ Further, although they may differ on specifics, these scholars, in essence, call for a flexible approach to environmental regulation based on a “nested hierarchy of interrelated federal, state, and local government authorities.”¹⁸¹

Our adaptive approach complements this work, but adopts a different perspective and emphasizes a distinct set of issues. We argue for a dynamic system of overlapping federal and state regulatory jurisdiction. This framework is consistent with the general principles of dynamic federalism. As others have noted, retention of both federal and state jurisdiction reinforces processes that contribute to better regulatory outcomes, particularly opportunities for positive feedback and incentives for a higher level of coordination between the state and federal levels of government.¹⁸² Similarly, the “safety net” provided by the potential for multiple regulators preserves legislative options for protecting environmental goods that might be sacrificed by one or the other level of government.¹⁸³ Concurrent regulation is

178. See, e.g., *supra* text accompanying notes 20–22.

179. Ruhl, *supra* note 75, at 1475, 1477. Professor Ruhl’s approach is premised on Stuart Kauffman’s criticality theory, which has important implications for the basic architecture of successful adaptive systems. According to Kauffman’s theory, adaptability entails “less hierarchical, flatter, and more decentralized power structures,” and it places a much higher premium on the importance (and regularity) of dramatic change. *Id.* at 1418–19.

180. RUHL ET AL., *supra* note 59, at 281; see Freeman & Farber, *supra* note 59, at 798; Karkkainen, *supra* note 59, at 204.

181. RUHL ET AL., *supra* note 59, at 284; see Freeman & Farber, *supra* note 59, at 798–800; Karkkainen, *supra* note 59, at 201.

182. Hills, *supra* note 58, at 2.

183. Failure to act at a particular level of government may be the product of information gaps, the demands of other priorities, or interest-group capture. Whatever the reason, we agree with Erwin Chemerinsky, who argues that “[a]

further justified because it mitigates the influence of powerful interest groups.¹⁸⁴ The rationale behind this view is simple: maintaining a dominant position in multiple fora is much more difficult than in one forum, and interest-group dominance will be disrupted at different times and to different degrees by changing conditions in each state.¹⁸⁵

The single most important means of fostering adaptive federalism is restricting federal regulatory preemption. A single preemptive legislative act eliminates the diversity of experiences and knowledge of an entire level of government.¹⁸⁶ This is a matter of great significance given the dramatic rise in preemptive statutes that have emerged from Congress¹⁸⁷ and the Supreme Court's willingness to infer preemption even where it is far from explicit in a statute.¹⁸⁸

We focus our attention on a specific type of federal preemption—ceiling preemption—that feeds the policy preferences of the powerful business interest groups most likely to leverage their abundant political power to undercut diversity and innovation in environmental policymaking.¹⁸⁹ Our recommendations draw from and reflect the insights of the public-choice literature. We propose three central presumptions for courts and policymakers that are designed to contain federal preemptive authority.

key advantage of having multiple levels of government is the availability of alternative actors to solve important problems. If the federal government fails to act, state and local government action is still possible." Erwin Chemerinsky, *Federalism Not as Limits, but as Empowerment*, 45 U. KAN. L. REV. 1219, 1234 (1997).

184. Our approach is consistent with calls by other scholars that "[t]o minimize capture, an overarching set of reforms should attempt to bring more players into the regulatory process and provide the important institutions with more resources to develop the capacity for independent analysis and implementation." TESKE, *supra* note 1, at 201.

185. The rapid growth in lobbying expenditures at the state level over the past few years suggests that interest groups are expanding their focus beyond the federal government. Sarah Laskow, Ctr. for Pub. Integrity, *State Lobbying Becomes Billion-Dollar Business* (Dec. 20, 2006), <http://www.publicintegrity.org/hiredguns/report.aspx?aid=835>.

186. *Cf.* Hills, *supra* note 58, at 16–21 (describing how state laws can influence and determine congressional agendas).

187. *See* TESKE, *supra* note 1, at 14–15.

188. *See* Chemerinsky, *supra* note 4, at 1314–15.

189. Hills, *supra* note 58, at 27–28. Here we define a regulatory ceiling as setting a maximum level of regulation that is permissible, such as the strictest standard for a given water or air pollutant. *See, e.g.*, Buzbee, *supra* note 1, at 1558 (defining regulatory ceiling as "the maximum level of regulation or protection that any entity could issue").

1. Establishing a Presumption Against Federal Preemption

Maintaining diversity within a federal system requires that overlapping state and federal jurisdiction remain the norm and, accordingly, that assertions of federal preemption be used and applied sparingly. Our presumption against preemption operates differently depending on whether the issue is pending before Congress, a court, or an administrative agency. We consider Congress separately in the next subpart. For the courts, we argue that judges should revitalize the moribund presumption against federal preemption.¹⁹⁰ If embraced, this “clear-statement” rule would permit state laws to survive a preemption challenge unless the statute contained an express preemption provision or provisions in the federal and state laws conflict directly.¹⁹¹ This rule would not eliminate federal preemption, but instead sharply curtail its prevalence.¹⁹² Further, by essentially cutting out court-created “implied preemption,” it would require interest groups seeking federal preemption to succeed unequivocally in the legislative process and thereby raise the bar for invoking preemption.¹⁹³ This strategy has the added benefit of depoliticizing court rulings on preemption, which many commentators believe reflect judges’ political ideologies far more than the legislative intent of Congress.¹⁹⁴

190. *Rice v. Santa Fe Elevator Corp.*, 331 U.S. 218, 230, 237 (1947); *see also* Richard H. Fallon, Jr., *The “Conservative” Paths of the Rehnquist Court’s Federalism Decisions*, 69 U. CHI. L. REV. 429, 462–63 (2002) (citing the Court’s failure, in recent years, to promote a presumption against preemption despite the preemption doctrine’s mandate); Daniel J. Meltzer, *The Supreme Court’s Judicial Passivity*, 2002 SUP. CT. REV. 343, 364–68 (highlighting recent implied preemption cases that run counter to the “clear statement” rule).

191. Bradford R. Clark, *Separation of Powers as a Safeguard of Federalism*, 79 TEX. L. REV. 1321, 1425–27 (2001); *see also* CHRISTOPHER R. DRAHOZAL, *THE SUPREMACY CLAUSE: A REFERENCE GUIDE TO THE UNITED STATES CONSTITUTION* 115 (2004); Caleb Nelson, *Preemption*, 86 VA. L. REV. 225, 230 (2000).

192. *See, e.g.*, Ann E. Carlson, *Federalism, Preemption, and Greenhouse Gas Emissions*, 37 U.C. DAVIS L. REV. 281, 305–07 (2003); Chemerinsky, *supra* note 4, at 1330–32; S. Candice Hoke, *Preemption Pathologies and Civic Republican Values*, 71 B.U. L. REV. 685, 760–63 (1991).

193. In other words, consistent with the position urged by Professor Chemerinsky, there would only be two circumstances in which state laws could be preempted: (1) where preemption is express in a statute, and (2) when federal law and state law are mutually exclusive. Chemerinsky, *supra* note 4, at 1329–30.

194. *See, e.g.*, David B. Spence & Paula Murray, *The Law, Economics, and Politics of Federal Preemption Jurisprudence: A Quantitative Analysis*, 87 CAL. L. REV. 1125, 1159 (1999).

Assertions of preemptive regulatory authority by federal agencies should be similarly limited. In the absence of express congressional delegation, courts should apply a strict “hard look” level of judicial review to agency regulations that preempt state law or regulations.¹⁹⁵ Under this approach, the National Highway Transportation Safety Administration’s asserted preemption,¹⁹⁶ pursuant to the Energy Policy and Conservation Act (EPCA), of California’s greenhouse gas vehicle emission standards would not survive judicial review. Nothing in the EPCA expressly preempts the California rules and compliance with those rules and the EPCA is not in conflict. Moreover, the agency inferred preemption indirectly by arguing that the California regulation is a de facto regulation of vehicle fuel economy standards, and thus runs afoul of the exclusive regulatory authority that Congress delegated to the National Highway Traffic Safety Administration (NHTSA).¹⁹⁷

2. The Unique Status of Preemptive Federal Floors

An adaptive framework on its own does not dictate how the inevitable conflicts between state and federal policies should be resolved. Drawing on the lessons from public-choice theory, our goal is to develop rules that preserve the benefits of federal regulation without triggering the harmful feedback effects that would increase the attractiveness of the federal government for lobbying efforts and thus policymaking.¹⁹⁸ These feedback effects are problematic because they threaten to enlarge the role of the federal government, and correspondingly, to erode state and local regulation, to the detriment of the adaptability and resilience of the federal system.

To avert this dynamic, Congress should adopt a new drafting principle against federal regulations containing an express preemptive “ceiling.” We define a ceiling standard as one that

195. See, e.g., *Motor Vehicle Mfrs. Ass’n v. State Farm Mut. Auto. Ins. Co.*, 463 U.S. 29, 42–44 (1983); Susan Bartlett Foote, *Administrative Preemption: An Experiment in Regulatory Federalism*, 70 VA. L. REV. 1429, 1432–33 (1984).

196. Average Fuel Economy Standards for Light Trucks, Model Years 2008–2011, 71 Fed. Reg. 17,566, 17,668 (Apr. 6, 2006) (to be codified at 49 C.F.R. pts. 523, 533, 537) (“A state’s adoption and enforcement of a CO₂ standard for motor vehicles would infringe on NHTSA’s discretion to establish CAFE standards consistent with Congress’[s] guidance and threaten the goals that Congress directed NHTSA to achieve.”).

197. The federal government bases this argument on the assertion that currently the only way to satisfy the California regulation is by improving vehicle fuel economy. *Id.*

198. See *supra* text accompanying notes 144–47.

preempts more stringent state environmental standards, as opposed to a “floor” standard that preempts less stringent state environmental standards.¹⁹⁹ In advocating this position, we recognize that the result may be less diversity and experimentation at the weaker end of state environmental standards. We nevertheless believe that this asymmetry is necessary to sustaining a dynamic federal system.²⁰⁰

Our rationale follows from three central assumptions. First, the relative advantage of business and industrial interests in achieving favorable regulatory outcomes *vis-à-vis* environmental interests at all levels of government cannot be seriously disputed.²⁰¹ As other scholars have noted, business and industry’s greater financial resources, the focus and cohesiveness of its goals, and its hierarchical structure contribute to political success.²⁰² These characteristics contrast with the relatively diffuse nature of environmental interests and the paucity of resources available to pursue environmental regulatory objectives, especially given their technical complexity.²⁰³

Second, we assume that virtually all interest groups would favor a federal rule of decision over a state-level rule. By achieving their preferred regulatory outcome at the federal level, an interest group takes advantage of “one-stop shopping,” thereby obtaining the benefits of its desired regulatory goal across the nation without the expense of participating in the political processes of each of the fifty states.

199. Within the category of “federal ceilings” we would include federal standards that impose a uniform standard. While these standards preempt less stringent standards, most importantly for our purposes, they also preempt more stringent state standards. *See, e.g.*, Buzbee, *supra* note 1, at 1568–72; Engel, *supra* note 27, at 291; Glicksman & Levy, *supra* note 137, at 28–29.

200. Two recent commentators have argued for “asymmetric” treatment of floor and ceiling standards on somewhat different grounds. Professor Buzbee argues that given the high likelihood of agencies failing to regulate and the de facto complete absence of flexible “regulatory ceilings” (all existing laws have fixed, unitary standards that states cannot deviate from), regulatory ceilings should be strongly disfavored. Buzbee, *supra* note 1, at 1558–59. Professors Glicksman and Levy advance an elegant argument that is based on evaluating the impacts of five potential collective action problems (negative externalities, resource pooling, race-to-the-bottom pressures, the need for regulatory uniformity, and so-called not-in-my-backyard, or NIMBY, distortions). Glicksman & Levy, *supra* note 137, at 13–22. They conclude that ceiling preemption is only warranted where the need for regulatory uniformity is high and strongly supported or where NIMBYism is a dominant factor. *Id.* at 28–29.

201. Esty, *supra* note 6, at 597–98; Farber, *supra* note 128, at 61.

202. *See, e.g.*, Farber, *supra* note 128, at 61.

203. *Id.*

Third, we assume that industry will be most firmly aligned and cohesive in its pursuit of federal ceilings, and generally opposed only by relatively weak environmental interest groups. We infer from this observation that federal ceilings provide the most ready access to federal regulatory power, as they favor the interest groups, business and industry, that have the upper hand in lobbying Congress.²⁰⁴ Federal ceilings will thus be both the most susceptible to public-choice distortions and potentially the most destructive of the diversity essential to a robust federal system. We therefore apply a presumption against federal regulatory ceilings.

This bias is inverted for federal legislation containing regulatory floors. While regulatory floors are favored by environmental groups seeking more aggressive environmental protection than that provided by some states, these groups are universally considered weaker in the political process than their industry counterparts.²⁰⁵ Assuming environmental groups are the sole advocates of federal floor regulation, their ability to obtain the passage of pro-environment legislation will be limited at best. For that reason, we do not see the need for a presumption against federal floors. The very difficulty of their passage will cabin the exercise of federal regulatory authority, and the likelihood that they will succeed in expanding the federal role beyond that desirable in an adaptive federal system will thus be low.

A potential objection to this argument is that industry groups often support federal regulation, and particularly federal floors. Professor Revesz, for instance, argues that, consistent with agency capture theory, most environmental legislation is enacted because of industry support, not over industry opposition.²⁰⁶ Standard economic rationales for industry support of environmental regulation include the barriers to entry that they create, rent seeking, the advantage regulations may create for industries with strong economies of scale, or the markets for new technologies created by environmental regulations that benefit certain industries—for example, pollution control or monitoring technologies.²⁰⁷

204. Buzbee, *supra* note 1, at 1590–92.

205. *Id.*

206. Revesz, *supra* note 33, at 571 (determining that industry-dominated accounts are “more plausible” public-choice accounts of environmental regulation).

207. *Id.* at 571–74.

While we take issue with the accuracy of these public-choice accounts,²⁰⁸ they do not undermine our conclusion. At most, federal minimum standards will be supported by a subset of industrial interests, such as companies that have already entered the market or invested in technologies that meet an environmental standard. Thus, because federal minimum standards will be opposed by other existing or prospective entrants to a given market, the industry lobby will be split, with some favoring the federal minimum standard and others opposing it. For this reason, we do not believe that industry support for federal minimum standards is likely to trigger negative feedbacks that threaten the federal system and, in any case, the struggle

208. The industry-dominated accounts of environmental regulation present only a part of the developmental history of any given federal environmental law. These accounts are effective in demonstrating how the final contours of the enacted statute benefit the competitive position of certain industries over those of their rivals. For example, many federal environmental statutes impose more stringent standards upon new plants in particular industries, as opposed to existing plants. *See, e.g.*, Clean Air Act New Source Performance Standards, 42 U.S.C. § 7411 (2000). Nevertheless, to the extent these accounts may claim that such competitive advantages were the genesis of the movement to seek federal environmental regulation, we strongly question their accuracy. For this to be true, the benefits to some firms of creating barriers to entry would have to outweigh the costs of compliance with whatever environmental standard did apply even to existing firms.

More likely, industries tend to get involved in statutory design only after it becomes clear that environmental regulation is likely. Take the case of stratospheric ozone depletion and the consequent regulation of chlorofluorocarbons (CFCs) in the 1980s. Revesz argues that the Montreal Protocol, which provides global-level regulation of CFCs, “provides a powerful example of environmental regulation creating rents and barriers to entry.” Revesz, *supra* note 33, at 572. This account relies on the assertion that the Montreal Protocol would not have succeeded but for the support of Dupont Chemical, which had developed chemical alternatives to CFCs. James Maxwell & Forrest Briscoe, *There’s Money in the Air: The CFC Ban and Dupont’s Regulatory Strategy*, 6 BUS. STRATEGY & ENV’T 276, 284–85 (1997). While certainly true, this description fails to examine why Dupont was spending precious research and development resources on identifying alternatives to CFCs in the first place.

A more robust account would acknowledge that the looming threat of regulation and the powerful scientific studies linking CFCs to stratospheric ozone depletion were essential to Dupont’s decision to invest its research dollars in these new technologies. *Id.* at 277–79 (describing how calls for a ban on the use of CFCs in aerosol spurred Dupont to conduct research on alternatives to CFCs and how a drop in political pressure for comprehensive regulation caused Dupont to abandon its research program during the early 1980s). We see a similar trend now with companies like British Petroleum investing heavily in alternative energy technologies because of the strong case for climate change and expectations that the company will stand to benefit when CO₂ is regulated. *See, e.g.*, Jad Mouawad, *BP to Invest \$500 Million on Biofuels at a Research Center*, N.Y. TIMES, June 14, 2006, at C9.

for federal floor legislation will at least be a reasonably “fair fight.”²⁰⁹ We consequently see no reason to impose a presumption against environmental legislation containing federal floors.

3. Tempering Federal Regulatory Uniformity

Dynamic federalism will sometimes have to give way to the need for regulatory uniformity, which may be extremely important for certain industries.²¹⁰ Federal environmental law contains many examples of preemptive uniform standards, although most involve commercial products. Examples include federal uniform emission standards for motor vehicles²¹¹ and warning labels for pesticides.²¹² One of the most common rationales for regulatory uniformity is efficiency.²¹³ In short, manufacturers of goods distributed in a national market should not be required to comply with fifty different state standards applicable to the design or operation of their products.

We recognize the value of uniformity, but believe the benefits often will not warrant total preemption. Accordingly, we argue that in many cases a weaker form of preemption would yield better regulatory outcomes. The quintessential example of tempered uniformity is vehicle emission standards under the Clean Air Act.²¹⁴ The statute empowers the EPA to establish national standards for emissions of pollutants from motor vehicles.²¹⁵ However, the EPA’s authority is subject to an exception, under which California alone, among all fifty states, is permitted to establish its own standards that may differ from, and be more stringent than, those of the EPA.²¹⁶

209. Hills, *supra* note 58, at 26.

210. See Glicksman & Levy, *supra* note 137, at 13–14.

211. 42 U.S.C. § 7521 (2000). These standards impose nationally uniform standards except in California, which has adopted a more stringent standard, or in a state that has adopted California’s standard. See *infra* Part III.A.3.

212. 7 U.S.C. § 136v (2000) (requiring that labels for pesticide use and application be uniform under the Federal Insecticide, Fungicide and Rodenticide Act).

213. See, e.g., Cooley v. Bd. of Wardens, 53 U.S. 299, 319 (1851) (“Whatever subjects of [the commerce] power are in their nature national, or admit only of one uniform system, or plan of regulation, may justly be said to be of such a nature as to require exclusive legislation by Congress.”); Buzbee, *supra* note 1, at 1610 (“[O]verlapping regulation can lead to confusion, high compliance costs, and a drag on otherwise beneficial activities.”); Engel, *supra* note 27, at 369.

214. Clean Air Act § 202, 42 U.S.C. § 7521.

215. *Id.*

216. 42 U.S.C. § 7453 (2000).

California's standards have been instrumental in promoting innovation and dissemination of that innovation. In several instances, a new standard was established in California and then subsequently adopted by the EPA as a national standard.²¹⁷ This process was later accelerated when Congress amended the Clean Air Act to allow any state to adopt standards promulgated in California.²¹⁸ This change enhanced California's leverage with the auto industry and prompted many car makers to ensure that all of their cars met the California standards, as opposed to manufacturing separate "California cars."²¹⁹

Tempered uniformity, we contend, should be replicated with respect to other environmental standards subject to blanket federal preemption. However, a tempered regime need not privilege a single state's standards in the manner that the Clean Air Act does. A number of potential variants exist according to the number of states at issue and the nature of the regulatory authority delegated to them. A regime could, for example, allow departures from a federal uniform standard for a consortium of states with respect to a particular area of commerce for which the states have recognized leadership in developing standards. Experimentation with a variety of regimes is warranted given the success of the California exception under the Clean Air Act.

B. TWO STATES OF ENVIRONMENTAL LEGISLATING

The importance of the structural presumptions set forth above will differ depending upon the context in which environmental legislation is being debated. The history of environmental law in the United States suggests that the dynamics of environmental legislative action are roughly separable into two primary states: periods of incremental change and periods of major disruption.²²⁰ The former consist more or less of times of

217. Engel, *supra* note 54, at 170–72 (describing the impact of California regulations on the Clean Air Act).

218. Clean Air Act § 177, 42 U.S.C. § 7507 (2000).

219. Engel, *supra* note 54, at 170.

220. Drawing on a similar evolutionary model, Professor Elliott and his coauthors argue that "environmental law, like other statutory and bureaucratic law, *grows*, like a living thing, in response to forces internal and external to the legal system. Sometimes its growth is unrestrained, like a cancer. Under other conditions, legislation cannot survive at all." Elliott et al., *supra* note 11, at 314; *see also* Repetto, *supra* note 128, at 3–4 (discussing the uneven development of environmental policy).

business as usual in which environmental issues compete for legislators' attention against myriad other issues at play in national politics.

The latter consist of periods in which environmental issues have high political salience.²²¹ This is typically precipitated by a major event or catastrophe, such as the spontaneous combustion of pollutants in the Cuyahoga River in 1969, the Love Canal in the late 1970s, the Bhopal, India, tragedy in 1984, and the *Exxon Valdez* oil spill in 1989.²²² Numerous scholars have acknowledged the importance of these dramatic events in prompting congressional action on statutes ranging from the Clean Water Act, to Superfund, to the Emergency Planning and Community Right-to-Know Act, and, most recently, the Oil Pollution Act of 1990.²²³ One could argue that the terrorist attacks of 9/11 represent a cataclysmic event that has prompted, or provided cover for, federal retrenchment from aggressive environmental regulation.²²⁴ The influence of major disruptive

221. Bradley C. Karkkainen, *Panarchy and Adaptive Change: Around the Loop and Back Again*, 7 MINN. J.L. SCI. & TECH. 59, 66–67 (2005). Professor Buzbee describes these discontinuities in obliquely economic rather than political terms, but the basic insight is the same:

Despite contextual factors that lead to the waxing and waning of federal and state activism, environmental protection efforts will always be largely dependent on the more consistent trends and incentives attributable to environmental federalism structures themselves. Some of these trends and incentives are not easily categorized as benefits or harms, but environmental federalism's contemporary structures that provide for regulatory overlap and interaction do create some clear benefits, with some associated costs. Historically contingent factors can, of course, trump these more consistent structurally created propensities, but they are nevertheless important factors to consider in assessing how environmental federalism operates.

Buzbee, *supra* note 52, at 120–21.

222. Karkkainen, *supra* note 221, at 66–67.

223. *Id.*; Ruhl, *supra* note 75, at 1428, 1447 n.164, 1460–62 (describing the wave of legislation in the 1970s as a republican moment or point of punctuated evolution).

224. Gary C. Bryner, *The National Energy Policy: Assessing Energy Policy Choices*, 73 U. COLO. L. REV. 341, 395–400 (2002) (examining how the current “energy crisis” has been used to open up public lands to aggressive resource extraction, often at the expense of environmental laws and protection); Sharon Buccino, *NEPA Under Assault: Congressional and Administrative Proposals Would Weaken Environmental Review and Public Participation*, 12 N.Y.U. ENVTL. L.J. 50 (2003) (describing how the Bush administration has systematically sought to circumvent the procedural requirements of the National Environmental Policy Act); Glicksman, *supra* note 74, 768 (describing the dilution of the Endangered Species Act as applied to the testing of military weapons); Hank C. Jenkins-Smith et al., *Explaining Change in Policy Subsystems: Analysis of Coalition Stability and Defection over Time*, 35 J. AM. POL. SCI. 851,

events can therefore cut either way, for or against environmental regulation.

The factors that prompt legislative action will differ markedly between these two states. We assume that public-choice dynamics will dominate during incremental phases, while highly volatile political views will dominate during periods of crisis.²²⁵ Disruptions will also occur at different scales, with some of purely local significance—say, a local contaminated site—and others of regional or even national prominence (for example, mercury pollution and climate change). We assume further that local disruptions will not receive sufficient national interest to trigger passage of federal legislation, except for the preemptive variety, whereas problems with national implications may receive attention at all levels of government.

Both legislative states are important to the federal system. Periods of turbulent legislative action may be compressed in time, but their impacts will be felt for decades. More to the point, most of the major environmental statutes were passed during the singular period of 1970s environmental legislating.²²⁶ Periods of relative stasis at the federal level are also important, but primarily because of diversity-destroying misalignments that may exist between the federal and state governments. As we have seen, public-choice dynamics at the federal level may be used to preempt innovations at the state level that are prompted by localized disruptions or grassroots constituencies in the state.²²⁷

Our three policy prescriptions are limited largely to periods of incremental change at the federal level, and they are justified with primarily this state of affairs in mind. During periods of disruptive change, the standard public-choice scenario ceases to be controlling, and all bets are off. In fact, we expect that these presumptions will be largely irrelevant. As we have seen repeatedly, Congress will do whatever it wants under the turbulent conditions that often propel regulatory action. Recent examples of precipitous federal legislative action include the

875–76 (describing how exogenous events like the 1970s energy crisis led to a relaxation of federal government regulation of oil and gas leasing on the outer continental shelf).

225. Elliott et al., *supra* note 11, at 314 (describing the evolution of legislation as sometimes growing “unrestrained, like a cancer”).

226. Ruhl, *supra* note 75, at 1460–62.

227. See TESKE, *supra* note 1, at 11–12; Chemerinsky, *supra* note 4, at 1314–15.

Patriot Act²²⁸ and the Sarbanes-Oxley Act.²²⁹ Of course, these political forces have the same overriding effect on application of the matching principle. Abstract economic arguments are unlikely to sway politicians under tremendous pressure to respond to the disaster of the day and to establish a name for themselves in the process.

A multijurisdictional adaptive approach, as distinct from our specific policy recommendations, has advantages over the classical approach of the matching principle during periods of national-scale disruptive change. The standard benefits of federal regulation are well known—its national scope, economies of scale, technical sophistication, and speed relative to the time it would take for state legislative action to spread across the country.²³⁰ The scope of the federal government's power thus has distinctive benefits in times of disruptive change.²³¹

The status of leading or concurrent state action during disruptive periods is perhaps less clear. Its benefits are illustrated by the recent surge in climate change mitigation regulations at the state and local levels of government.²³² Current state and local efforts to mitigate climate change provide important templates for other states and the federal government. Few would dispute that we are better off when states take the lead in the absence of federal action. Thus, just as the federal government can operate as a backstop for state inaction, so too can the states play a crucial role in addressing even national problems. States may be particularly willing to do so during periods of dramatic change when standard economic models such as the matching principle are likely to have the least explanatory value.

228. Pub. L. No. 107-56, 115 Stat. 272 (2001) (codified as amended in scattered sections of 8, 12, 15, 18, 20, 21, 31, 42, 47, 49, and 50 U.S.C.).

229. Sarbanes-Oxley Act of 2002, Pub. L. No. 107-204, 116 Stat. 745 (codified as amended in scattered sections of 15 and 28 U.S.C.).

230. See Glicksman & Levy, *supra* note 137, at 11–22 (describing collective action problems found in state-level action and the ability of federal regulation to overcome these problems).

231. See Karkkainen, *supra* note 221, at 66–67.

232. See BARRY RABE, PEW CTR. ON GLOBAL CLIMATE CHANGE, GREENHOUSE AND STATEHOUSE: THE EVOLVING STATE GOVERNMENT ROLE IN CLIMATE CHANGE (2002), available at http://www.pewclimate.org/docUploads/states_greenhouse.pdf; Linda Adams, *California Leading the Fight Against Global Warming*, ECOSTATES, Summer 2006, 14, 14–16; Kirsten H. Engel, *Mitigating Global Climate Change in the United States: A Regional Approach*, 14 N.Y.U. ENVTL. L.J. 54, 60–61 (2005); Rabe, *supra* note 21, at 423.

C. TWO EXAMPLES OF ADAPTIVE FEDERALISM AT WORK

We conclude with two examples to illustrate some of the implications of an adaptive model of federalism. The first example, brownfields, is largely local in its scope and situated in a period of business as usual.²³³ The second example, climate change, is a quintessentially international issue that arose during a relatively placid period but has itself become a source of major policy disruption.²³⁴

Both examples violate the matching principle. In the case of brownfields, which involve local industrial site contamination and economic redevelopment issues,²³⁵ the federal government played an important role at two points. The federal government established the initial scope of liability under the Superfund statute²³⁶ for the costs of cleaning up contaminated industrial sites,²³⁷ and then in response to state initiatives, tailored that liability to encourage the cleanup and redevelopment of underutilized brownfield sites.²³⁸ This pattern reveals the back-and-forth dynamic between the states and the federal government.

Climate change inverts the brownfields fact pattern. State and local governments have taken the lead in addressing this global problem.²³⁹ In doing so, they have filled the regulatory gap left by the federal government's failure to institute a mandatory program for controlling greenhouse gas emissions.²⁴⁰ State-level legislative actions have led to a proliferation of policies and regulatory regimes, ranging from purely symbolic to stringent command and control measures.²⁴¹ In the process, they have altered the political debate at all levels of government, and by raising public expectations and consciousness of

233. See Buzbee, *supra* note 51, at 2–3.

234. See, e.g., Peter Baker & Steven Mufson, *Bush's Climate Remarks Weighed for Policy Shift*, WASH. POST, Jan. 27, 2007, at A1; James Kanter & Andrew Revkin, *Politics Shift as Planet Heats Up*, INT'L HERALD TRIB. (New York), Apr. 7–8, 2007, at A1; Micheline Maynard, *Turnabout on Fuel Standards*, N.Y. TIMES, Dec. 7, 2007, at C1.

235. Buzbee, *supra* note 51, at 1.

236. 42 U.S.C. § 9611 (2000).

237. See Buzbee, *supra* note 51, at 53.

238. *Id.* at 40–42.

239. See *supra* note 232.

240. See, e.g., Engel, *supra* note 232, at 54–55; Glicksman, *supra* note 74, at 781–86.

241. See Glicksman, *supra* note 74, at 779–86.

the issues, created substantial political pressure for the federal government to act.

1. The Evolution of Brownfields Legislation

Brownfield sites are abandoned or underutilized industrial sites contaminated with hazardous materials.²⁴² The location of many of these sites near urban centers or harbors renders them desirable for redevelopment.²⁴³ Many of them are abandoned or underutilized, in part because the presence of contamination at the site creates a risk of substantial liability for site cleanup pursuant to the federal Superfund statute.²⁴⁴ In the 1990s, business, environmental, and citizen groups mobilized to address the growing brownfields problem, which was contributing to urban blight, depreciating the value of neighboring properties, and hampering economic development.²⁴⁵ Central targets of this movement were passage of regulations that would mitigate the potential for liability and ultimately passage of amendments to Superfund itself.²⁴⁶

The process of brownfields regulatory innovation is a textbook case of adaptive federalism. As Professor William Buzbee notes, the emergence of brownfields measures is “a history of copycat legislation, alternating innovations, and generally parallel legal coverage.”²⁴⁷ Under their parallel statutes, the states were the first to adopt brownfields initiatives that, among other provisions, protected innocent purchasers from cleanup liability and provided for incentives to promote voluntary cleanup that terminated or substantially reduced the likelihood of further liability.²⁴⁸ The EPA initially resisted the calls for reform.²⁴⁹ However, after being subject to severe criticism

242. Buzbee, *supra* note 51, at 3–5.

243. *Id.* at 5.

244. *Id.* at 6 (noting that “[e]nvironmental liabilities undoubtedly contribute to Brownfields abandonment,” but cautioning that such sites “are the product of many interrelated phenomena, many of which are unrelated to environmental laws.”). Moreover, while brownfields may appear to be solely local problems, they are occasionally a source of interstate pollution, collectively implicating interstate hazardous waste management and influencing interstate competition for business. *Id.* at 24.

245. *Id.* at 13–16.

246. *Id.* at 12–13.

247. *Id.* at 26.

248. *See id.* at 15–16.

249. The one exception to this was a 1995 EPA regulatory amendment that exempted lenders and several other categories of potentially responsible parties from Superfund liability. This was classic public-choice lobbying by a

and the threat of budget cuts, the EPA embraced the state-led initiatives, and ultimately worked to facilitate and build upon innovative state programs.²⁵⁰

Professor Buzbee is careful to point out that “state acti- vi[sm] is at least partially the result of preceding federal initia- tives,” particularly the passage of Superfund itself.²⁵¹ Buzbee’s point is that pressure can be asserted from below, at the state level, just as readily as it can be asserted from above, and that despite the early dominance of the federal government, the states were able to play a vital role in environmental regula- tion.²⁵² It is this alternating federal-state pressure, which takes advantage of differing local (or national) political, environmen- tal, or economic conditions, that is critical to sustaining innova- tive policy development.

2. The Emergence of State Climate Change Initiatives

Climate change illustrates further the predictive failures of the matching principle and the virtues of adaptive federalism. Because climate change is caused, in part, by human-induced greenhouse gas emissions from around the globe, climate change is widely regarded as the textbook example of a global commons problem that is best addressed at the national and inter- national levels.²⁵³ It therefore presents a relatively clean case for the matching principle, which predicts that regulation of greenhouse gas emissions at the state level is highly unlike- ly.²⁵⁴ State-level regulation is disfavored, so the argument goes, because it risks triggering the migration of major greenhouse- gas-emitting industries to jurisdictions that do not regulate such emissions, along with the jobs and other economic benefits that accompany these industries (the so-called leakage prob- lem).²⁵⁵

group of special interests dominated by investors and banks. Interestingly, the amendment was invalidated but was then revived and passed as a 1996 ap- propriations rider. *Id.* at 14.

250. *Id.* at 41.

251. *Id.* at 55. Buzbee argues that it was the backdrop of strict federal lia- bility that led business interests to seek state measures that would limit un- certainty about liability. *Id.* at 53.

252. *Id.* at 66–67.

253. DANIEL A. FARBER ET AL., CASES AND MATERIALS ON ENVIRONMENTAL LAW 47 (2006) (“Perhaps the most striking example of a commons problem is climate change, since everyone on the planet has a stake and nearly every- one’s activities contribute to the problem.”).

254. See *supra* note 6 and accompanying text.

255. Esty, *Governance*, *supra* note 36, at 1555 (“Falling back to national-

Yet in direct contravention of this reasoning, it is state and local governments, not the federal government, that have taken the lead on climate change policy initiatives. For example, California is leading the way by capping the state's carbon dioxide emissions²⁵⁶ and mandating vehicle greenhouse gas emission limits.²⁵⁷ Other states, especially in the Northeast, have also been active on climate change mitigation. The most significant action among them has been the creation of the Regional Greenhouse Gas Initiative,²⁵⁸ which establishes a cap and trade program that will ultimately cover greenhouse gas emissions from electric utilities located in eight states.

Global climate change policy illustrates the power of the bottom-up dynamics that are characteristic of adaptive systems. Although the "wrong" jurisdictions from a static economic perspective, state and local initiatives can play an instrumental role in generating innovative policies and propelling change at higher levels of government. First, state actions bring much-needed public and media attention to climate change and its local effects.²⁵⁹ Second, state and local governments prompt, albeit on a small scale, critical technological, social, and economic changes essential to mitigating climate change.²⁶⁰ Third, state and local governments, as the old saying goes, function as "laboratories of democracy" for parallel testing of initiatives in a

scale intervention . . . invites free riding, holdouts, and inefficient spending of limited resources—and thus structural regulatory failure. At least from a theoretical viewpoint, inherently global problems demand concerted worldwide action.”); Robert Stavins, *Policy Instruments for Climate Change: How Can National Governments Address a Global Problem?*, 1997 U. CHI. LEGAL F. 293, 323–24 (“On the domestic level, even the most cost-effective greenhouse policy instrument will be desirable only if the national target it seeks to achieve is part of an accepted set of international mandates. Because unilateral action will invariably be highly inefficient, any domestic program requires an effective international agreement, if not a set of international greenhouse policy instruments.”).

256. CAL. HEALTH & SAFETY CODE § 38550 (West 2006) (seeking to reduce emissions of greenhouse gases generated in California by twenty-five percent by the year 2020 in order to bring California's total emissions down to 1990 levels).

257. *Id.* § 43018.5.

258. See Regional Greenhouse Gas Initiative, Home Page, <http://www.rggi.org/index.htm> (last visited Apr. 28, 2008).

259. Engel, *supra* note 232, at 55–57 (noting that state action on climate change has received extensive media coverage).

260. Carlson, *supra* note 192, at 314–15 (observing that concentrating environmental innovation in a given state or states has the potential to take advantage of economies of scale and network effects that are critical to technological innovation, such as those found in Silicon Valley).

range of contexts that then can serve as models for other jurisdictions.²⁶¹ Finally, action at the state and local level can feed back to the national level, as the threat of fifty distinct state laws regulating a single industry has, as in the past, the potential to prompt congressional action.²⁶²

State and local government climate change initiatives also demonstrate the basic insight of an adaptive model. The diverse range of political, environmental, and socioeconomic conditions found at the state and local levels is a critical, and so far undervalued, source of innovative policy development—irrespective of the putative scale of the problem.

Such initiatives also have a clear economic rationale that defies the leakage problem and the matching principle. Take the example of state-level renewable energy portfolio standards, which, because of the added costs and thus economic risks, ought to preclude state action. Yet, twenty-one states and the District of Columbia currently have standards that require energy suppliers' portfolios to contain a certain percentage of renewable power.²⁶³ The socioeconomic rationale is simple—there are counterbalancing economic and social benefits that accrue to the state.²⁶⁴ Even on purely economic grounds the benefits can be compelling. Renewable energy, for instance, is generally more job-intensive than conventional energy sources²⁶⁵ and, for states that import electricity from out-of-state suppliers, investment in renewable energy can pave the way for a stepped-up intrastate energy sector.²⁶⁶

Beyond the economic rationales, some jurisdictions, such as the coastal states in the Southeast, are much more vulnerable to the potential impacts of climate change. Other states

261. Schapiro, *Interactive Federalism*, *supra* note 15, at 267 (noting the population and economic competition among states).

262. Engel, *supra* note 232, at 57 (describing the movement of policy from the state to the federal level as the “domino effect”).

263. For updates on state-level climate legislation, see Pew Center on Global Climate Change, http://www.pewclimate.org/what_s_being_done/in_the_states (last visited Apr. 28, 2008).

264. Indeed, the economic benefits of a renewable portfolio standard are often advanced as a rationale for maintaining or enhancing such mandates. See Barry G. Rabe & Philip A. Mundo, *Business Influence in State-Level Environmental Policy*, in BUSINESS AND ENVIRONMENTAL POLICY 265 (Michael Kraft & Sheldon Kamieniecki eds., 2007).

265. See, e.g., NAT'L RENEWABLE ENERGY LAB., DOLLARS FROM SENSE: THE ECONOMIC BENEFITS OF RENEWABLE ENERGY 1 (1997), available at <http://www.nrel.gov/docs/legosti/fy97/20505.pdf>.

266. See *id.* at 2–3; Carlson, *supra* note 192, at 314–15.

may have far less to lose economically, either because they are large enough players, such as California, or their industrial base would be only indirectly affected by regulation or might even benefit from it (for example, North Dakota and Vermont). Alternatively, the political leanings or ideological bent of a jurisdiction may place a high value on environmental protection and the citizens may be less concerned about a strict cost-benefit rationale for setting environmental policies.²⁶⁷

Climate change policy demonstrates how the local conditions of a jurisdiction, broadly construed, select for different types of environmental policy. State and local government actions thus collectively generate a diversity of policy options. As the preceding examples illustrate, variation in local conditions allows diversity to be maintained in the federal system as in adaptive systems generally. At the same time, competition for limited legislative and administrative resources winnows out policies and experience leads to their refinement. An adaptive model of environmental federalism would sustain both over time, preferencing neither policy diversity nor efficiency.

CONCLUSION

Our adaptive model provides a powerful framework for a dynamic conception of federalism premised on the parallel development of environmental policies at multiple levels of government. By revealing the deficiencies of a one-sided focus on static optimization and the virtues of sustaining a diverse range of regulatory options, this Article has shown that a shift to a dynamic model of environmental federalism would enhance government responsiveness, policy innovation, and socioeconomic adaptability and resilience to unpredictable environmental change.

The implications of an adaptive framework are not solely academic. Over the past few decades, and especially during the current Bush administration, Congress and the executive branch have adopted preemptive measures at a historically unprecedented rate.²⁶⁸ During the same period, the courts have

267. See generally Kirsten Engel, *State and Local Climate Change Initiatives: What Is Motivating State and Local Governments to Address a Global Problem and What Does This Say About Federalism and Environmental Law?*, 38 URB. LAW. 1015 (2006) (discussing the unusual federal-state role reversal in formulating aggressive strategies to combat climate change).

268. Nivola, *supra* note 16, at 50 ("More preemptions were piled on after 1970 than in the entire preceding history of the Republic."); Rabe, *supra* note

been facilitators in this movement, often inferring preemption from the penumbra of a statute.²⁶⁹

These worrisome trends make it all the more important for policymakers and scholars to appreciate the unique virtues that a dynamic system of overlapping federal-state jurisdiction has for environmental policymaking. An adaptive model, as we have argued, provides a theoretical framework for making this case. Our hope is that it will help to persuade legislators and judges to reverse course on federal preemption and convince scholars of environmental federalism that a singular focus on the static model of the matching principle ought to be reconsidered, if not abandoned altogether.

21, at 417–20 (describing the Bush administration's extreme centralization of environmental policymaking in the federal government).

269. Chemerinsky, *supra* note 4, at 1314–15.