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**CLIMATE CHANGE ADAPTATION: A COLLECTIVE ACTION PERSPECTIVE ON
FEDERALISM CONSIDERATIONS**

Robert L. Glicksman*

I. INTRODUCTION

The longer Congress dithers and stumbles in its efforts to pass climate change legislation aimed at reducing greenhouse gas emissions, the greater will be the need for the adoption and implementation of climate change adaptation measures. As the Congressional Budget Office has recognized, “[t]he world is committed to some degree of warming from emissions that have already occurred, and even very aggressive emissions restrictions are unlikely to halt the growth of concentrations for many years to come.”¹ Most climate change scientists seem to agree.² Although the exact nature, extent, and distribution of the adverse effects of climate change is unknowable, the climate change to which the world is already committed threatens to transform natural ecosystems and disrupt human social and economic systems that rely on them, perhaps to an unprecedented degree and within a relatively short time period.³ According to the Intergovernmental Panel on Climate Change (IPCC), the expected impacts of climate change include melting of glaciers, intensifying droughts and runoff, rising sea levels, and changes in the morphology, physiology, phenology, reproduction, species

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¹ CONG. BUDGET OFFICE, UNCERTAINTY IN ANALYZING CLIMATE CHANGE: POLICY IMPLICATIONS 36 (2005) [hereafter CBO].

² See Hari M. Osofsky, *Is Climate Change “International”? Litigation’s Diagonal Regulatory Role*, 49 VA. J. INT’L L. 585, 598 (2009) (citing INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE 2007: IMPACTS, ADAPTATION AND VULNERABILITY: CONTRIBUTION OF WORKING GROUP II TO THE FOURTH ASSESSMENT REPORT OF THE IPCC (2007), available at <http://www.ipcc.ch/ipccreports/ar4-wg2.htm>) (“The Fourth [Intergovernmental Panel on Climate Change] Report makes it clear that we have passed the point at which prevention of impacts is possible . . . and scientific consensus suggests that they will only get worse as time passes.”) [hereafter IPCC ADAPTATION REPORT]. See also Alejandro E. Camacho, *Adapting Governance to Climate Change: Managing Uncertainty Through A Learning Infrastructure*, 59 EMORY L.J. 1, 17 (2009) (stating that “no amount of abatement, even if enacted tomorrow, is likely to diminish the effects of climate change for several decades. Evidence suggests that the effects of global warming are already being experienced in the United States, and climate change is likely to continue for decades, even in the event of significant reduction of emissions.”); Robin Kundis Craig, *“Stationarity is Dead”—Long Live Transformation: Five Principles for Climate Change Adaptation Law*, 34 HARV. ENVTL. L. REV. 9, 14 (2010) (“Because of ‘committed’ warming — climate change that will occur regardless of the world’s success in implementing mitigation measures, a result of the already accumulated greenhouse gases (‘GHGs’) in the atmosphere — what happens to socio-ecological systems over the next decades, and most likely over the next few centuries, will largely be beyond human control.”). Consensus about the link between anthropogenic greenhouse gas emissions and climate change, and about whether climate change poses immediate and unacceptable threats is not universal. The purpose of this article is not to rehash the scientific debate. Rather, it is to consider how policymakers committed to preparing society for what they regard as the unavoidable, anticipated adverse effects of climate change should structure a climate change adaptation policy in light of federalism considerations.

³ See Camacho, *supra* note 2, at 13.

distribution, community structure, ecosystem processes and species evolutionary processes among marine, freshwater, and terrestrial biological systems.⁴

The buildup of greenhouse gases (GHGs) in the atmosphere that has already occurred⁵ and the likely growth in future emissions due to increased energy consumption in developing nations such as China and India,⁶ has convinced many scientists and policymakers that society needs to begin developing policies that will allow adaptation to climate change in ways that minimize its adverse effects.⁷ While effort to mitigate climate change entail reducing emissions of GHGs and lowering their concentrations in the atmosphere, adaptation, according to the IPCC, involves “adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities.”⁸ In other words, “[w]hile mitigation in response to climate change primarily represents activities to *protect nature from society*, adaptation constitutes ways of *protecting society from nature*.”⁹

Climate change adaptation is designed to increase the resilience of natural and human ecosystems to the threats posed by a changing environment. Resilience, in turn, can be viewed as “the ability of a system to return to its initial state and function in spite

⁴ IPCC ADAPTATION REPORT, *supra* note 2, at § 1.5, http://www.ipcc.ch/publications_and_data/ar4/wg2/en/ch1s1-5.html. For further description of some of the potential adverse physical, biological, and socio-economic effects of climate change, see Robert L. Glicksman, *Ecosystem Resilience to Disruptions Linked to Global Climate Change: An Adaptive Approach to Federal Land Management*, 87 NEB. L. REV. 833, 839-51 (2009).

⁵ According to the World Meteorological Organization, global concentrations of CO₂ reached record highs in 2005 — 381.2 parts per million. See WORLD METEOROLOGICAL ORGANIZATION, GREENHOUSE GAS BULLETIN: THE STATE OF GREENHOUSE GASES IN THE ATMOSPHERE USING GLOBAL OBSERVATIONS THROUGH 2006 (2007), available at http://www.wmo.ch/pages/mediacentre/news/index_en.html. According to a study published in 2007, the growth rate of atmospheric CO₂ is increasing rapidly as a result of recent growth of the world economy, rapid growth in fossil fuel CO₂ emissions since 2000, and a long-term (50-year) increase in the airborne fraction of CO₂ emissions. The last finding implies a decline in the efficiency of CO₂ sinks on land and oceans in absorbing anthropogenic emissions. The authors concluded that the magnitude of the airborne fraction appears larger than that estimated by models. As a result, the carbon cycle is generating stronger-than-expected and sooner-than-expected climate forcing. Josep G. Canadell et al., *Contributions to Accelerating Atmospheric CO₂ Growth from Economic Activity, Carbon Intensity, and Efficiency of Natural Sinks*, 104 PROC. NAT'L ACAD. OF SCI. 10288 (Oct. 25, 2007).

⁶ See, e.g., Keith Bradsher, *China's Energy Use Threatens Goals on Warming*, N.Y. TIMES, May 6, 2010 (noting that China's “surging demand for power from oil and coal has led to the largest six-month increase in the tonnage of human generated greenhouse gases ever by a single country”); *India's GHG Emissions Up by 58 Per Cent*, SCIDEV NET (May 12, 2010), <http://www.scidev.net/en/climate-change-and-energy/india-s-ghg-emissions-up-by-58-per-cent-1.html> (reporting that India's GHG emissions rose by 58 per cent between 1994 and 2007).

⁷ See, e.g., IPCC ADAPTATION REPORT, *supra* note 2, at § 17.5 (suggesting “that a high priority should be given to increasing the capacity of countries, regions, communities and social groups to adapt to climate change in ways that are synergistic with wider societal goals of sustainable development”), http://www.ipcc.ch/publications_and_data/ar4/wg2/en/ch17s17-5.html.

⁸ *Id.* at 6.

⁹ Stine Aakre & Dirk T.G. Rübhelke, *Adaptation to Climate Change in the European Union Efficiency vs. Equity Considerations*, CEPS Working Document No. 301/September 2008, at 2-3, available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1275262&download=yes.

of some major perturbation,”¹⁰ or “the amount of change or disturbance that a system can absorb before it undergoes a fundamental shift to a different set of processes and structures.”¹¹ Professor Robin Craig has summarized the IPCC’s call for the development of adaptation capacity as follows:

[T]he IPCC noted that “[a]daptation is necessary in the short and longer term to address impacts resulting from the warming that would occur even for the lowest stabilisation scenarios assessed.” In other words, adaptation must become a co-strategy with mitigation efforts for dealing with climate change, because “[r]isks associated with climate change could greatly increase vulnerability unless adaptation is stepped up.” Moreover, adaptation efforts may have immediate benefits for socio-ecological systems by decreasing vulnerability to future changes, “reducing sensitivity to climatic risks,” and increasing the adaptive capacity of both humans and the ecological systems upon which they depend.¹²

Despite the critical need for the development of adaptive responses to climate change, the federal government has done almost nothing to stake out its turf on adaptation policy or to coordinate the responses of lower levels of government.¹³ This article takes the need for the development of an effective adaptation policy as a given¹⁴ and focuses on the proper allocation of decisionmaking authority within our federal system of government. While much has been written about the federalism implications of climate change mitigation policy,¹⁵ relatively less has been written about the federalism issues arising from climate change adaptation policy.¹⁶ This disproportionate

¹⁰ U.S. CLIMATE CHANGE SCIENCE PROGRAM & THE SUBCOMM. ON GLOBAL CHANGE RESEARCH, PRELIMINARY REVIEW OF ADAPTATION OPTIONS FOR CLIMATE-SENSITIVE ECOSYSTEMS AND RESOURCES 9-16 (2008), <http://www.climatescience.gov/Library/sap/sap4-4/default.php>.

¹¹ *Id.* at 2.

¹² Craig, *supra* note 2, at 21 (quoting INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE 2007: SYNTHESIS REPORT: SUMMARY FOR POLICYMAKERS 19 (2007)).

¹³ See J.B. Ruhl, *Climate Change Adaptation and the Structural Transformation of Environmental Law*, 40 ENVTL. L. 363, 409 (2010) (stating that “the United States has compiled close to zero in the way of coordinated anticipatory adaptation policy for managing the risk in the United States of climate change catastrophe and crisis”).

¹⁴ See *supra* note 2.

¹⁵ See, e.g., Symposium, *Federalism and Climate Change: The Role of the States in a Future Federal Regime*, 50 ARIZ. L. REV. 673-938 (2008); Ann E. Carlson, *Iterative Federalism and Climate Change*, 103 NW. U. L. REV. 1097 (2009); 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); Robert L. Glicksman & Richard E. Levy, *A Collective Action Perspective on Ceiling Preemption by Federal Environmental Regulation: The Case of Global Climate Change*, 102 N.W. U. L. REV. 579 (2008); Alice Kaswan, *A Cooperative Federalism Proposal for Climate Change Legislation: The Value of State Autonomy in a Federal System*, 85 DENV. U. L. REV. 791 (2008).

¹⁶ See Daniel A. Farber, *Climate Adaptation and Federalism: Mapping the Issues*, UC Berkeley Public Law Research Paper No. 1468621, at 1, http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1468621 [hereafter Farber, *Mapping*] (“There is a vigorous debate about the appropriate roles of the state and federal government in reducing greenhouse gases and mitigating climate change. There has been little if any discussion, however, about the appropriate roles of the states and the federal government in adapting to climate change.”) Cf. Daniel A. Farber, *Adapting to Climate Change: Who Should Pay?*, 23 J. LAND USE & ENVTL. L. 1, 2 (2007) (“Adaptation has been a neglected topic, in part because mitigation seems more

emphasis on mitigation is not because the problems facing adaptation policymakers are any simpler than those relating to adaptation, or because the government is further along in devising solutions. President Obama’s Interagency Climate Change Task Force has posited that “[a]daptation and resilience will require action from all segments of society — the public sector, the nonprofit sector and individuals. This challenge provides Federal, Tribal, State, and local governments with significant opportunities for innovation.”¹⁷ The Task Force also stated that significant gaps in the U.S. government’s approach to climate change adaptation and building resilience exist, including the absence of a unified strategic vision and approach, an understanding of the challenges at all levels of government, and an organized and coordinated effort among federal, state, local, and tribal actors.¹⁸

One argument for devolving considerable control over the formulation and implementation of adaptation policy to the state and local levels is that the effects of climate change will vary by location, requiring different strategies.¹⁹ If a “one size fits all” approach was ill-suited to pollution control regimes,²⁰ it is likely to be that much more problematic when addressing climate change adaptation issues. Accordingly, some have advocated placing the power and responsibility of dealing with adaptation issues principally in the hands of local governments.²¹ The German federal government has accepted this view, postulating that “[p]eople on the spot often know what is good for

urgent, and in part for political reasons. The political reason is a fear by environmentalists that discussing possible adaptive measures might undermine the political pressure for mitigation.).

¹⁷ Interagency Climate Change Task Force, Progress Report of the Interagency Climate Change Adaptation Task Force, at 1 (Mar. 16, 2010), <http://www.whitehouse.gov/sites/default/files/microsites/ceq/20100315-interagency-adaptation-progress-report.pdf>.

¹⁸ *Id.* at 3-4.

¹⁹ See Craig, *supra* note 2, at 25. The same is true at the global level. See *id.* at 23 (stating that “a global legal response is insufficient to deal with the localized details of climate change impacts, which will require legal reforms at the national, state, and local levels as well.”).

²⁰ See, e.g., Timothy F. Malloy, *The Social Construction of Regulation: Lessons from the War Against Command and Control*, 58 BUFF. L. REV. 267, 269 (2010) (describing uncritical acceptance of the premise that “[i]nnovation is stifled, and pollution management is dominated by a one-size-fits-all approach developed by the uninformed, centralized regulatory agency”). Cf. Carol M. Rose, *From H₂O to CO₂: Lessons of Water Rights for Carbon Trading*, 50 ARIZ. L. REV. 91, 92 (2008) (“The older command-and-control regulatory systems have certainly had an important impact on pollution reduction, in the United States as elsewhere, but their rigidity and one-size-fits-all character make them seem expensive and old-fashioned by comparison to more nimble, innovative and cost-sensitive market approaches.”); Richard B. Stewart, *United States Environmental Regulation: A Failing Paradigm*, 15 J.L. & COM. 585, 587-88 (1996) (“In order to economize on decision-making costs, regulators adopt uniform measures of procrustean character that are often inappropriate for particular facilities. [FN10] Command and control regulation also creates enormous economic waste by failing to equalize the marginal costs of control of the same pollutant across different sources. Uniform “one size fits all” requirements are adopted for categories of industrial facilities, ignoring large variations in the costs of control among different facilities within the same category.”).

²¹ See, e.g., REBECCA CARTER & SUSAN CULP, PLANNING FOR CLIMATE CHANGE IN THE WEST 24 (Lincoln Inst. of Land Policy 2010) (“Counties, cities, and towns are also the most appropriate level of government to tackle the adaptation actions that must take place to climate-proof communities.”).

their specific case. The Federal Government is therefore relying on strengthening individual capacity and adaptive capacity at the local level.”²²

On the other hand, federal participation and leadership is likely to be necessary for several reasons. State and local authorities may lack the resources to lead the adaptation effort, they are likely to have incentives to put their citizens at a disadvantage vis-à-vis those of other jurisdictions fighting for scarce resources such as water, the actions of one jurisdiction may have adverse spillover effects in other places, and coordination of the policies of multiple jurisdictions may be needed to ensure effectiveness.²³ These have long been the justifications offered for affording a prominent role to the federal government in many environmental regulatory programs. As one observer has noted, “[f]ederal systems always seem to face substantial pressure to devolve implementing policy choices to the local level. On the other hand, joint action is the *raison d'être* for federalism, and hence, the lines of authority must facilitate unity.”²⁴

My aim in this article is to provide a framework for determining how to structure a policy to facilitate adaptation to climate change that assigns appropriate roles to all levels of government. The framework emerges from analysis of several questions. First, when is participation by the federal government appropriate? Second, should the federal government set a floor that requires participation by, or at least conformance with federal requirements, by states and localities? Third, should the federal government ever displace state and local adaptation responses based on the threats those responses pose to federal interests? In other words, the article inquires whether climate change adaptation policy should be a thoroughly state or local affair with no federal participation, a cooperative venture in which all three levels of government lend a hand, or an exclusively federal regime. The obvious answer is that some aspects of adaptation policy should be controlled exclusively by state and localities, some should be governed by cooperative federalism ventures, and still others should be exclusively within the control of the federal government. The real issue is which aspects of the need to adapt to climate change should be governed by each of these three possible relationships.

I argue that collective action principles provide a useful tool for determining the proper institutional arrangements for dealing with climate change adaptation. Part II of the article examines three models for structuring the relationship between federal, state, and local actors in preparing for the onset of the adverse effects of climate change. Under the first model, the federal government provides information or funding to states and localities, who may use that information and those resources to craft their own adaptation policies free of federal intervention and control. A variation of that model, in which the federal government retains greater control, attaches conditions to the receipt of

²² FEDERAL MINISTRY FOR THE ENVIRONMENT, NATURE CONSERVATION AND NUCLEAR SAFETY, COMBATING CLIMATE CHANGE: THE GERMAN ADAPTATION STRATEGY 9 (Mar. 2009) [hereafter GERMAN ADAPTATION].

²³ See, e.g., Farber, *Mapping*, *supra* note 16, at 2 (“The states are likely to play the leading role in adaptation, but federal intervention may be warranted by the existence of interstate spillover effects, political distortions that hinder state responses, or equitable factors.”).

²⁴ Charles H. Koch, Jr., *The Devolution of Implementing Policymaking in Network Governments*, 57 EMORY L.J. 167, 174 (2007).

federal funds. The second model is the traditional cooperative federalism model that characterizes much of federal environmental law under statutes such as the Clean Air Act. The third model involves federal preemption of particular aspects of state and local adaptation policy. Part II also briefly addresses whether federal, state, and local roles should differ in the contexts of climate change mitigation and adaptation policy, given that adaptation measures in some instances will affect areas of the law (such as water and land use law) in which policy traditionally has been set primarily at the state and local levels.

Part III applies collective action principles to climate change adaptation policy as an aid to deciding on the appropriate allocation of decisionmaking authority among governments. Subpart A explains the function of collective action analysis and then identifies the five traditionally recognized collective action justifications for the federal government's participation in determining environmental policy. In the next subpart, I inquire whether any of these justifications support setting federal floors to counter state and local inaction or the adoption by these levels of government of inadequate adaptation measures. I conclude that the presence of transboundary externalities and race-to-the-bottom considerations are the most likely justifications for establishment of a federal floor, and that the use of conditional funding or cooperative federalism arrangements may be used to avoid excessive intrusion on state and local discretion. Subpart C considers whether collective actions principles ever justify preemption of "excessive" or wrong-headed state or local activity in response to the threats posed by climate change. I conclude that while most of the collective action justifications for a federal presence in environmental law are not likely to justify preemption of state and local adaptation measures, the possibility of transboundary externalities, the need for uniformity, and the proclivity of state and localities to foist problems arising from climate change on other jurisdictions may do so in limited instances.

II. THE DESIGN OF FEDERAL CLIMATE CHANGE ADAPTATION POLICY

The options for the design of a federal policy for climate change adaptation range from affording state and local governments broad discretion to determine the nature of their responses, to divesting state and local power in favor of exclusive federal control. The appropriate option may differ depending on the strength of federal, state, and local interests in, the traditional allocation of decisionmaking authority over, and the nature of the collective action problem implicated by the various resources and activities affected by climate change. The institutional considerations and federalism concerns are not necessarily the same for climate change adaptation as for mitigation policy. In particular, they may tilt more heavily on favor of an expansive role for state and localities in the adaptation context.

A. Models of Adaptation Federalism

The allocation of power among the federal government and state and localities to determine the nature of governmental responses to the anticipated or actual effects of climate change can follow one of three models. First, the federal role could be confined

to developing and providing information or providing financial support for actions designed and implemented by state and local governments. The federal government could retain greater control while still leaving implementation authority primarily in state or local hands by conditioning the receipt of federal funds on adherence to federal standards or policies. Second, Congress could choose to follow the traditional cooperative federalism model in fashioning a climate change adaptation regime by setting goals, but delegating to the states the primary authority to achieve them through means selected by the states. Third, federal authority could displace state or local power, at least over certain aspects of the adaptation effort.

The first model is the one Congress used in the initial stages of the modern environmental area. Congress during the 1960s enacted legislation into the causes and effects of pollution, for example, but depended on the states to use that information to control the sources of pollution that created health and environmental risks. It also provided financial support for state regulatory efforts.²⁵ Under the Clean Water Act, for example, EPA has administered a program of grants and loans to state and local governments for the construction of sewage treatment plants.²⁶ To this day, the federal environmental laws identify these kinds of information and resource-sharing efforts as critical statutory purposes. The Clean Air Act, for example, includes among its purposes the initiation and acceleration of a national research and development program to prevent and control air pollution, and the provision of technical and financial assistance to state and local governments to develop and execute their air pollution prevention and control programs.²⁷ Other environmental statutes reflect similar goals.²⁸ Although the federal role in controlling air and water pollution has moved well beyond providing federal technical and financial support to state and local programs,²⁹ federal statutes specifically directed at climate change to date focus on information gathering and distribution, not regulatory action.³⁰ Other nations with federal systems have concluded that an appropriate role for the federal government is supplying information on climate change adaptation to lower level units of government.³¹

²⁵ See Robert L. Glicksman, *From Cooperative to Inoperative Federalism: The Perverse Mutation of Environmental Law and Policy*, 41 WAKE FOREST L. REV. 719, 730 (2006); Glicksman & Levy, *supra* note 15, at 596.

²⁶ 33 U.S.C. §§ 1281-1301 (2006). See also *id.* §§ 1255-1260 (providing grants for various water pollution control programs).

²⁷ 42 U.S.C. § 7401(b)(2)-(3) (2006).

²⁸ See, e.g., 42 U.S.C. § 6902(a)(1), (9) (2006) (Resource Conservation and Recovery Act); 33 U.S.C. § 1251(b) (2006) (Clean Water Act).

²⁹ See Glicksman, *supra* note 25, at 737-40.

³⁰ E.g., 7 U.S.C. §§ 6701-6711 (2006); 15 U.S.C. §§ 2901-2903, 2931-2938 (2006); 16 U.S.C. § 1601(a)(5)-(6) (2006); 42 U.S.C. § 10366 (2006); 42 U.S.C. §§ 13381-13389 (2006); 42 U.S.C. § 16293 (2006). The Supreme Court has interpreted the Clean Air Act, however, to vest in EPA the authority to regulate GHG emissions. *Massachusetts v. EPA*, 549 U.S. 497 (2007). EPA has begun to exercise that authority. See, e.g., EPA, Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards; Final Rule, 75 Fed. Reg. 25,324 (May 7, 2010); EPA Prevention of Significant Deterioration and Title V Greenhouse Gas Tailoring Rule, 75 Fed. Reg. 31,514 (June 3, 2010).

³¹ See, e.g., GERMAN ADAPTATION, *supra* note 22, at 51 (“To enable federal, [state] and local authorities to take a systematic approach to the adaptation issue, they need a common basis of methods, data and information about climate change, the expected consequences and the effects already observed.”).

One way to increase the federal government's role in the development of climate change adaptation strategies without displacing state and local authorities as the primary policymaking bodies would be to use Congress' authority under the Spending Clause³² to condition the provision of federal funds for adaptation planning on compliance with federal standards or criteria.³³ In particular, federal funding could be conditioned on compliance with adaptation strategies that do not interfere with federal purposes or damage the national interest. This approach would leave state and local governments with the option of choosing not to follow the federal lead if they are willing to forego federal financial assistance.³⁴ Some of the major climate change bills considered by Congress during 2009-2010 would have conditioned federal funds for adaptation planning in this way.³⁵ The federal government could condition the receipt of federal flood insurance, funding for infrastructure projects, and agricultural subsidies, among other things, on the willingness of states and localities to comply with federal adaptation planning procedures and criteria.³⁶

A second model, which would increase the extent to which the federal government controls the design and implementation of climate adaptation policy without ousting state or local exercises of power, is the cooperative federalism model reflected in the major federal pollution control statutes such as the Clean Air and Clean Water Acts.³⁷ In those contexts, cooperative federalism involves shared governmental responsibility for

³² U.S. CONST. art. I, § 8, cl. 1.

³³ See *South Dakota v. Dole*, 483 U.S. 203 (1987) (describing the scope of Congress's authority to impose conditions on the receipt of federal funds). See generally Denis Binder, *The Spending Clause as a Positive Source of Environmental Protection*, 4 CHAP. L. REV. 147 (2001); Terry Jean Seligman, *Muddy Waters: The Supreme Court and the Clear Statement Rule for Spending Clause Legislation*, 84 TUL. L. REV. 1067 (2010).

³⁴ See, e.g., Damien Leonard, *Raising the Levee: Dutch Land Use Law as a Model for U.S. Adaptation to Climate Change*, 21 GEO. INT'L ENVTL. L. REV. 543, 561 (2009) (urging the attachment of explicit conditions to federal funding of state and local adaptation planning efforts).

³⁵ See, e.g., American Clean Energy and Security Act of 2009, H.R. 2454, 111th Cong. §§ 479-480 (conditioning funding from Natural Resources Climate Change Adaptation Fund on state or tribal preparation of natural resources adaptation plan to address impacts of climate change and ocean acidification on fish, wildlife, plants, habitats, ecosystems, wildlife health, ecological processes, and the coastal zone); Clean Energy Jobs and American Power Act, S. 1733, 111th Cong. § 383 (2009) (conditioning receipt of cost-share grants to assist in wildfire protection practices on fulfillment of requirements concerning cooperative fire agreements, community wildfire protection plan, and other collaborative processes).

³⁶ See Farber, *Mapping*, *supra* note 16, at 8.

³⁷ The dividing line between a regime based on information sharing and conditional federal funding, and the cooperative federalism model described here is not always clear. The Coastal Zone Management Act, 16 U.S.C. §§ 1451-1466 (2006), involves both conditional federal funding and state implementation of federally devised criteria for protecting coastal zones from development. See Leonard, *supra* note 34, at 557 (stating that the Coastal Zone Management Act encourages a "brand of inter-governmental cooperation" that involves federal establishment of broad criteria, but recognizes that "the implementation of those criteria must occur on the state and local level to address the unique needs of that jurisdiction. For those states that choose to carry out the federal program, there is federal funding and technical assistance available."). Moreover, as indicated above, statutes such as the Clean Air and Clean Water Acts, which are the most prominent examples of cooperative federalism in U.S. environmental law, authorize information sharing and federal financial assistance.

achieving federally prescribed environmental protection goals.³⁸ Under the Clean Air Act, for example, the federal government retains the authority to set national ambient air quality standards,³⁹ delegates to the states the authority to achieve those standards through the preparation of implementation plans which must be approved by EPA,⁴⁰ allows states to administer the permit program through which emission controls are applied to individual sources,⁴¹ requires sources to comply with federal technology-based standards such as those that apply to new stationary sources⁴² or sources of hazardous air pollutants⁴³ but allows states to adopt more stringent standards,⁴⁴ and shares enforcement authority with the states.⁴⁵ Some European nations, including the Netherlands, have created climate change adaptation strategies that build on the cooperative federalism model.⁴⁶

A third model involves displacement of state and local authority to devise and implement climate change adaptation policy. Such preemption of state and local authority is rare in the federal environment laws.⁴⁷ Most statutes explicitly preserve state

³⁸ Professors Adelman and Engel have described cooperative federalism as follows:

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

David E. Adelman & Kirsten H. Engel, *The Case Against Reallocating Environmental Regulatory Authority*, 92 MINN. L. REV. 1796, 1811-12 (2008). For a more expansive discussion of the elements of cooperative federalism in the federal pollution control and natural resource management statutes, see Glicksman, *supra* note 25, at 737-47. Other variations are possible. See, e.g., A. Dan Tarlock, *Federalism Without Preemption: A Case Study in Bioregionalism*, 27 PAC. L.J. 1629, 1651 (1996) (describing a model of "partnership federalism" which "allows state and local governments to define the content of federal mandates" through mechanisms such as multiparty agreements and federal waivers of power); Erin Ryan, *Negotiating Federalism*, 52 B.C. L. REV. __ (forthcoming), http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1583132 (describing various methods by which state and federal authorities bargain concerning federalism issues); Kirsten Engel, *Harnessing the Benefits of Dynamic Federalism in Environmental Law*, 56 EMORY L.J. 159 (2006) (describing version of cooperative federalism based on presumptively concurrent federal and state power).

³⁹ 42 U.S.C. §§ 7408-7409 (2006).

⁴⁰ *Id.* § 7410.

⁴¹ *Id.* § 7661a(d).

⁴² *Id.* § 7411.

⁴³ *Id.* § 7412.

⁴⁴ *Id.* § 7416. State authority to adopt and apply more stringent standards controlling emissions from motor vehicles is more restricted. *Id.* § 7543. See *infra* notes 49-51 and accompanying text.

⁴⁵ 42 U.S.C. § 7413 (2006). For a description of state authority and responsibilities under the Clean Water Act, see Glicksman, *supra* note 25, at 741-42.

⁴⁶ See Leonard, *supra* note 34, at 548-49 (describing decentralized model in which regional and local governments determine land use policy, but "must take national concerns such as water management, environment, cultural heritage, and landscape into account when developing their plans").

⁴⁷ See William W. Buzbee, *Federal Floors, Ceilings, and the Benefits of Federalism's Institutional Diversity*, in PREEMPTION CHOICE: THE THEORY, LAW, AND REALITY OF FEDERALISM'S CORE QUESTION 98

authority to adopt standards that are more stringent than the federal floor.⁴⁸ In rare instances, however, Congress has barred the states from adopting standards or other regulatory approaches that differ from federal standards in any way. The most important example is the Clean Air Act's prohibition on adoption by the states of motor vehicle emission standards that differ from EPA's standard.⁴⁹ Congress carved out an exception from that prohibition for California because of the severity of its air pollution problems and the fact that it began regulating motor vehicle emissions before Congress adopted the Clean Air Act.⁵⁰ If EPA waives the prohibition on state standards for California, other states may adopt standards equivalent to California's.⁵¹ In similar fashion, Congress could decide that the federal government should retain exclusive (or near-exclusive) control over certain aspects of climate change adaptation policy.

B. Mitigation and Adaptation Compared

It is unlikely that the same model is appropriate for all aspects of federal climate change adaptation policy. A federal information-sharing role may be best suited to some aspects, while others would accommodate conditional funding or traditional cooperative federalism arrangements. Even displacement of state and local authority may be appropriate in some areas. Some participants in debate over climate change mitigation legislation have advocated displacement of state cap-and-trade programs for reducing GHG emissions.⁵² Regardless of whether Congress decides to preempt state cap-and-trade programs, the considerations that bear on whether to preempt state and local measures relating to climate change mitigation policy are not necessarily the same as those relevant to the role of the states and localities in adapting to climate change.⁵³

Some of the analysis of whether the federal government should preempt state and local efforts to abate GHG emissions is likely to be applicable to analysis of adaptation federalism questions, too. As Professor Robin Craig has noted, for example, pollution control laws bear on adaptation as well as mitigation because a reduction in some forms of pollution will reduce ecological stressors and thus enhance ecosystem resilience to

(William W. Buzbee ed., 2009) (asserting that "ceiling preemption," which involves precluding states from adopting standards that are more stringent than federal standards, are uncommon in environmental law).

⁴⁸ E.g., 33 U.S.C. § 1370 (2006) (Clean Water Act); 42 U.S.C. § 6929 (2006) (Resource Conservation and Recovery Act); 42 U.S.C. § 7416 (Clean Air Act (2006)). Professor Buzbee has explained that provisions such as these that establish federal floors "preclude any more lax regulatory choices by state or local governments," but allow states and localities to impose more stringent controls through regulation or common law standards. Buzbee, *supra* note 47, at 98.

⁴⁹ 42 U.S.C. § 7543(a) (2006).

⁵⁰ *Id.* § 7543(b); Glicksman & Levy, *supra* note 15, at 627.

⁵¹ 42 U.S.C. § 7507 (2006).

⁵² See, e.g., Alice Kaswan, *A Cooperative Federalism Proposal for Climate Change Legislation: The Value of State Autonomy in a Federal System*, 85 DENV. U. L. REV. 791 (2008); Yvonne Gross, *Kyoto, Congress, or Bust: The Constitutional Invalidity of State CO₂ Cap-and-Trade Programs*, 28 T. JEFFERSON L. REV. 205 (2005); Glicksman & Levy, *supra* note 15, at 642-47.

⁵³ See, e.g., Craig, *supra* note 2, at 39 (arguing that "policymakers, courts, and regulators should acknowledge that mitigation law and adaptation law address separate, if ultimately related, regulatory problems and need different sets of tools to do so").

climate change.⁵⁴ Two aspects of climate change adaptation policy, however, suggest that preservation of a strong state and local role is even more important than it is in the mitigation context.

First, climate change adaptation policy will need to address a broader and more diffuse set of problems than the ones targeted by mitigation policy. As J.B. Ruhl has noted, mitigation policy is “all about the same goal — cutting down greenhouse gas concentrations in the atmosphere. Adaptation, by contrast, is about many different effects, varies across the nation, operating at many different and sometimes competing scales.”⁵⁵ As a result, while the federal government will have an important role in formulating the broad goals of adaptation policy, effective adaptation strategies are likely to be site-specific.⁵⁶ The problems will differ by location (drought may be the problem in one place, while another is prone to flooding) and, even when the problems are similar, what is effective in preparing for and accommodating to the effects of climate change in one place (such as preparing for flooding resulting from rising sea levels along the coast) may be ineffective or even counterproductive in another (where flooding may be due to increased snowmelt in the spring due to rising temperatures).⁵⁷ In short, effective adaptation policy may depend on knowledge of and the ability to respond to diverse local conditions. State and local policymakers may be able to make the necessary adjustments more effectively than the federal government can.

Second, climate change adaptation policy will involve areas in which law and policy have traditionally been set at the state and local level, and in which the federal government has been loath to intervene. Two obvious such areas are land use control and water allocation law. Land use controls such as zoning are likely to be important parts of climate change adaptation strategies. It may be necessary to restrict development in areas vulnerable to flooding or to preserve open space to provide connective corridors for migrating wildlife species unable to survive in existing habitat. Congress has almost always steered clear of establishing anything that remotely resembles a federal land use regulatory program (other than for lands and resources owned by the federal government)

⁵⁴ *Id.* at 45.

⁵⁵ Ruhl, *supra* note 13, at 423. *See also* .’); *id.* at 420 (“[C]limate change adaptation will be about policing the impacts of how hundreds of millions of people, millions of small businesses and farms, and hundreds of thousands of local communities respond to climate change in a multitude of decision contexts.”); CBO, *supra* note 1, at 36 (“Unlike mitigation policy, which could be implemented largely with a single instrument — for instance, a single emissions price, or an aggregate emissions cap — policies to promote adaptation are likely to be more diffuse, involving numerous policies in many different areas and involving different levels of government”).

⁵⁶ *See, e.g.*, Jonathan H. Adler, *Hothouse Flowers and the Virtues of Climate Federalism*, 17 *TEMPLE POL. & CIV. RIGHTS L. REV.* 441, 453 (2008) (“Because the unavoidable consequences of climate change will vary from state to state, and region to region, so too will the optimal mix of adaptation measures. Some jurisdictions may need to prepare for potential rises in sea level. Others may need to prepare for the possibility of drought. Still others may need to plan for both.”).

⁵⁷ *Cf. Craig, supra* note 2, at 29 (arguing that “adaptation law will have to cope with multiple layers of governmental interest, since many adaptation strategies will have to be intensely local in implementation, while adaptation principles and goals may need to operate on a larger state, watershed, regional, or national scale”). As Professor Ruhl has put it, “the case for localism in adaptation policy . . . is a matter of physical reality” as a result of “the variations in climate change impacts across the landscape.” Ruhl, *supra* note 13, at 423.

and has remained committed to protecting the sovereignty of state and local governments to control land use. This commitment, or the fear of the political backlash that the adoption of federal land use controls might cause, is a principal explanation, for example, of the Clean Water Act's failure to regulate nonpoint source pollution.⁵⁸ It also at least partially explains why Congress has chosen not to regulate the construction of or access to structures that are magnets for automobiles (called indirect sources) under the Clean Air Act, even in areas of the country in which automotive pollution has contributed to persistent failures to attain the health-based primary national ambient air quality standards.⁵⁹

Climate change also will affect the distribution of water resources, providing too much water in some places and not enough in others.⁶⁰ Adaptation policy can play a useful role in preventing waste in areas in which water is plentiful and assuring that water is diverted to areas in which shortages exist. Congress has been just as skittish about infringing on state authority to control water allocation as it has to jump into the land use regulation business. As Robert Adler has explained, "since at least the middle of the nineteenth century, state water law has reigned supreme as the primary authority governing the allocation and use of water resources, as proclaimed by Congress, the executive branch, and the courts."⁶¹ Congress went to great lengths in the Clean Water Act to steer clear of any such infringement.⁶² Somewhat less absolutely, the Endangered Species Act declares a federal policy "that Federal agencies shall cooperate with State and local agencies to resolve water resources issues in concert with conservation of

⁵⁸ See, e.g., Robert L. Glicksman & Matthew R. Batzell, *Science, Politics, Law, and the Arc of the Clean Water Act: The Role of Assumptions in the Adoption of a Pollution Control Landmark*, 32 WASH. U. J. L. & POL'Y 99, 116 (2010). See also 33 U.S.C. § 1251(b) (2006) (enunciating a policy of recognizing, preserving, and protecting "the primary responsibilities and rights" of states "to plan the development and use (including restoration, preservation, and enhancement of land)").

⁵⁹ See ROBERT L. GLICKSMAN, DAVID L. MARKELL, WILLIAM W. BUZBEE, DANIEL R. MANDELKER & A. DAN TARLOCK, ENVIRONMENTAL PROTECTION: LAW AND POLICY 506 (5th ed. 2007).

⁶⁰ See, e.g., Robert W. Adler, *Climate Change and the Hegemony of State Water Law*, 29 STAN. ENVTL. L.J. 1, 6 (2010) (noting that "most models suggest that global warming will change the distribution of fresh water resources around the country, with some areas considerably drier, others facing greater flood risks, and others facing seasonal changes in the amount and distribution of precipitation and runoff").

⁶¹ *Id.* at 4. But cf. Reed D. Benson, *Deflating the Deference Myth: National Interests vs. State Authority Under Federal Laws Affecting Water Use*, 2006 UTAH L. REV. 241, 312 (2006) (arguing "that federal deference to states in water resource matters may be a familiar refrain, but it is not a uniform, or even a consistent, requirement of federal law. Instead, federal statutes and Supreme Court cases have protected federal interests while acknowledging that states retain the primary role in choosing how to allocate water resources among various users.").

⁶² The Clean Water Act states:

It is the policy of Congress that the authority of each State to allocate quantities of water within its jurisdiction shall not be superseded, abrogated or otherwise impaired. It is the further policy of Congress that nothing [in the Act] shall be construed to supersede or abrogate rights to quantities of water which have been established by any State.

33 U.S.C. § 1251(f) (2006). See also *id.* § 1251(b) (declaring policy of protecting the primary responsibilities and rights of the states to plan the development and use of water resources); *id.* § 1370 (2) (stating that nothing in the Act shall "be construed as impairing or in any manner affecting any jurisdiction of the States with respect to the waters (including the boundary waters) of such states").

species.”⁶³ These precedents suggest that Congress will, if possible, tread lightly on state and local authority to decide on climate change adaptation measures that entail decisions about land use and water allocation.

C. Resolving the Tension Between Historic Tradition and Current Need

The fact that states and localities have traditionally had played a dominant role in controlling land use and water allocation does not mean they will or should continue to do so in addressing the risks posed by climate change. Changes are likely to occur.⁶⁴ These traditions do mean, however, that efforts to enhance the federal government’s authority to dictate land use and water application policy, or even to adopt minimal federal standards under a cooperative federalism-like regime, are likely to generate at least as much political opposition as the efforts to adopt mandatory controls on GHG emissions or to price carbon have done. A tension between leaving sacrosanct state and local prerogatives in areas such as land and water use and recognizing the need for a larger federal role is therefore apt to shape the institutional design of federal climate change adaptation policy, whenever the federal government is prepared to tackle climate change adaptation. In striking the appropriate balance, collective action analysis may provide environmental policymakers with important insights on when it is appropriate for the federal government to establish a presence even in areas in which it has thus far been reluctant to stake out a significant role and on related institutional design questions.

III. COLLECTIVE ACTION AND CLIMATE CHANGE ADAPTATION POLICY

Collective action theory examines the dynamics of individual behavior in group settings. Collective action theorists such as Mancur Olson recognized that the benefits of collective action are often a species of public good that members of the collective will enjoy even if they do not contribute to the creation of these goods. This dynamic creates an incentive for individual members of the collective to “free ride” on the efforts of others.⁶⁵ Under this theory, individual states have incentives to take actions that will deviate from the interests of the nation as a collective. These incentives become problematic if transaction and enforcement costs prevent an effective agreement among the states to act collectively so that all states contribute in equitable fashion to the public good and none act in a manner that is contrary to the interests of states as a collective.⁶⁶

⁶³ 16 U.S.C. § 1531(c)(2) (2006). *Cf.* Benson, *supra* note 61, at 316 (“In enacting the CWA and the ESA, Congress preserved this traditional state role, but established a strong policy of controlling water pollution and conserving biodiversity in all fifty states.”).

⁶⁴ See Daniel A. Farber, *Climate Change, Federalism, and the Constitution*, 50 ARIZ. L. REV. 879, 914 (2008) (“Traditionally, state and local governments have been the major regulators of land use and urban development. Responding to climate change may result in changes to this tradition. Given the national and international scope of climate change, the need for an integrated national strategy for controlling emissions and planning adaptation is strong.”); Adler, *supra* note 60, at 60 (arguing that longstanding federal deference to state water law and policy “may change — indeed, it may have to change — in the face of climate change”).

⁶⁵ Glicksman & Levy, *supra* note 15, at 579 n.1 (citing MANCUR OLSON, *THE LOGIC OF COLLECTIVE ACTION: PUBLIC GOODS AND THE THEORY OF GROUPS* (1965)).

⁶⁶ See Richard E. Levy & Robert L. Glicksman, *Access to Courts and Preemption of State Remedies in Collective Action Perspective*, 59 CASE W. RES. L. REV. __, __ (2010) (forthcoming).

Federalism is thus a structural response to collective action problems among states that arise when a state, for example, taxes collective entities excessively because it retains the benefit of the tax while spreading the economic burden to other states.⁶⁷ As I and my coauthor Richard Levy have explained elsewhere:

The exercise of federal authority is most justified in response to collective action problems that provide incentives for states to act in a manner that is inconsistent with the interest of the nation as a whole. Most federal regulatory legislation responds to one or more collective action problems, as reflected in the statutory purposes. In other words, federal action is necessary or justified when state regulation is unlikely to produce the optimal result, viewed from the perspective of the United States as a whole, because the incentives of individual states and the interests of the states as a collective run in different directions.⁶⁸

In this part of the article, I summarize the five types of collective action problems that have most frequently justified federal regulation of activities that create risks of harm to public health and natural resources.⁶⁹ In the second section of this part, I consider whether these collective action problems justify the establishment of a federal floor to counter state inaction or inadequate state action on climate change adaptation that derives from individual state incentives to benefit at the expense of the national interest. In the third section, I explore whether any of the problems identified in the first section justify a more intrusive (and exclusive) federal role in climate change adaptation in which federal policy displaces the capacity of states and localities to supplement or deviate from the federal program.

A. Collective Action Justifications for A Federal Role

Many of the traditional justifications for federal environmental regulation are based on collective analysis in that they posit a federal presence as an appropriate barrier to state actions that deviate from the collective national interest.⁷⁰ This section summarizes each of these arguments in favor of creating a federal presence in environmental regulation. Each is designed to allow federal action to thwart individual state environmental laws and policies that threaten to interfere with collective concerns.

1. Transboundary Negative Externalities

⁶⁷ Glicksman & Levy, *supra* note 15, at 593.

⁶⁸ Levy & Glicksman, *supra* note 66, at ____.

⁶⁹ The justifications for adopting laws that govern use and management of lands and resources owned by the federal government are at times different and will not be addressed here. *See generally* 1 GEORGE CAMERON COGGINS & ROBERT L. GLICKSMAN, PUBLIC NATURAL RESOURCES LAW §§ 1:3-1:6, 1:16, 1:22-1:23 (2d ed. 2007).

⁷⁰ This summary is largely taken from the discussion of the justifications for federal environmental regulation described in Glicksman & Levy, *supra* note 15, at 594-602. That discussion includes examples of explicit reliance by legislators on these justifications during the process of adopting many of the nation's landmark federal environmental laws.

One of the earliest and least contentious justifications for federal environmental regulation is the desire to prevent transboundary (interstate and international) externalities.⁷¹ State and local governments can allow industrial and developmental activities operating within their jurisdiction to externalize environmental harms, particularly air and water pollution. Upstream states, for example, have incentives to refrain from regulating pollution-causing activities that generate interstate environmental spillover costs.⁷² The result of a source state's failure to regulate such activities is to secure for state residents the economic and tax benefits of the activity creating the spillovers while exporting the environmental burdens to other states. The states affected by the activity that generates adverse spillover effects have strong incentives to regulate the offending activity but lack the legal authority to do so.⁷³ Thus, even if the economic benefits garnered by the source state are outweighed by the environmental costs suffered in downwind or downstream states, state regulation will not block the activity. Only the federal government has both the incentives and authority to regulate consistent with the interests of the states as a collective by restricting spillover effects to the point at which they are lower than the economic and social gains produced by the polluting activity.⁷⁴

2. Resource Pooling

⁷¹ Externalities are spillover costs imposed on persons other than those who produce them that are not taken into account by those who produce them. Regulation can force those who impose such costs to internalize them. See, e.g., SIDNEY A. SHAPIRO & JOSEPH P. TOMAIN, *REGULATORY LAW AND POLICY: CASES AND MATERIALS* 53–54 (3d ed. 2003).

⁷² According to one prominent analyst of interstate spillovers, “[t]he problem of interstate externalities arises because a state that sends pollution to another state obtains the labor and fiscal benefits of the economic activity that generates the pollution but does not suffer the full costs of the activity. Under these conditions, economic theory maintains that an undesirably large amount of pollution will cross state lines.” Richard L. Revesz, *Federalism and Interstate Environmental Externalities*, 144 U. PA. L. REV. 2341, 2343 (1996). See also William W. Buzbee, *The Regulatory Fragmentation Continuum: Westway and the Challenges of Regional Growth*, 21 J.L. & POL. 323, 344 (2005) (“Even where a social ill is widely recognized, the existence of multiple potential regulators will create predictable incentives for regulatory inattention. Especially where the causes of an ill cross jurisdictional borders, the harms themselves cross borders, and there is vertical or horizontal fragmentation of potential regulatory turfs, incentives for regulatory inattention are strong.”).

⁷³ See, e.g., *Edgar v. MITE Corp.*, 457 U.S. 624 (1982) (discussing contours of the constitutional prohibition on extraterritorial legislation); *National Solid Wastes Mgmt. Ass'n v. Meyer*, 165 F.3d 1151 (7th Cir. 1999) (striking down as an improper “clog on interstate commerce,” and as improper extraterritorial legislation, a Wisconsin statute allowing out-of-state waste to be disposed of in Wisconsin only if the community where the waste originates adopts an ordinance incorporating the mandatory components of Wisconsin's recycling program).

⁷⁴ See David E. Adelman & Kirsten H. Engel, *The Case Against Reallocating Environmental Regulatory Authority*, 92 MINN. L. REV. 1796, 1804 (2008) (citing Richard B. Stewart, *Pyramids of Sacrifice? Problems of Federalism in Mandating State Implementation of National Environmental Policy*, 86 YALE L.J. 1196, 1210 (1977)) (“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).”). Distributional considerations may justify regulating to a point different from the economically efficient level of regulation at which the economic benefits to the collective equal the environmental costs to the collective. Collective action analysis, however, focuses on the cost calculus.

A second justification for federal environmental regulation is the achievement of economies of scale or synergistic effects through *resource pooling*. The advantages of resource pooling qualify as a “public good,” which in collective action terms creates an incentive for each state to free ride on the efforts of others. The federal government often has superior resources because it can pool the resources of the states. In the environmental context, resource pooling has the capacity to generate efficiencies in the collection and distribution of scientific and technical information.⁷⁵ The federal government’s superior resource base thus may support vesting federal agencies with responsibilities to gather and disseminate information needed to make regulatory decisions, although resource pooling justifies creation of a federal role in generating information and disseminating it to the states, more than it does allocating to the federal government the authority to regulate risk-creating activities. The resource pooling rationale also may be relevant to regulatory enforcement, however. Much as cartelization and collective bargaining tend to enhance the clout of the companies or unions whose efforts are pooled, the superior resources often available to federal regulators may make put them in a better position to induce desirable behavior by regulated entities than state or local authorities can.⁷⁶

3. *The Race to the Bottom*

A third rationale for federal environmental regulation is the so-called “race to the bottom.” This justification proceeds on the premise that competition for business and industry will drive states to relax their environmental standards to gain the economic benefits and tax revenues brought to them if businesses or industries decide to locate within their borders. This dynamic proceeds even if the states as a collective would be better off if the states did not seek to undercut each other due to each state’s fear that if it decides to regulate, it will lose out to states who prioritize the economic benefits of economic activity more than its environmental costs. Scholars have debated whether the empirical evidence supports the race to the bottom theory, but Congress has relied on the theory as a rationale for federal action whatever the reality is.⁷⁷ In one case, for example, the Supreme Court described the Surface Mining Control and Reclamation Act as a response “to a congressional finding that nationwide ‘surface mining and reclamation standards are essential in order to insure that competition in interstate commerce among sellers of coal produced in different States will not be used to undermine the ability of the several States to improve and maintain adequate standards on coal mining operations

⁷⁵ Glicksman & Levy, *supra* note 15, at 596. The benefits of resource pooling in this context have been summarized as follows:

Where effective regulation will require substantial investigation of technological capabilities, or links between pollutants and health impacts, or comprehensive assessment of diverse jurisdictions’ pollution control efforts, economies of scale will favor a federal role. Otherwise, no individual state will have incentives to gather these sorts of valuable information, and all states will be tempted to free ride on any state that makes such an investment. Federal leadership also reduces the risk of duplicative regulatory investigation. For this reason, federal gathering and creation of information about pollution impacts and pollution control has long been part of federal environmental laws.

GLICKSMAN ET AL., *supra* note 59, at 86.

⁷⁶ See Glicksman & Levy, *supra* note 15, at 596-97.

⁷⁷ For a sampling of the literature on both sides of the argument, see *id.* at 597-98.

within their borders.”⁷⁸ Thus, federal regulation can halt the race to the bottom by subjecting activities that generate environmental harms to a minimal level of regulation that no state can undercut.

4. *Uniform Standards*

The need for uniform standards provides yet another important justification for federal environmental regulation. Uniform standards reduce transaction costs for regulated entities such as product manufacturers and distributors, especially for commodities sold in interstate commerce.⁷⁹ In theory, states acting independently may be able to develop uniform standards by harmonizing their laws, but in practice it is difficult and unusual for them to fully achieve uniformity in the regulation of products that produce environmental spillover costs. In authorizing federal regulation of the adverse environmental consequences of the manufacture and use of products such as automobiles, Congress has viewed uniform federal regulation as a way to relieve product manufacturers of the need to keep abreast of and comply with a welter of potentially contradictory regulatory restrictions resulting from regulation by individual states.⁸⁰

5. *The NIMBY Syndrome*

The not-in-my-backyard, or NIMBY, phenomenon arises when there is widespread consensus about the social need for an activity with which undesirable consequences are associated, but no one wants the activity to be located near them. All hope instead that the activity will be located elsewhere so that they can take advantage of the economic or social benefits that the activity produces without having to bear any of the negative consequences. In the environmental context, individual states may adopt regulations that make it unattractive or impossible for an activity such as a nuclear waste disposal site to receive necessary permits or similar authorizations to proceed within their borders in an attempt to drive the activity into other states. The NIMBY phenomenon represents the flip side of the transboundary negative externality problem. The source of a NIMBY problem is a positive externality in that the state in which the activity locates bears all or most of the environmental burdens, but the economic benefits are spread to other states.⁸¹ Federal regulation has the capacity to combat NIMBYism by precluding

⁷⁸ *Hodel v. Virginia Surface Mining and Reclamation Ass'n*, 452 U.S. 264, 281-82 (1981) (quoting 30 U.S.C. § 1201(g)).

⁷⁹ See Adelman & Engel, *supra* note 38, at 1839 (explaining that the uniformity rationale for federal regulation is based on the principle that “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”). “Even where standards can be met by meeting the most stringent standard, this might put a company in a position whereby it would face the prospect of modifying its product to meet the most stringent standards or deciding not to market its product at all in the state with the most stringent standards.” Robert B. McKinstry, Jr. & Thomas D. Peterson, *The Business of Climate Change: Challenges and Opportunities for Multinational Business Enterprises: The Implications of the New “Old” Federalism in Climate-Change Legislation: How to Function in a Global Marketplace When States Take the Lead*, 20 PAC. MCGEORGE GLOBAL BUS. & DEV. L.J. 61, 89-90 (2007).

⁸⁰ See Glicksman & Levy, *supra* note 15, at 599-600.

⁸¹ See *id.* at 600-02.

all states from adopting laws that create unwarranted obstacles to the undesirable activity, thereby putting all states on equal footing and at equal risk.

6. *The Threat of Under and Overregulation by the States*

The five justifications discussed above provide a rationale for using federal regulation to forestall state environmental regulation that harms the national interest in circumstances in which the incentives of individual states prompt them to take actions that would harm the interests of the states as a collective. Sometimes, a state will have incentives not to regulate (e.g., when in-state industries create negative spillover costs outside the state, when a state seeks to free ride on the information gathering efforts of other states, or when a state refrains from regulating in an effort not to lose industry as a result of a race to the bottom).⁸² In such cases, federal regulation can establish a regulatory floor that counters the state's inclination not to regulate or to regulate weakly. At other times, collective action analysis predicts more state regulation than is consistent with the national good (e.g., when a state seeks to keep environmentally undesirable activities from locating inside the state or when a state regulates products that generate environmental harms inside the state but that are manufactured elsewhere, in effect externalizing the negative economic impact of regulation). The federal government can respond to such efforts by displacing the offending state law.

Collective action analysis thus has the potential to assist policymakers in identifying when state efforts to adapt to climate change are likely to be too weak or too strong. This information can support appropriate federal responses that realign individual state actions so that they correspond to the interests of states as a collective. The next section address when federal action may be necessary to establish a federal floor so that all states take on their fair share of preparing for and responding to the challenges of climate change. The third section in this part addresses the opposite problem, when federal action may be needed to preclude overreaction by the states that may mitigate the adverse effects of climate change in one jurisdiction but result in even greater such effects elsewhere.

B. Collective Action and Minimal State and Local Participation

Collective considerations suggest that the federal government should establish a “floor” to prevent state failure to take steps to adapt to climate change or inadequate state responses from harming those located outside the state. Federal policy to supply a floor that addresses these kinds of problems of inadequate state adaptation measures could be structured in the ways suggested by two of the three models discussed in Part II A above (e.g., through information sharing, the use of conditional federal funding, or some kind of cooperative federalism approach). Displacement of state and local law generally would

⁸² The same dynamic operates at the international level. Cf. Scott Barrett & Michael Toman, *Contrasting Future Paths for an Evolving Global Climate Regime*, The World Bank, Policy Research Working paper 5164, at 3 (Jan. 2010) (“Even when benefits for each country from global abatement are high, the incentive for each country to contribute significantly to global abatement may be weak since each country gets back just a fraction of the total benefit of its own abatement.”).

be inappropriate if the problem is inadequate state activity rather than overly zealous state responses to climate change.

1. *Federal Provision of Information, Financial Aid, and Planning Assistance*

The resource pooling justification for a federal presence in environmental matters suggests an appropriate federal role in gathering and distributing information needed to make informed climate change adaptation policy choices. Even though adaptive responses will often be driven by location-specific considerations, the federal government, given its superior resource base compared to those of the states and localities, can provide perform a critical function by developing a shared information infrastructure.⁸³ The gathering and distribution of information on the likely effects of climate change and the alternative ways of responding to them would preclude the need for every state to reinvent the adaptation wheel.⁸⁴ Resource pooling does not strongly support forcing states to engage in a minimum level of information gathering, even though states will have incentives to free ride on the efforts of other jurisdictions,⁸⁵ because the lack of state capacity to perform this function is the very reason for federal intervention. Climate change legislation proposed during the 111th Congress invariably included provisions that would have created new federal information gathering entities and programs.⁸⁶ Similarly, the federal government should play a role in financing adaptive responses by lower levels of government.⁸⁷ By taking on at least part of the financial burden of activities such as disaster relief planning and response, the federal

⁸³ See Camacho, *supra* note 2, at 66 (“By providing regulators access to information on the achievements and limitations of past management strategies, Congress would help reduce uncertainty by allowing regulators considering adaptations to draw from other management experiences.”). Cf. Stine Aakre & Dirk T.G. Rübbecke, *Adaptation to Climate Change in the European Union: Efficiency vs. Equity Considerations*, CEPS Working Document No. 301/September 2008, at 17, available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1275262&download=yes (arguing that “in order to get an efficient allocation in the case of national/domestic public adaptation goods, national government intervention in adaptation efforts may be justified, especially when taking into account that national governments may have information advantages on local/regional adaptation compared with decision-makers at the EU-level.”).

⁸⁴ Federal entities in other countries have recognized this point. See, e.g., GERMAN ADAPTATION, *supra* note 22, at 54 (“There is no point in constantly reinventing the wheel. The [German] Federal Government is therefore making available a toolbox that enables actors to find out what climate change has in store for them in their field and what means they have of dealing with it.”). But cf. *id.* at 29 (describing role of Germany’s federal government in providing general information about flooding risks and precautions, but stating that “it is the cities and municipalities which identify where specific risks exist”).

⁸⁵ See Camacho, *supra* note 2, at 28 (arguing that “[r]egulators who act early are likely to receive diluted credit as other regulators free ride on their efforts while status quo biases and risk aversion create additional incentives for regulatory inaction. Regulators thus have little incentive to devote resources to gather information on — or regulate the risks of—global climate change.”).

⁸⁶ See, e.g., American Clean Energy and Security Act of 2009, H.R. 2454, 111th Cong. §§ 451(b), 452 (2009); Clean Energy Jobs and American Power Act, S. 1733, 111th Cong. §§ 367, 371 (2009).

⁸⁷ See, e.g., Farber, *Mapping*, *supra* note 23, at 17 (“The federal government might simply take adaptation as its own responsibility and pay for projects directly from the Treasury. Alternatively, state and local governments might receive federal grants to engage in adaptation, or private sector actors might receive tax credits or other subsidies.”).

government can assist in risk spreading.⁸⁸ Proposed federal climate change legislation has consistently created new grant and other financial assistance programs.⁸⁹

The federal government also is best situated to assist states and localities in coordinating their policy responses so that they do not work at cross purposes and in mediating disputes among jurisdictions.⁹⁰ The Intergovernmental Panel on Climate Change has emphasized the need for cross-jurisdictional coordination both within and among nations.⁹¹ The federal government's failure to play that role effectively has plagued governmental efforts to respond to previous disasters, such as Hurricane Katrina.⁹²

2. *Federally Required Adaptive Measures*

Because the uniformity and NIMBY rationales for a federal environmental regulatory presence premise federal intervention on the need to prevent excessive state or local regulation from impairing the collective national interest, these two kinds of collective action problems are unlikely to justify a federal regulatory floor for adaptation. Floors are designed to combat free riding and state inaction, not excessive state regulation. Transboundary negative externalities and the race to the bottom, on the other hand, can be expected to produce inadequate state and local regulation, and therefore

⁸⁸ Professor Farber has made this point. *See id.* at 15 (“The underlying principle could be called ‘taxpayer pays,’ and rests on the premise that society as a whole should protect individuals from certain kinds of harm. This system achieves that maximum amount of loss spreading. It expresses the idea that climate change is a national problem, thus emphasizing national solidarity in the face of the threat.”). Farber also argues, however, that federal financing may be inappropriate in some contexts. Federal subsidization of flood insurance, for example, may provide incentives for states and localities to overinvest in projects that create climate-related risks, such as building in flood zones, because the federal government will be paying to cover those risks. *Id.* at 14-15. He suggests that federal funding be limited to situations involving spillovers, obstacles to state provision of adaptation measures, or a strong claim for “national solidarity.” *Id.* at 18.

⁸⁹ *See, e.g.*, Clean Energy Jobs and American Power Act, S. 1733, 111th Cong. § 381 (2009) (proposing program to provide funds to states for water system adaptation projects); *id.* § 382 (proposing to require EPA to establish a program to provide funds to states for flood control projects).

⁹⁰ *See* Craig, *supra* note 2, at 53-54 (arguing that “to reduce redundancies, increase efficiency, and avoid conflicting adaptation measures, planning must be coordinated, and where possible integrated, within and among those various levels”). *See also* Camacho, *supra* note 2, at 65 (“The funding and development by Congress of a large-scale procedural adaptation that fosters information sharing is crucial for reducing the negative effects of regulatory fragmentation and managing the uncertainty from climate change.”).

⁹¹ *See* Craig, *supra* note 2, at 60 (quoting INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, ADAPTATION REPORT: SUMMARY FOR POLICYMAKERS 20 (2007) (“According to the IPCC, responses to climate change should include ‘actions at all levels from the individual citizen through to national governments and international organizations.’ Such multilevel efforts, however, will be most effective if they are coordinated or, at the very least, not working at cross-purposes.”).

⁹² *See* Leonard, *supra* note 34, at 555 (arguing that the lack of integrated communication among land use planners that characterizes the U.S. system “was exemplified by the confusion and inadequate response that characterized response efforts to the devastating effects of Hurricane Katrina,” and that a “top down, well organized planning regime” is needed to address such problems). *See generally* Center for Progressive Reform, *An Unnatural Disaster: The Aftermath of Hurricane Katrina* (September 2005), http://progressivereform.org/articles/Unnatural_Disaster_512.pdf (describing the governmental failures that hindered an effective response to the hurricane).

should justify the adoption of federal floors for adaptive measures that apply in all jurisdictions. Federal policymakers can adjust the degree to which these floors infringe on state and local prerogatives by choosing one or another of the models for federal action discussed above (e.g., through conditional funding or other forms of traditional cooperative federalism in environmental law).

Enactment of a federal floor is an appropriate way to prevent states from failing to take adaptive measures that could have avoided transboundary effects, particularly if the state could have mitigated those effects more efficiently than other jurisdictions. Many aspects of climate will generate harms that cross jurisdictional borders. Four examples will suffice to make the point. The first two examples concern water supplies, both too little and too much. Suppose, for example, that a group of states in the Southwest that share a common water source (such as the Colorado River) is plagued by drought as warming temperatures and associated climatic shifts reduce the amount or temporal distribution of precipitation received by the area.⁹³ If one of the affected states refuses to enact water conservation measures, downriver states may experience sharply reduced supplies.⁹⁴ At the opposite end of the water availability spectrum, a state that refuses to take flood control measures may put neighboring states at risk. Wetlands, for example, can serve as buffers against storms and the flooding they produce.⁹⁵ If a coastal state fails to prevent destruction of wetlands through development, a storm that could have been mitigated by preservation of coastal wetlands could hit a neighboring state harder than it otherwise would have, creating an increased risk of flooding.

Three more examples concern pest proliferation, infrastructure damage, and air pollution. Climate change is allowing pests to survive in areas that were inhospitable to them when temperatures were cooler.⁹⁶ A state that fails to treat proliferating pests may

⁹³ “Because conflicts over water are already acute in the western United States, the potential impacts of climate change on water resources in that region are of significant concern. . . . In general, scientists expect that [the effects of climate change] are likely to decrease stream flows and reservoir storage.” Adler, *supra* note 60, at 13. For a discussion of drought and climate change, see Robin Kundis Craig, *Adapting Water Law to Public Necessity: Reframing Climate Change Adaptation as Emergency Response and Preparedness*, 34 VT. J. ENVTL. L. 781, 789=91 (2010); Farber, *Mapping*, *supra* note 16, at 4-5.

⁹⁴ See Adler, *supra* note 60, at 40 (“Especially in times of increased scarcity, leaving decisions about interstate transfers entirely to state law could result in decisions that benefit individual states at the expense of the national interest. Some states might engage in hoarding and protectionism by seeking to prevent interstate transfers even if the result was environmental or economic calamity in other regions. Other states might seek short-term profit from their saleable water resources at the expense of nationally-significant aquatic environments.”). See also Farber, *Mapping*, *supra* note 16, at 10 (claiming that failure to conserve water in one state may decrease supplies or impair water use downstream).

⁹⁵ See Elizabeth Burleson, *Climate Change Consensus: Emerging International Law*, 34 WM. & MARY ENVTL. L. & POL’Y REV. 543, 578 (2010) (“Wetlands, coral reefs and mangrove forests provide natural storm buffers.”).

⁹⁶ See Matthew Zinn, *Adapting to Climate Change: Environmental Law in a Warmer World*, 34 ECOLOGY L.Q. 61, 74 (2007) (“Vector-borne diseases such as malaria that currently do not occur or are uncommon in the United States are expected to expand into previously inhospitable areas. In some cases, the disease vector, such as the anopheles mosquito, is already present in the United States, but the parasite does not develop under current climatic conditions. Increasing temperatures may expand the range of vectors and allow parasites to thrive in new locations.”).

increase the risk of destruction of natural resources⁹⁷ or of the spread of disease vectors in nearby states to which the pests spread as a result.⁹⁸ Climate change is likely to damage critical infrastructure such as bridges, highways, sewer systems, and utility transmission lines.⁹⁹ One state's failure to strengthen infrastructure to protect against the risk of climate change-related damage or repair infrastructure such as highways or electricity transmission lines may adversely affect other states who depend on continuing access to the affected transportation networks or electric power.¹⁰⁰ In all of these cases, federal action may be needed to mitigate the risks of widespread harm flowing from one state's inactivity. Finally, scientists have determined that increasing temperatures linked to GHG emissions will exacerbate ozone pollution.¹⁰¹ One state's failure to abate emissions of pollutants that are ozone precursors could create health risks in downwind states as a result of the long-range transport of ozone pollution.¹⁰²

The race to the bottom theory also may justify the creation of minimal federal requirements concerning adaptation. Several examples help make the point. Local governments may seek to attract new real estate development by allowing building in flood plains or other at risk areas, especially if the federal government is providing insurance for these activities, or by adopting weak building standards that are not adequate to protect against damage from severe storms or flooding linked to climate

⁹⁷ Warming temperatures have paved the way for an infestation of western forests by mountain pine beetles. *See, e.g.*, Craig, *supra* note 2, at 13 (noting that the mountain pine beetle “invades pines, particularly lodgepole pines, and kills them. The beetle's territory is normally limited by cold winters, but since the 1970s, warming temperatures have expanded the beetle’s potential range by more than seventy-five percent. Mountain pine beetles have been taking advantage of this new habitat in British Columbia, Canada, and the northern Rockies in the United States (especially Colorado and Wyoming), and the expansion of the species can only be explained by changes in climate.”); *id.* at 54 (characterizing the pine beetle infestation as creating “an impact of national importance”).

⁹⁸ *See, e.g.*, Linda Munson et al., *Climate Extremes Promote Fatal Co-Infections During Canine Distemper Epidemics in African Lions*, PLOS ONE (June 25, 2008) (arguing that “[t]emporal and spatial convergence of several infectious agents under environmental conditions that favor their transmission and propagation could create a ‘perfect storm’ of pathogens, resulting in significantly greater mortality,” in that case of lions).

⁹⁹ *See* Elizabeth C. Black, *Climate Change Adaptation: Local Solutions for a Global Problem*, 22 GEO. INT’L ENVTL. L. REV. 359, 365 (2010) (noting that among the less widely recognized effects of climate change are “the predicted increased frequency of severe weather events, from hurricanes to heat waves, [which threaten] to damage electricity infrastructure, such as power plants and transmission lines”).

¹⁰⁰ *See* Farber, *Mapping*, *supra* note 16, at 10 (stating that “infrastructure that is exposed to climate impacts such as highways, railroads, power lines, and pipelines, may suffer service interruptions that impact businesses and individuals well outside a state’s borders”).

¹⁰¹ *See* Mark Z. Jacobson, *On the Causal Link Between Carbon Dioxide and Air Pollution Mortality*, 35 GEOPHYSICAL RES. LETTERS L03809 (2008) (finding that increased water vapor and temperatures from higher CO₂ concentrations may exacerbate ozone pollution and increase U.S. annual air pollution deaths and cancers).

¹⁰² *See* EPA, Final Rule To Implement the 8-Hour Ozone National Ambient Air Quality Standard — Phase 1, 69 Fed. Reg. 23,951–23,958 (Apr. 30, 2004) (discussing “the long-range transport of ozone and the importance of employing regional controls in addition to local controls”). The provisions of the Clean Air Act that requires states to achieve the national ambient air quality standards for ozone already address this problem, though not effectively enough to abate all interstate ozone pollution. *See* *North Carolina v. EPA*, 531 F.3d 896 (D.C. Cir. 2008), *modified on reh’g*, 550 F.3d 1176 (D.C. Cir. 2009) (striking down EPA’s Clean Air Act Interstate Rule).

change.¹⁰³ Some states and localities may refuse to restrict potentially lucrative land development in areas needed for the creation of wildlife migration corridors.¹⁰⁴ States may refuse to impose restrictions on water use by agriculture and other high-consumption industries for fear of driving these industries away. Similarly, they may be reluctant to require measures (such as best management practices) needed to reduce the risk of runoff that may impair water quality, even if anticipated increases in precipitation threaten erosion or other forms of nonpoint source pollution.¹⁰⁵ In these and other instances, a federal regulatory floor can prevent state or local inaction from failing to abate adverse consequences of climate change that damage the national interest.

C. Collective Action and Preemption of State and Local Action

The flip side of the collective action coin involves deciding whether the federal government should limit the power of state or local governments to engage in adaptive responses to climate change through partial or complete preemption. Preemption doctrine allocates decisional responsibility when federal and state governments exercise concurrent authority. The key question is whether collective action problems create incentives for individual states to act in ways that conflict with the interests of the states as a collective. The distorting effects of collective action problems can lead states to undervalue either the environmental costs that regulation is designed to prevent or the economic burdens that regulation can create. Generally, collective action analysis favors preemption when the underlying rationale for federal intervention is a concern about overregulation by the states. For current purposes, overregulation would take the form of “excessive” or counterproductive adaptation responses.

1. *Non-Problematic State and Local Adaptation Measures*

Some state and local efforts to reduce the adverse consequences of climate change should not be problematic from a collective action perspective. Any benefits for the adopting jurisdiction derived from state or local efforts to promote (or require) water conservation in response to water shortages linked to climate change, for example, would not appear to conflict with collective interests.¹⁰⁶ Likewise, local land use controls aimed at moving development away from flood-prone areas or areas located adjacent to forests at high fire risk of wildfire activity, the adoption of stronger building codes to allow structures to withstand floods or to require greater energy efficiency to reduce demands

¹⁰³ Weak land use controls may attract real estate development. See Farber, *Mapping*, *supra* note 16, at 12.

¹⁰⁴ See Craig, *supra* note 2, at 56 (arguing that local land use planning “operates at the wrong scale to deal with mass migrations”).

¹⁰⁵ The disincentive to regulate may be particularly strong if the activities threatening to degrade water quality are located near a jurisdictional border, so that downstream jurisdictions will suffer most of the adverse effects.

¹⁰⁶ See Adler, *supra* note 60, at 34 (noting that some regions have already adopted strategies to limit growth in light of water resource limitations). Restrictions on water use are not necessarily completely benign, however. See, e.g., David Zahniser & Jessica Garrison, *Lawn-Watering Rules Contributed to L.A. Main Breaks, Experts Find*, L.A. TIMES, Apr. 14, 2010 (describing study finding that high-volume water main breaks in Los Angeles were caused in part by the city’s restrictions on lawn watering, which caused fluctuations in water pressure that led to bursting of pipes).

for electricity and protect against heat-related illnesses, and the adoption of storm water design standards to allow urban areas to accommodate higher water flows would not appear to create collective action problems such as transboundary externalities, a welter of conflicting standards applicable to product manufacturers, or NIMBYism. Indeed, some adaptation measures are likely to create environmental benefits that extend beyond the adopting jurisdiction. One example might be the adoption of land use controls that preserve open spaces in flood prone areas by reducing the amount of impervious surface area and thus decreasing the volume and contamination of surface runoff that flows into interstate surface water bodies.¹⁰⁷

Further, several of the collective action justifications for creating a federal presence in climate change adaptation policy generally would not support making that presence exclusive. Because preemption targets excessive state or local regulation motivated by concerns that diverge from the collective interest, neither the race to the bottom nor resource pooling problems tend to support preemption of state and local authority to take steps to adapt to climate change. The race to the bottom tends to make states unwilling to take regulatory action that may drive up the costs of doing business compared to the costs in states that take no action or weaker action. The problem created by the race to the bottom is inaction. That problem does not exist if a state or locality decides to take adaptive measures despite the presence of adverse economic impacts within the jurisdiction. As a result, collective action principles provide no justification for displacing state or local authority to pursue those measures.

Resource pooling also would not generally support preemption because resource pooling by the federal government is a response to the tendency of states to free ride on the efforts of other jurisdictions. If a state or locality gathers information to allow it to take adaptive measures, it acts counter to the collective action incentive to free ride. Preemption would appear to be appropriate only if state or local action would weaken the national government's ability to threaten other nations that the United States will not contribute to adaptation efforts without their participation, an argument that relates to the ability of resource pooling to enhance bargaining leverage.¹⁰⁸ The courts have rejected the argument that Congress intended to preempt state limits on GHG emissions from automobiles to afford the federal government a stronger bargaining chip in dealing with foreign nations.¹⁰⁹ As a policy matter, the argument in favor of preemption is even weaker in connection with adaptation than it is for mitigation. Reductions in GHG emissions in one jurisdiction will benefit other jurisdictions to the same extent that they benefit the enacting jurisdiction because global concentrations of GHGs are uniform. Because reductions in GHG emissions in the United States will benefit other nations vulnerable to climate change, those other nations may have respond to threats by the United States not to enact GHG emission controls absent reciprocal action so that other

¹⁰⁷ See CARTER & CULP, *supra* note 21, at 24.

¹⁰⁸ See *supra* note __ and accompanying text.

¹⁰⁹ See *Cent. Valley Chrysler-Jeep, Inc. v. Goldstene*, 529 F. Supp. 2d 1151, 1182-88 (E.D. Cal. 2007), *reconsideration denied*, 563 F. Supp.2d 1158 (E.D. Cal. 2008); *Green Mountain Chrysler Plymouth Dodge Jeep v. Crombie*, 508 F. Supp. 2d 295, 392-97 (D. Vt. 2007). For discussion of these cases, see Glicksman & Levy, *supra* note 15, at 617-24.

nations will benefit from the reduced risks of climate change stemming from U.S. reductions. Adaptation responses, at least in certain contexts, will have more localized effects. A threat by State A not to take steps to protect against flooding will likely not register with non-adjacent State B, which either is not threatened by flooding or faces threats whose magnitude will not be affected by State A's action or inaction.

2. *Preemption and Potentially Problematic State and Local Adaptation Measures*

The uniformity and NIMBY rationales for the creation of a federal environmental policymaking structure would appear to be more relevant to the need to preempt state and local adaptation measures because these collective action problems involve excessive regulation by individual members of the collective. The uniformity rationale for federal preemption applies when the application of multiple standards creates excessive transaction costs for regulated entities.¹¹⁰ That rationale has typically been used to justify preemption of state and local regulation of nationally marketed products that create adverse environmental effects, such as cars¹¹¹ and pesticides.¹¹² It is not immediately apparent that climate change adaptation measures will involve mass marketing of products subject to potentially conflicting standards or otherwise create the same kinds of threats of excessive transaction costs that occur in the mitigation context.¹¹³ Building codes, for example, need not be uniform because construction design tends to be site-specific.¹¹⁴ There may be a need for a uniform set of rules governing inter-jurisdictional water transfers, however, to prevent individual states from adopting laws that prohibit or restrict water transfers as a means of hoarding scarce water supplies.¹¹⁵ In addition, the desire for uniformity may support displacement if state activities threaten to disrupt the

¹¹⁰ The argument often used to support preemption of state and local regulation of product content is that multiple standards create a confusing and unwieldy “patchwork” of regulations. See Richard J. Lazarus, *Super Wicked Problems and Climate Change: Restraining the Present to Liberate the Future*, 94 CORNELL L. REV. 1153, 1229 n. 320 (2009) (quoting Eric Lipton & Gardiner Harris, *In Turnaround, Industries Seek U.S. Regulations: A Broad Tactical Shift; Trying to Fend Off Suits, Foreign Competitors and State Efforts*, N.Y. TIMES, Sept. 16, 2007, at A1 (“While businesses often oppose requirements by saying they are unnecessary as it is already in their interest to produce safe products, at other times they have asked for them to avoid a patchwork of state regulations, to ensure that competitors must meet the same standard or to provide legal protection.”)).

¹¹¹ See 42 U.S.C. § 7543(a) (2006).

¹¹² See 7 U.S.C. § 136v(b) (2006).

¹¹³ Professor Adler has pointed out the obstacles to the adoption of national water efficiency standards for industries such as agriculture. Adler, *supra* note 60, at 36. He has raised the possibility of the use of a cooperative federalism structure to promote efficient water use, in which Congress sets an efficiency goal and delegates to the states the authority to develop efficiency standards suitable for their own climates, uses, and conditions. *Id.* at 37-38.

¹¹⁴ See Glicksman & Levy, *supra* note 15, at 635 & n.265 (citing Thomas Magnusson, Fredrik Tell & Jim Watson, *From CoPS to Mass Production? Capabilities and Innovation in Power Generation Equipment Manufacturing*, 14 INDUSTRIAL & CORP. CHANGE 1, 1 (2005)); GERMAN ADAPTATION, *supra* note 22, at 26.

¹¹⁵ See Adler, *supra* note 60, at 40. That kind of hoarding may run afoul of the dormant Commerce Clause in any event. See *Sporhase v. Nebraska*, 458 U.S. 941 (1982) (striking down state effort to restrict exports of groundwater).

coordinating role undertaken by the federal government in preparing for and responding to climate change.¹¹⁶

The NIMBY problem arises when states or localities adopt stringent environmental protection measures whose aim is force socially important activities that create environmental risks to locate elsewhere, because residents of the adopting jurisdiction can enjoy the economic benefits of the activity without sharing in the environmental risks. Federal preemption is a way to preclude that kind of “overregulation.” Although the extent to which this rationale for preemption applies in the context of climate change adaptation is also not clear, the NIMBY problem may have some relevance to adaptation. Climate change is likely to produce environmental refugees as it makes certain areas of the world uninhabitable or inhospitable.¹¹⁷ Individual states may seek to avoid an influx of immigrants who may put a strain on social services and infrastructure by adopting laws that restrict entry by or employment opportunities for immigrants. The adoption in 2010 of Arizona’s controversial law making the failure to carry immigration documents a criminal offense¹¹⁸ illustrates the potential for states to take measures to keep out unwanted refugees.¹¹⁹ Congress may decide that it is desirable to preempt such tactics to prevent one state from foisting the burdens resulting from an influx of climate refugees on other states.¹²⁰

The final collective action justification for federal action is the prevention of transboundary externalities. Typically, this problem involves inadequate regulatory action in one jurisdiction that fosters adverse effects in another. As discussed above, this collective action problem justifies the establishment of a federal floor for climate change adaptation. It also may justify, however, the creation of a federal ceiling or the adoption of preemptive measures designed to prevent excessive state adaptation that would be inconsistent with the national interest. Suppose, for example, that a state decides to construct dams or reservoirs to abate water shortages linked to climate change. Those facilities could diminish supplies downstream, alter aquatic ecosystems in ways that

¹¹⁶ See *supra* notes 90-92 and accompanying text.

¹¹⁷ See, e.g., Shuaizhang Feng et al., *Linkages Among Climate Change, Crop Yields and Mexico-US Cross-Border Migration*, doi: 10.1073/pnas.1002632107 (2010), <http://www.pnas.org/content/early/2010/07/16/1002632107> (describing impact of climate change on emigration to the United States from Mexico due to reductions in crop yields caused by rising temperatures).

¹¹⁸ Support Our Law Enforcement and Safe Neighborhoods Act, 2010 Ariz. Session laws, ch. 113.

¹¹⁹ A federal district court enjoined portions of the law from going into effect on the ground that they are likely preempted by federal law. *United States v. Arizona*, ___ F. Supp. 2d ___, 2010 WL 2926157 (D. Ariz. July 28, 2010). For further discussion of the Arizona legislation, see Randal C. Archibold, *Arizona Enacts Stringent Law on Immigration*, N.Y. TIMES, Apr. 24, 2010; Linda Greenhouse, *Breathing While Undocumented*, N.Y. TIMES, Apr. 27, 2010. See also Patrick S. Cunningham, Comment, *The Legal Arizona Workers’ Act: A Threat to Federal Supremacy Over Immigration?*, 42 ARIZ. ST. L.J. 411 (2010) (considering whether earlier Arizona legislation that restricts employment of undocumented workers and other state employment laws that interact with federal immigration policy are preempted by federal law).

¹²⁰ See Ruhl, *supra* note 13, at 55 (arguing that “[s]ome aspects of aspects of adaptation policy are inherently national in scope, such as immigration policy”). Professor Ruhl lists several other such areas, including food supply safety, conservation of marine resources, and pandemic disease control. Of these, pandemic disease control appears most likely to involve the NIMBY problem if, for example, a state or locality adopts quarantine laws or laws restricting movement of ill individuals.

create adverse effects outside the jurisdiction, or block access to fish spawning grounds in upstream states.¹²¹ Similarly, the construction of canals to block salt water intrusion resulting from rising sea levels has the potential to produce wildlife habitat fragmentation and loss with adverse effects in other jurisdictions.¹²² A state or locality that decides to attack aggressively pests that proliferate as temperatures climb through the application of chemical pesticides may create water quality problems outside the jurisdiction if the chemicals find their way into surface water boundaries that cross political boundaries.¹²³ In such cases, action, not inaction, by the state or locality would be responsible for externalizing some of the adverse effects of climate change. The appropriate federal response may be to preclude state or local measures that impair access to water or harm aquatic environments elsewhere.

Preemption will not necessarily be the appropriate response every time state or local adaptation measures create interjurisdictional externalities. Each state has a responsibility to protect its citizens from harm. Further, as the aftermath of Hurricane Katrina demonstrated, it may be problematic to rely on the federal government to respond adequately to a problem whose effects are concentrated locally. If the harm that an adaptation measure seeks to avert is concentrated in one or a few states, the other states may lack the incentive to contribute to or finance the remedy.¹²⁴ In addition, the external costs that result from a state's adaptation measure may be attenuated or difficult to measure, while the localized harm at which the measure is directed may be obvious and severe. Finally, if a particular effort to prevent or minimize the adverse effects of climate change creates both positive and negative externalities in other states, the case for federal displacement may be relatively weak.¹²⁵ It might be appropriate to require a strong threshold showing of a discrepancy between the cost-benefit balance for an individual state and the collective interest before triggering preemption, especially in areas in which there is a long tradition of state regulatory authority.

IV. CONCLUSION

¹²¹ See Adler, *supra* note 60, at 7 (arguing that efforts by individual states to address shortages may affect interstate supplies in ways that cause conflicts between states and that "state efforts to address water shortages (or excess in the case of increased flooding) are likely to affect national interests in navigation, environmental protection, and other issues"); Zinn, *supra* note 96, at 69-70.

¹²² See Adler, *supra* note 60, at 58 ("Salt water intrusion into aquifers will impair groundwater sources currently used for public drinking water supplies and other human uses."); Zinn, *supra* note 96, at 78.

¹²³ The application of pesticides to control the spread of vector-borne diseases also could cause environmental problems in other jurisdictions. See Zinn, *supra* note 96, at 74-75 ("Expanding pesticide use to combat vector-borne diseases would have environmental effects of varying severity, dependent on the pesticides used. For example, prior to being banned in the United States, DDT was shown to contribute significantly to the decline of a variety of bird species by thinning and weakening their egg shells.").

¹²⁴ See Asbjørn Aaheim et al., *Adaptation to Climate Change: Why is it Needed and How Can it Be Implemented?*, 161 Centre for European Studies (CEPS) Policy Brief 11 (May 2008), available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1334046&download=yes (arguing that "measures to protect and prevent against negative impacts benefits the collective without being subject to the control of single agents and/or measures are subject to economies of scale. Hence, there is a lack of incentives to single agents to implement them. So the federal collective may do nothing, even if the harm to the affected state or states caused by inaction exceeds the cost of taking preventive action.").

¹²⁵ Suppose, for example, that pest control efforts in State A contribute to the contamination of waters in State B but also abate the adverse effects caused by the pests in State B as well as State A.

The uncertainty about the magnitude and distribution of the effects of climate change makes it impossible to predict exactly what kinds of adaptive measures will be needed in different parts of the country and when they will be needed. There seems to be a consensus among those who have focused on climate change adaptation policy that the effort will necessarily involve federal, state, and local government participation. In an optimal world, policymakers at different levels would coordinate their responses so that adaptation proceeds as efficiently and effectively as possible, the burdens resulting from climate change are minimized, and the unavoidable burdens are distributed as equitably as possible, even though climate change is likely to affect some areas of the country (such as coastal areas vulnerable to flooding and severe storm activity) more than others.

It is inevitable, however, that clashes of interest will develop between jurisdictions when desired goods (such as potable water) are scarce or efforts by one state or locality to avoid the undesirable aspects of climate change shift the burden of those changes to other jurisdictions. Collective action analysis can help avoid or resolve such conflicts by assigning the authority to control the development of climate change adaptation policy to the level of government best situated to address a problem without exacerbating the adverse consequences of climate change for others. The conflicts are likely to arise both when states and localities fail to do enough to anticipate and react to climate change and when they do “too much.” As the analysis above indicates, collective action analysis supports the exercise of federal power to create minimal protections against the ravages of climate change in the face of state or local reluctance to react to its consequences. The federal role, which would exist concurrently with the exercise of state and local power to respond to climate change, could involve providing technical and financial assistance to state and local governments or the creation of the kinds of cooperative federalism regulatory programs that have become entrenched in U.S. environmental law over the last forty years. In limited contexts, collective action analysis also supports displacement of the aggressive exercise of state and local authority to adapt to climate change in favor of exclusive federal control. These situations are most likely to involve state and local efforts that result in interstate externalities.