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CONTINUITY AND TRANSFORMATION IN ENVIRONMENTAL REGULATION

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Since the modern era of environmental regulation began in the 1970s, there have been arguments for replacing it with something else. Surely, critics have argued, it was possible to improve on a rigid hierarchy from the issuance of federal uniform standards to state implementation of firm compliance.[1] Conventional regulation, it has been said, is too clumsy, too slow, too inefficient.[2] Yet, there is little sign the traditional paradigm is fading away.[3]

Commentators have proposed several replacements for conventional regulation by EPA, including the adoption of new regulatory approaches and

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[1] Richard B. Stewart, *A New Generation of Environmental Regulation*, 20 CAP. L. REV. 21, 154 (2001).

[2] *Id.* at 31-35, 157. Stewart catalogued the arguments against conventional regulation, calling it "centralized planning without the planning." In his view, "[t]he fundamental defect is the pervasive and indiscriminate effort to specify and control the details of conduct by myriad actors throughout the nation and its economy."

[3] *Id.* at 21-24.

greater empowerment of state government. What these approaches have in common is that they all involve "[a] significant degree of decentralization, involving state and local governments, markets, and non-governmental organizations" rather than top-down federal mandates. Regulatory tools, market instruments, voluntary programs, negotiated approaches, nudges, and disclosure requirements have been heralded as game changers in environmental protection.[4] Over time, these regulatory tools have found their place within the regulatory system, but they have not supplanted traditional prescriptive regulation.[5] As Richard Stewart observed nearly twenty years ago, while there has been "an abundance of fresh thinking, research, and scholarship" on new approaches, in practical terms those efforts have made a "positive but limited contribution."[6] "For all the furious battle between those attacking the king's fortress and its defenders," he wrote, "the fortress still stands."[7] That remains true today.[8] One might add, however, that the attackers have settled down outside the castle and founded villages.

Besides the attack on traditional regulation as a form of environmental protection, the 1970's regulatory system has also been criticized for placing too much regulatory power in the hands of the federal government, rather than leaving states to find their own balances between environment and economy. Here, too, the attackers have made headway, but within limits. The federal government has retained its primary position within the regulatory system, providing a regulatory floor. But states have been much more assertive in pursuing their own regulatory efforts, especially in terms of climate change.[9]

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[4] *Id.* at 21.

[5] *Id.* at 21, 24. As Stewart observed almost two decades ago, conventional regulation has had some major successes, despite what he viewed as its flaws. However, he attributed part of the failure to adopt alternative methods to political gridlock, a problem that has only gotten worse since he wrote.

[6] *Id.* at 25.

[7] *Id.* at 175. Near the end of the article, he expands on this conclusion: "There has been limited use of alternative approaches, including micro-contracts and emissions trading, which have been adopted because of the substantial welfare gains that they have provided relative to the inefficient command system. Yet, the use of alternative instruments has been quite limited in relation to their theoretical potential."

[8] *See id.* at 175-176. It is worth asking why conventional regulation has stood the test of time so well. Stewart offers a number of explanations based on government gridlock and interest group influence. While these factors may have played a role, a simpler explanation is that despite its flaws, the present statutes (combined with a good deal of creativity in implementation) have worked well enough to eliminate any great impetus to fundamental change. And meanwhile, the alternatives have also proved not to be panaceas. Thus, we continue to muddle through.

[9] *See* Tod Agaard, *Environmental Law Outside the Canon*, 89 IND. L. J. 1239 (2014). In addition to the diffusion of environmental action to states, cities, and private actors, there has also been diffusion into new federal agencies and programs. Tod Agaard has explained that role of "non-environmental programs" in many different federal agencies. Of particular importance has been the growing convergence of environmental law and energy law, bringing new regulatory agencies such as the Federal Energy Regulatory Commission and state public utility commissions into play as environmental actors. *See also* Jody Freeman, *The Uncomfortable Convergence of Energy and Environmental Law* 41 HARV. ENV. L. REV. 339 (2017).

Although the regulatory system as a whole has shown more continuity than transformation, the balance shifts in the climate arena. Changes in the climate arena are perhaps the most significant shift in regulatory approaches since the 1970s. The shift is more complex than merely an expression of federalism versus nationalism. Contrary to expectations, state activity has been most pronounced in an area of global concern, not in terms of purely local environmental issues. Activity is not limited to state governments but are accompanied by initiatives from cities and private firms from Apple to Walmart. Moreover, these entities are not acting in isolation from each other. This more diverse group of actors has also created a robust cooperative network that crosses categorical and national boundaries. Within each level of government, non-environmental agencies—especially energy regulators—have assumed important roles. This effort has no clear precedents in the earlier decades of environmental law.

We have replaced a hierarchical system based on a dominant federal role with an ecosystem of multiple actors interacting in multiple networks. The federal government still plays an outsized role in regulation as a whole, and conventional regulation remains the most frequently used tool. Despite the importance of the federal government and conventional regulation, they share the stage with other actors and other methods of environmental protection. How to coordinate and guide this complex system may be the key problem of institutional design confronting us. Its importance stems not only from the urgency of the climate change issue, but from the fact that climate change is interwoven with so many other environmental problems.

Part I of this Article will discuss two of the most important "game changers" that have been heralded over the past forty—now almost fifty—years as substitutes for conventional regulation: market-based mechanisms and collaborative governance. Neither of these eliminated traditional prescriptive regulation, but they have had significant applications, broadening the menu of available regulatory tools. Like any other set of tools, they have proved to be useful in some contexts, less so in others.

Part II focuses on the identity of the actors, including the issue of federalism. Arguments for greatly curtailing the role of the federal government have not been effective. There has, however, been an unexpected blossoming of state environmental activity. What emerged has been far different than the classical federalism image of states regulating local problems. As noted above, states are most active in the area of climate change, a global problem, and rather than operating independently to address the preferences of their system, they have allied with other states, foreign jurisdictions, and private firms. The active involvement of private firms is also a significant deviation from the traditional vision of regulatory coercion as the default relationship between governments and regulated firms.

Outside of the climate change arena, Parts I and II emphasize more on continuity than transformation. But the climate change arena is an important exception. An important change in environmental law has arguably been the emergence of this new mode of environmental governance relating to climate change, one in which there is a rich diversity of actors interacting in multiple networks. Terms like polycentric regulation or network governance capture some of what is going on. As Part III of the article discusses, however, there are dynamics that make the resulting web of actors more like an ecosystem than like a network such as the internet. Polycentrism is also too narrow a term, because various "centers" actively influence the political and the environmental settings in which they operate. Governance by ecosystem may be suited for some problems more than others. But it is a promising addition to our understanding of possible regulatory models.

Among other possible benefits, this governance system may be more robust than a centralized system of top-down federal control. The replacement of Barack Obama with Donald Trump dramatically reversed the federal government's attitude toward climate policy. But as we will see, the activities of state, local, and corporate actors have managed to temper the policy shift. A more diversified portfolio of climate policies provides insurance against sudden shifts in the political winds. Such shifts in national politics are not unique to the United States or to this one episode. For instance, Australia has seen a bewildering series of shifts in national climate policies.[10] Thus, we should not assume that the Obama-Trump transition is a unique policy reversal. Democratic politics are inherently unpredictable, and it would be a mistake to put all of our bets on any one source of climate action. Ecosystem governance may provide a hedge against policy reversals in any one jurisdiction.

I. Alternative Regulatory Tools

Federal environmental regulation generally takes two forms. First are mandates to achieve defined environmental standards. For instance, under Section 110 of the Clean Air Act, states are required to adopt plans to achieve national air quality standards, which are set by the federal government.[11] The second form of regulation, exemplified by Section 301 of the Clean Water Act, consists of mandates to achieve levels of pollution reductions at individual facilities that are attainable with the best available technology at the facilities.[12]

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[10] *See* Tim Baxter, George Gilligan, and Cosima Mcrae, Australian Climate Change Regulation and Political Math (Sept. 2018), https://ssrn.com/abstract=3241945.

[11] 42 U.S.C. § 7410(1). Section 110(1) provides that:

> Each State shall, after reasonable notice and public hearings, adopt and submit to the Administrator, within 3 years (or such shorter period as the Administrator may prescribe) after the promulgation of a national primary ambient air quality standard (or any revision thereof) under section 7409 of this title for any air pollutant, a plan which provides for implementation, maintenance, and enforcement of such primary standard in each air quality control region (or portion thereof) within such State.

[12] 33 U.S.C. § 1311(b)(2)(A). For instance, section 301 provides in part that:

These levels may be set for each individual plant or they may apply to an entire category of sources. Critics have long challenged these tools for being too inflexible and clumsy, for demanding more information and expertise than regulators possess, and for failing to provide incentives to develop new technologies. This section will discuss the alternative approaches to environmental protection that these critics have advocated. They fall into two broad categories: those that would replace regulatory mandates with economic incentives and those that seek to move away from top-down mandates toward more subtle mechanisms for changing industry behavior.

A. Economic Tools

Richard Stewart, a leading advocate of these tools, has detailed the arguments in favor of emissions fees and emission trading (better known as "cap-and-trade"). These economic tools promise to achieve improvements in environmental quality at a lower cost than conventional regulation, while providing continual incentives for further improvement.[13] The economic tools have their own set of critics, who have made a series of arguments against them.[14] Critics worry that these tools can "create serious loopholes and undermine the legal and public accountability of the regulatory system" while failing to deal with pollution hotspots.[15] In any event, while the theory behind cap-and-trade is well established, there is still a great deal we do not understand about how emissions trading systems actually operate. As the authors of a 2007 review concluded, "[t]hough we have some evidence of significant cost savings through emissions trading schemes, we know much less about how effective (in terms of measurable environmental benefits) and fair (in terms of distributional burdens) they are."[16] They further noted that "[t]he studies that do exist are laudable and informative,

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> [E]ffluent limitations for categories and classes of point sources, other than publicly owned treatment works, which (i) shall require application of the best available technology economically achievable for such category or class, which will result in reasonable further progress toward the national goal of eliminating the discharge of all pollutants, as determined in accordance with regulations issued by the Administrator pursuant to section 1314(b)(2) of this title, which such effluent limitations shall require the elimination of discharges of all pollutants if the Administrator finds, on the basis of information available to him (including information developed pursuant to section 1325 of this title), that such elimination is technologically and economically achievable for a category or class of point sources as determined in accordance with regulations issued by the Administrator pursuant to section 1314(b)(2) of this title.

[13] Stewart, *supra* note 1, at 99.

[14] See *id.* at 22 (citing a large number of articles on both sides of the debate).

[15] *Id.* at 22.

[16] Jody Freeman & Charles D. Kolstad, *Prescriptive Environmental Regulations Versus Market-Based Incentives*, *in* Jody Freeman & Charles D. Kolstad, MOVING TO MARKETS IN ENVIRONMENTAL REGULATION 14-15 (2007).

yet their methodological limitations caution against strong conclusions."[17] As we will see, recent research has addressed some of these gaps, but significant gaps remain.[18]

The U.S. Acid Rain Program was the world's first significant emissions trading system.[19] Under the Reagan Administration, acid rain became a highly controversial, heavily politicized issue.[20] The Administration opposed congressionally-proposed control programs and refused to take action in cooperation with the Canadian government on the problem.[21] The political deadlock was broken during the George H.W. Bush Administration with the passage of the 1990 Amendments to the Clean Air Act.[22] The amendments entirely bypassed the existing mechanism for resolving interstate disputes and established a new nationwide system to reduce sulfur-dioxide (SO_2) emissions.[23] It created a cap-and-trade system for addressing SO_2 emissions, setting the absolute ceiling (the "cap") on emissions by electric utilities nationwide at roughly nine million tons, less than half of 1980 levels.[24] Congress left the mechanisms for achieving reductions unspecified, allowing individual firms to determine the most appropriate compliance pathway, for example: energy conservation, the use of cleaner fuels, installation of pollution control technology, or purchase of additional allowances. Congress authorized EPA to distribute allowances annually through a combination of mechanisms, including auctions and free allocation to firms.[25] Allowances can be transferred (bought and sold) beneath the cap.[26] Therefore, firms that are able to reduce their emissions can benefit by selling their excess allowances, creating an incentive to develop and implement better emissions-reduction methods.

The general verdict is that the Acid Rain Program was successful in reducing emissions at a low cost.[27] A 2011 data review suggested that SO_2

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[17] *Id.*

[18] *See* Richard Schmalensee and Robert Stavins. Policy Evolution Under the Clean Air Act (Nov. 30, 2018), https://scholar.harvard.edu/stavins/publications/policy-evolution-under-clean-air-act.

[19] *See* Stewart, *supra* note 1, at 105-110. A precursor was the credit trading scheme during the phase out of lead gasoline, although that can be considered a compliance mechanism rather than a true trading program; *see also* Schmalensee & Stavins, *supra* note 18, at 7.

[20] *See, e.g.*, Michael T. Kaufman, *Canada Announces New Effort to Cut Acid Rain*, N.Y. TIMES, Mar. 8, 1984 (describing the Reagan administration as "stalling by insisting on further study and research of the problem of acid rain, which many scientists say is killing life in lakes of Canada and parts of the northeastern United States").

[21] *Id.* at 32 Writing over a decade earlier, Stewart concluded that "[m]odeling studies have consistently found that use of economic incentives, such as environmental taxes or pollution trading systems, would achieve pollution control goals far more efficiently than existing command-and-control approaches, reducing compliance costs by up to 50% or more."

[22] The acid rain provision now constitutes Subchapter IV-A of the Clean Air Act, 42 U.S.C. §§ 7651–7651o.

[23] The existing interstate provisions were 42 U.S.C. § 7410(a)(1)(D(i) and 42 U.S.C. § 7426.

[24] *See* 42 U.S.C. § 7651b(a)(1).

[25] *See id.*

[26] *See* 42 U.S.C. § 7651b(b).

[27] *See, e.g.*, 2009 Acid Rain Program Progress Reports, http://www.epa.gov/airmarkets/progress/ARP09.html, http://blogs.edf.org/climate411/2010/12/02/there-they-go-again/; Robert W. Hahn

allowances were much cheaper than originally expected because industry found less expensive ways to reduce emissions, saving up to one billion dollars per year in compliance costs.[28] Consumers have presumably benefitted from lower energy costs. To some extent, the program benefitted from fortuitous changes in fossil fuel prices in favor of lower-sulfur coal and natural gas.[29] Analytical efforts that attempt to control for these changes report "savings of 43–55 percent compared to a uniform standard that would have regulated the rate of emissions at a facility" and savings of twice that amount as compared with "a mandate to use postcombustion controls" such as scrubbers.[30] On the other hand, although the program does not appear to have increased SO_2 emissions specifically in minority communities, it contributed to increased emissions in "poorly educated," and presumably lower-income, communities.[31]

Another major experiment with cap-and-trade took place in Los Angeles: RECLAIM, Southern California's nitrogen oxides (NO_x) and SO_2 trading program.[32] In 1993, California's South Coast Air Quality Management District established a cap-and-trade program under which stationary sources like oil refineries received initial allowances of RECLAIM Trading Credits (RTCs) that

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& Gordon L. Hester, *Marketable Permits: Lessons for Theory and Practice*, 16 Ecology L.Q. 361(1989). A more recent review concludes:

> Although the program's costs were likely not as low as they ideally could have been, costs were much lower than they would have been under comparable command-and-control regulation. The emission reductions goals were achieved with less litigation (and thus less uncertainty) than was typical for environmental programs, because firms that found it particularly costly to reduce emissions had the option to buy allowances instead. Moreover, firms could not complain about EPA's exercise of administrative discretion, because the law gave EPA very little discretion.

Schmalensee and Stavins, *supra* note 19, at 5. The authors also observe that benefits were a "substantial multiple" of costs, though many of the benefits were in the form of health improvements rather than reduction of the ecological impact of acid rain.

[28] *See* WILLIAM C. WHITESELL, CLIMATE POLICY FOUNDATIONS 165–166 (2011).

[29] *See* DALLAS BURTRAW & SARAH JO SZAMBELAN, RESOURCES FOR THE FUTURE, U.S. EMISSIONS TRADING MARKETS FOR SO_2 AND NO_x 11 (2009), http://www.rff.org/documents/RFF-DP-09-40.pdf.

[30] *Id.* (emphasizing the findings of "the two most convincing studies," which used different analytical methods to arrive at similar conclusions).

[31] *See* Evan J. Ringquist, *Trading Equity for Efficiency in Environmental Protection? Environmental Justice Effects from the SO_2 Allowance Trading Program*, 92 SOC. SCI. Q. 297, 320, fig.5 (2011); *see also* Jason Coburn, *Emissions Trading and Environmental Justice: Distributive Justice and the USA's Acid Rain Programme, 28* ENVTL. CONSERV. 323 (2001) (finding that "[f]or the first few years of the ARP, the emissions trading regime does not appear to have been concentrating SO_2 pollution disproportionately for the poor and racial minority populations").

[32] For a detailed description of the RECLAIM program, *see generally* Daniel P. Selmi, *Transforming Economic Incentives from Theory to Reality: The Marketable Permit Program of the South Coast Air Quality Management District*, 24 ENVTL. L. REP. 10695 (1994).

they could either utilize or sell to other facilities.[33] The market contained 390 facilities accounting for two-thirds of the NO_x emissions in the district.[34] The district set initial allocation of allowances based on maximum emissions during the 1989–1992 period, with an adjustment to control for the total emissions from all sources.[35] The amount of pollution represented by an allowance would decline over time.[36]

RECLAIM produced a mixed record. An overall assessment of the program by EPA staff observed that "[e]missions have been reduced under RECLAIM, but the program has also been criticized for delaying reductions, over-managing the market, and perpetuating complexity and uncertainty."[37] Design flaws plagued the program. After initial over-allocation of permits provided no incentive to install control technologies, the district implemented changes that required "more reductions to meet tougher air quality goals." [38] The California electricity crisis in 2000 caused a price spike that dramatically affected the market for allowances and resulted in removal of the power sector from the NO_x market.[39] The spike in allowance prices was caused by a spike in electricity wholesale prices due to high consumer demand and low natural-gas supply. Generators expanded usage of "local power plants without additional emissions controls—including older, higher-emitting peaking units" and "turned to the RTC market to cover their higher emissions, thus rapidly depleting the available supply of RTCs and driving prices up."[40] In response to this crisis, the South Coast Air Quality Management District made extensive changes to the system.[41] Ultimately, despite problems, the program contributed to a sixty-percent decrease in NO_x emissions from RECLAIM sources between 1994 and 2004.[42] However, in 2017 the air quality district decided to phase out the program.[43]

Trading programs have found some important new applications. Perhaps the most prominent today is California's cap-and-trade scheme for carbon

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[33] *Id.* at 10696-10697. Selmi explains that the agency turned to cap-and-trade after political resistance to command-and-control regulations became severe.
[34] *Id.* at 10698.
[35] *Id.* at 10698-99.
[36] *Id.* at 10699-701.
[37] EPA CLEAN AIR MARKETS DIVISION, AN OVERVIEW OF THE REGIONAL CLEAN AIR INCENTIVES MARKET (RECLAIM) 1 (2006), http://www.epa.gov/airmarkt/resource/docs/reclaimoverview.pdf [hereinafter RECLAIM OVERVIEW].
[38] *See id.* at 1, 22.
[39] *See id.* at 8–9.
[40] *See id.* at 6.
[41] *Id.* at 9–10.
[42] *See id.* at 12; *see also* Meredith Fowlie et al., *What do Emissions Markets Deliver and to Whom? Evidence from Southern California's NOx Trading Program*,203 AMER. ECON. REV. 965 (2012) (noting that a recent statistical study of program data determined that pollution reductions were greater for plants within the RECLAIM system than in similar California plants outside the system not subject to cap-and-trade).
[43] John Heinz & Aron Potach, *Southern California' s Once Groundbreaking Cap and Trade Program is Now Riding Towards the Sunset*, 26 ENV. L. NEWS 35 (Fall 2017), https://www.lw.com/thoughtLeadership /southern-california-cap-trade-program-clean-air.

emissions, which is discussed later in this article. Notably, however, California has also adopted a number of direct regulatory interventions outside of this program.[44] Of these, the most important program consists of regulatory standards for carbon emissions from new vehicles.[45]

As Stewart ruefully observed, "there is little evidence that environmental tax or fee schemes will entirely replace command regulation in any given sector."[46] Rather, he said, "[s]uch programs have been an 'add on,' imposing prices on residuals allowed by command programs."[47] That remains true today. Emissions trading has been a successful regulatory innovation in the sense that it has firmly established a role within the regulatory system. It has not, however, replaced traditional regulation. In part, the reason may have been federal gridlock, but as the California climate change program illustrates, emissions trading has not been the exclusive regulatory tool even when it has been adopted as a part of new regulatory initiatives. Thus, it is more accurate to see emissions trading as enriching the regulatory toolkit rather than transforming it.

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[44] S*ee* Mary D. Nichols, *California's Climate Change Program: Lessons for the Nation*, 27 J. ENV. L. 185 (2009). The California system has some resemblance to an option discussed by Stewart, though over time the trading system has begun to play a more significant role:

> A second basic reform strategy is hybrid and two-tier in character. It would maintain command systems in order to provide a basic level of control of residuals and other environmental stresses, and use EIS [Economic Incentive Systems] or environmental agreements to obtain additional reductions above the command baseline. Thus, pollution taxes could be imposed or a trading system with a progressively lower cap could be adopted to deal with residuals discharges that are allowed by existing command regulations. Facility-specific risk bubbles could be used for the same purpose. These alternative mechanisms could be made progressively more restrictive in order to achieve additional reductions in accordance with a schedule that would ensure continuing further reductions. For example, the level of an environmental tax could gradually be increased over time. The cap established for residuals trading systems or risk bubbles could be made increasingly more restrictive.

Stewart, *supra* note 1, at 180.

[45] *See* California Air Resources Board, Clean Car Standards - Pavley, Assembly Bill 1493, https://www.arb.ca.gov/cc/ccms/ccms.htm.

[46] Stewart, *supra* note 1, at 113. Later in the article, he remarked that:

> There is considerable experience in the United States with the use of emissions trading systems to control air pollution. The record is on the whole positive, but mixed. Many of the programs have made valuable contributions. The most successful have been the SO2 and gasoline lead additive trading programs. In other programs, trading has been impeded by the perpetuation of command regulatory requirements and case-by-case administrative review of trades. These requirements and other factors have inhibited external trading. Nonetheless, the programs overall have produced significant cost savings as well as environmental benefits.

Id. at 177. As of 2018, prices had stabilized at a relatively modest level. *See* Schmalensee and Stavins, *supra* note19, at 10.

[47] Stewart, *supra* note 1, at 177.

B. Voluntary Programs, Informational Strategies, and Collaborative Governance

Emissions trading is not the only reform that has been proposed as an alternative to traditional "command and control" regulation. In the next section, we turn to another set of "Big Ideas": Proposals for moving away from coercive measures toward efforts to expand voluntary action and more flexible, collaborative initiatives by government and industry. Advocates of this approach see many of the same flaws in the regulatory system as advocates for economic incentives, but offer a different set of remedies.

At the turn of this century, there was a surge of interest in collaborative government. In one of the leading articles on the subject,[48] Jody Freeman argued that, compared with traditional regulation, the "goals of efficacy and legitimacy may be better served by a model that views the administrative process as a problem-solving exercise in which parties share responsibility for all stages of the rule-making process, in which solutions are provisional, and in which the state plays an active, if varied, role."[49] Based on several case studies, she concluded that "multi-stakeholder processes are promising not solely because they bring techniques of alternative dispute resolution to public policy making and facilitate bargaining by groups that would otherwise litigate rules."[50] Instead, "they are promising because they are more likely than the traditional rule-making process to be sites at which regulatory problems are redefined, innovative solutions devised, and institutional relationships rethought in ways that are likely to increase both quality and legitimacy."[51] Professor Freeman cited a "problem-solving orientation," "[p]articipation by interested and affected parties," use of "[p]rovisional solutions," a form of "[a]ccountability that transcends traditional public and private roles in government," and a "flexible, engaged agency."[52]

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[48] Jody Freeman, *Collaborative Governance in the Administrative State*, 45 UCLA L. REV. 1, 2 (1997); *see also* Christopher H. Schroeder, *Third Way Environmentalism*, 48 KAN. L. REV. 801 (2000) (noting similar developments in Britain).

[49] *Id*. at 6.

[50] *Id.* at 7.

[51] *Id.*

[52] *Id.* at 22. Writing at the time, I expressed both appreciation of the potential benefits of collaborative governance and concerns about potential problems:

> In short, serious concerns exist about the workability, transparency, and accountability of the new governance structures. Another, perhaps even more fundamental, question relates to political equality. Although the process is imperfect, we do have an elaborate set of political institutions that purport to give every voter an equal representation in government. It is questionable whether we can expect the same degree of equality in a system where decisions are made by a hodgepodge of government officials and affected interests. How the new governance structure would reflect traditional democratic norms remains unclear.

Daniel A. Farber, *Triangulating the Future of Reinvention: Three Emerging Models of Environmental Protection*, 2000 U. ILL. L. REV. 61, 75 (2000). I suggested that "reinvention is likely to have a symbiotic relationship with conventional regulation rather than replacing it." *Id.* at 62.

Collaborative efforts have taken more than one form. One prominent technique involves negotiations between industry and the regulator to reduce overall environmental impacts at lower cost than enforcement of detailed regulatory requirements. The premise is that negotiation could uncover win-win situations where the regulator could obtain better regulatory results while industry would enjoy lower costs.[53] Perhaps the best-known example of this technique in the realm of pollution control was EPA's Project XL, which relaxed permitting and procedural requirements in return for greater reductions of pollutants.[54] In

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[53] As Stewart explained:

> The premise is that legal rules will advance society's welfare if they are voluntarily agreed to by all relevant interests. If those with a stake in the regulatory requirements-the regulated, the regulator, and perhaps third party environmental or citizen interests-agree on an alternative to the standard requirements, the agreement may be presumed to be superior to the standard. In order to achieve such agreements, the government establishes a process of informal negotiation with the aim of securing agreements on individualized, hand-tailored rules or orders that are substitutes for those generally applicable.

Stewart, *supra* note 1, at 61. As he pointed out, there are some questions about the legitimacy of this renegotiation of statutory requirements. *Id.* at 62.

[54] *Id* at 64. Freeman described Project XL as follows:

> Under XL, an applicant company promises "superior environmental performance" in exchange for a performance-based permitting system that may allow cross-pollutant trades--that is, trading a decrease in the emission of one pollutant for increased emissions of another; or multi-media trades--that is, trading decreased releases into one medium, for example, water, for increased releases into another, such as air. Companies seeking such permits must negotiate a nonbinding memorandum of understanding, known as the Final Project Agreement (FPA), with federal and state agencies. The process also requires stakeholder support. The FPA, which contains the company's detailed commitments to improve environmental performance, forms the basis of a new multi-year permit, or set of permits, to be enforced either by state agencies or the EPA.

Freeman, *supra* note 52, at 55 (1997). For a more detailed critique of Project XL, *see* Rena I. Steinzor, *Reinventing Environmental Regulation: The Dangerous Journey from Command to Self-Control*, 22 HARV. ENVTL. L. REV. 103, 104 (1998). Writing a few years into the program, Steinzor said:

> Project XL has proved a disappointment to virtually all of its outside constituencies. As this Article went to press, EPA had received a total of forty-six applications, far fewer than the several hundred it expected when it launched the program in 1995, suggesting fundamental problems with the incentives the program offers industry participants. Project XL has also been under constant fire from national and local environmentalists and community representatives, who condemn it on the basis of both substance and process.

Id. at 124-125. Among the flaws that she cites was the separation by Project XL negotiators and other EPA staff: "Although Project XL staff are committed to innovation, they lack the technical expertise necessary to foresee the substantive problems posed by industry proposals. Their performance is measured by how fast they get projects up and running, yet they must depend on front-line regulators to evaluate the complex ramifications of proposals." *Id.* at 137. Project XL

addition, companies that outperformed others in their industries were allowed to self-certify their environmental compliance.[55] Stewart observed that the performance of this program was disappointing, due to low industry participation, legal uncertainty, and considerable negotiation barriers.[56] Other types of programs proved more successful, however, including the negotiation of additional environmental measures as part of enforcement actions.[57] Probably the most successful use of compacts with related parties took the form of Habitat Conservation Plans to protect endangered species, which have seen widespread adoption.[58] EPA also implemented voluntary programs intended to improve environmental performance by industry, including the 33/50 program to reduce hazardous waste and the Green Lights program to encourage energy efficiency.[59] Collaborative programs have played a significant role in the regulatory system, but they have not been free of problems. Stewart wrote that the "varying degrees of success of these programs certainly presents more questions than answers about the long-term viability of [this] approach as a vehicle for dealing with the shortcomings of command-and-control regulation."[60]

Informational programs have also provided an important mechanism for prompting voluntary action. The Energy Star program to encourage the purchase of energy efficiency appliances has been a prominent example.[61] The most notable informational program is arguably the Toxic Release Inventory, which publishes information on industry releases of toxic chemicals.[62] This program has been "credited with stimulating a dramatic reduction of on-site inventories and releases of toxic chemicals."[63]

Voluntary action has turned out to be most prominent in the area of climate change. In *Beyond Politics: The Private Governance Response to*

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stopped accepting new projects in 2002.; *See* Project XL, https://archive.epa.gov/projectxl/web/html/index.html.

[55] Stewart, *supra* note 1, at 66.

[56] *Id.* at 67-68.

[57] *Id.* at 71-72.

[58] *Id.* at 73-75. Stewart also discusses wetlands mitigation and banking, which are on the borderline between negotiated measures and trading systems. *Id*. at 75-77.

[59] *Id*. at 86. One example is the chemical industry Responsible Care initiative. Karkkainen described the evidence of performance improvement under this program as "quite ambiguous." Bradley K. Karkkainen, *Information As Environmental Regulation: TRI and Performance Benchmarking, Precursor to A New Paradigm?*, 89 GEO. L.J. 257-307 (2001). Industry gives this program credit for considerable improvements, including 84% reductions in hazardous releases from 1989 to 2016. AMERICAN CHEMISTRY COUNCIL, RESPONSIBLE CARE, https://responsiblecare.americanchemistry.com/default.aspx?gclid=EAIaIQobChMIiOX1jbbD4AIVLB-tBh2cUwlaEAAYASAAEgLRkvD_BwE.

[60] Stewart, *supra* note 2, at 79.

[61] *Id*. at 137.

[62] For descriptions of the program, *see* Bradley K. Karkkainen, *Information As Environmental Regulation: TRI and Performance Benchmarking, Precursor to A New Paradigm?*, 89 GEO. L.J. 257-307 (2001) at 286-289; Stewart, *supra* note 1, at 138.

[63] Stewart, *supra* note 1, at 139. California has an even more stringent program, Proposition 65. *See id.* at 140.

Climate Change,[64] Vandenbergh and Gilligan make the case for devoting far more attention to private initiatives that reduce carbon emissions and combat climate change.[65] As Vandenbergh and Gilligan point out, it is a mistake to pin all of our hopes to a single strategy.[66] For this reason, they argue, we should look beyond government regulation to the private sector—both companies and individuals—for help.[67]

Vandenbergh and Gilligan make a strong case for the potential for private action to reduce carbon emissions. They open with the story of Walmart's dramatic reductions of carbon emissions by itself and its suppliers.[68] Of course, Vandenbergh and Gilligan are aware of the possibility of "greenwashing"—false or misleading claims of environmental virtue[69]—but they point out that any approach to carbon reduction will have less than perfect effectiveness.[70] They assemble a mass of evidence that reveals the prevalence, importance, and potential benefits of voluntary climate action by corporations and individuals. This is a phenomenon that is beginning to receive public attention. For instance, the *NY Times* reported in a 2017 article that corporations were picking up the slack due to the Trump Administration's rollback of climate policy, and "almost two dozen companies, including Google, Walmart, and Bank of America have pledged to power their operations with 100 percent renewable energy, with varying deadlines, compared with just a handful in 2015."[71]

In 2016, the Climate Disclosure Project (CDP) reported that 638 companies were "proactively planning" for climate risk and "are outpacing their governments in thinking ahead" and 150 global companies included a "shadow price" in their business strategies.[72] For instance, ConocoPhillips says that:

> [f]or operations in countries without existing or imminent [greenhouse gas] regulation, all capital projects with a total

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[64] Michael P. Vandenbergh & Jonathan M. Gilligan, BEYOND POLITICS: THE PRIVATE GOVERNANCE RESPONSE TO CLIMATE CHANGE (Cambridge University Press, 2017).
[65] *Id.* at 446-448.
[66] *Id.* at ix.
[67] *Id.*
[68] *Id.* at 3. For more on corporate efforts to increase the use of renewables, *see id.* at 425-426.
[69] For instance, although Walmart has made genuine reductions in carbon emissions, its record is not unblemished. It is marred by support for anti-climate action groups, and a decrease in the percentage of renewables used at its stores. *Id.* at 179, 184.
[70] *Id.* at xv.
[71] Hiroko Tabuchia, *With Government in Retreat, Companies Step Up on Emissions*, NY TIMES (Apr. 25, 2017), https://www.nytimes.com/2017/04/25/climate/with-government-in-retreat-companies-step-up-on-emissions.html. A more guarded assessment is provided by D. McCarthy and P. Morling, *Using Regulation as a Last Resort: Assessing the Performance of Voluntary Approaches* (2015) (need for clear incentives, targets, and accountability as key to success), http://ww2.rspb.org.uk/Images/ usingregulation_tcm9-408677.pdf.
[72] CDP, *Putting a Price on Risk: Carbon Pricing in the Corporate World* (2016), https://b8f65cb373b1b7b15feb-c70d8ead6ced550b4d987d7c03fcdd1d.ssl.cf3.rackcdn.com/cms /reports/documents/000/000/918/original/carbon-pricing-in-the-corporate-world.pdf?1472456914.

> installed cost of $150 million or greater or that result in a change to annual emissions in excess of 25,000 metric tons of CO_2 equivalent are required to perform a sensitivity analysis that includes carbon cost as part of the project's economic analysis.[73]

The company uses an estimated market cost of greenhouse gas emissions in the range of $6 to $51 per ton (in 2014 uninflated terms) depending on the timing and country or region to evaluate future project opportunities.[74]Similar strategies—although, with varying approaches—are used by many companies, including others in the oil industry. Wells Fargo applies a carbon price to the operations of borrowers in considering credit risks. Microsoft charges its business groups a small carbon fee and uses the funds to support internal efficiency initiatives, green power, and carbon offset projects.[75] It contends that its operations are now carbon-neutral.[76]

As Vandenbergh and Gilligan note, many corporations made carbon commitments prior to the Paris Agreement,[77] and over six hundred have joined the Ceres Climate Declaration.[78] One revealing statement was from the Director of Global Sustainable Agriculture at Monsanto, who said, "[t]his is directly related to our business . . . . We need to provide solutions while farmers are facing climate change."[79] Monsanto is on track to be carbon-neutral by 2021 and has long accepted as fact something the Trump Administration has not: that absent swift action, human-induced climate change could be catastrophic for business.[80] It was among the more than 745 companies and big investors that signed a post-election letter expressing full support for the Paris Agreement.[81]

After Trump announced his intention to withdraw from the Paris Agreement, major corporations endorsed the "We're Still In" effort.[82] Among those supporting the Paris Agreement is ExxonMobil, which, in a company statement, stated: "Today marks the entering into force of the Paris Agreement. The agreement is an important step forward by world governments in addressing the serious risks of climate change."[83] The statement continued, "ExxonMobil supports the work of the Paris signatories, acknowledges the ambitious goals of

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[73] *Id.* at 33-34.
[74] *Id.*
[75] *Id.* at 140.
[76]Microsoft Corporation, *Globally Carbon Neutral*, https://www.microsoft.com/en-us/environment/carbon/.
[77] Vandenbergh & Gilligan, *supra* note 65, at 177.
[78] *Id.* at 181.
[79] Evan Halper, *Trump's Vow to Scrap the Paris Climate Change Accord Faces Skepticism from Corporations and GOP Moderates*, LA TIMES (Feb. 25, 2017), http://www.latimes.com/politics/la-na-pol-trump-paris-accord-20170215-story.html.
[80] *Id.*
[81] *Id.*
[82] Vandenbergh & Gilligan, *supra* note 65, at 10.
[83] *Id.*

this agreement and believes the company has a constructive role to play in developing solutions."[84]

Vandenbergh and Gilligan assemble compelling stories of corporations such as Apple and Dell taking initiative on climate change.[85] Readers are entitled to ask about the financial motivations for such actions, although we should not dismiss the idea that corporate management may have altruistic impulses as well.[86] Vandenbergh and Gilligan point to a number of more tangible motivations that obviate the need to rely too heavily on altruism.[87] Pressure from financial markets is one reason for corporate action.[88] Another is supply chain pressure from businesses like Walmart.[89] Some consumers are willing to pay a premium for sustainable products,[90] and some shareholders press for climate action.[91] In addition, actions to cut carbon emissions can have other benefits for corporations, by revealing areas of waste and opportunities for increased efficiency.[92] And an overarching concern for companies is protecting the reputation of their brand.[93]

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[84] *Id.*

[85] *Id*. at 4. For an effort to provide more of a theoretical context for understanding these corporate actions, *see* Sarah E. Light & Eric W. Orts, *Parallels in Public and Private Environmental Governance*, 5 MICH. J. ADMIN. & ENV. L. 1, 12 (making the "central analytical claim … that there are striking parallels between traditional public environmental regulatory options and analogous forms of private environmental governance").

[86] Economic theory suggests several reasons why corporations might adopt voluntary efforts to reduce pollution:

> As it turns out, there may be some economic pressure on corporations toward responsible environmental behavior. Moreover, the ability of shareholders to control managers is imperfect, leaving some room for managers to seek goals other than profit maximization. Indeed, as we have seen, critics of the self-regulation model concede the possibility of such exceptional corporate behavior; they merely doubt that the behavior is sufficiently widespread to make much practical difference. The critical question, then, is an empirical one--are there significant pressures on corporations toward responsible environmental behavior apart from the direct sanctions regulation provides?

Daniel A. Farber, *Triangulating the Future of Reinvention: Three Emerging Models of Environmental Protection*, 2000 U. ILL. L. REV. 61, 71 (2000). Some empirical support for these effects is discussed in pages 71-72.

[87] Vandenbergh & Gilligan, *supra* note 65, at 126.

[88] *Id.* at 11.

[89] *Id.* at 15.

[90] *Id.* at 142.

[91] *Id.* at 145-147. Similarly, lenders may press corporations to take action to address climate change. *Id*. at 148.

[92] Vandenbergh & Gilligan, *supra* note 65, 139. Corporations began to discover these efficiency possibilities in the 1990s. *Id.* at 185.

[93] *Id.* at 143. Light and Orts also stress the variety of corporate motivations:

> The adoption of private governance options signals a recognition that private firms have an essential role to play in combatting major environmental problems such as climate change—and not merely because the law requires it, but because it is part of the firm's core business strategy, expresses a firm's identity, or simply because it is the right thing to do. In this sense, private governance may support and reinforce an emerging

Outside the climate change area, efforts to move beyond a coercive relationship between regulators and firms have only been moderately successful. Some efforts, such as Project XL, have faded away, but others such as the use of informational mechanisms like toxic release inventory, have proven durable. What has happened in terms of climate change has been quite notable. After a look at the emerging role of state governments in Part II, this article will attempt to establish a conceptual frame for developments in the climate sphere in Part III.

II. Federalism and Beyond

Part I discussed proposals to change the way in which the government seeks to alter industry behavior. Part II is a transition from *how* to regulate to *who* should do the regulating. In particular, the issue is the extent to which regulation should be decentralized, moving authority to set policy from the federal government to the states. Section A begins with a brief review of arguments for a larger state role. While these arguments have failed to transform the regulatory system as a whole, there have been notable state climate initiatives, which are discussed in Section B.

A. Arguments for Federalism

One might expect that the argument for state regulation might come from industry wanting to allow states to set lower standards than the federal government, but this argument also gained support from others. In the 1990s, Richard Revesz wrote a series of articles offering sophisticated arguments for a presumption in favor of decentralization rather than federal dominance in environmental policy.[94] He based this presumption on the premise that local communities were entitled, where possible, to set their own balances between environmental quality and economic welfare. Some states might view economic growth as the most urgent need, while others might be willing to trade jobs and tax revenues for greater environmental quality.

Besides this affirmative argument for greater localism, Revesz also critiqued the traditional arguments for a dominant federal role. He argued that at least one important rationale for federal action—the possibility that states would engage in a destructive regulatory "race to the bottom"— was economically unfounded.[95] Revesz's critique was subject to a great deal of criticism.[96] On the

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> environmental ethic within firms that business managers have a public responsibility as well as a private role to play with respect to the environment.

Light & Orts, *supra* note 86, at 71.

[94] Revesz summarized his previous work and responded to critics in Richard L. Revesz, *The Race to the Bottom and Federal Evironmental Regulation: A Response to Critics*, 82 MINN. L. REV. 535 (1997).

[95] Richard L. Revesz, *Rehabilitating Interstate Competition: Rethinking the 'Race to the Bottom' Rationale for Federal Environmental Regulation*, 67 NYU L. REV. 1210 (1992).

[96] *See, e.g.*, Kirsten H. Engel, *State Environmental Standard-Setting: Is There a 'Race' and is It 'to the Bottom'?*, 48 HASTINGS L.J. 271 (1997); Daniel C. Esty, *Revitalizing Environmental Federalism*, 95 MICH. L. REV. 570 (1996); Joshua Sarnoff, *The Continuing Imperative (But Only*

other hand, a careful analysis of economics literature found little support for the existence of a race to the bottom except in unusual circumstances, thus supporting an important part of Revesz's argument.[97] In a later article, Revesz critiqued the idea that state governments are more prone to capture by industry groups, another justification for federal regulation.[98] Besides contesting the theoretical validity of this idea, Revesz argued that state governments were doing a reasonably good job of regulating before the federal government entered the picture.[99] He also suggested that states continue to be sources for innovative environmental measures today. Thus, he concluded, environmental regulation should be left to local governments except when spillovers between jurisdictions required higher level intervention.

Around the same time, Jonathan Adler, a leading libertarian legal scholar, made similar arguments. Like Revesz, he contended that the story of state regulatory failure prior to federal legislation was greatly exaggerated.[100] Adler argued that the "federal government is intensely involved in myriad environmental problems that are truly local in character."[101] In particular, he wrote, "[d]rinking water, underground storage tanks, and hazardous waste sites are all problems that lack the features that would justify federal regulation, yet federal requirements for such intrastate concerns are sometimes more stringent

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from a National Perspective) for Federal Environmental Regulation, 7 DUKE ENVTL. L. & POL'Y F. 225 (1997); Peter P. Swire, *The Race to Laxity and the Race to Undesirability: Explaining Failures in Competition Among Jurisdictions in Environmental Law*, 14 YALE J. ON REG. 67 (1996); *see also* Kirsten H. Engel & Scott R. Saleska, *'Facts Are Stubborn Things': An Empirical Reality Check in the Theoretical Debate Over the Race-To-The-Bottom in State Environmental Standard-Setting*, 8 CORNELL J.L. & PUB. POL'Y 55 (1998).

[97] *See* Bruce G. Caruthers & Naomi R. Lamoreaux, *Regulatory Races: The Effects of Jurisdictional Competition on Regulatory Standards*, 54 J. ECON. LIT. 52 (2016).

[98] *See* Richard L. Revesz, *Federalism and Environment Regulation: A Public Choice Analysis*, 115 HARV. L. REV. 553 (2001).

[99] William Buzbee argued that the state–federal dichotomy Revesz set up fails to take into account the specific context of individual state and/or federal policies. *See* William W. Buzbee, *Contextual Environmental Federalism*, 14 NYU ENV. L. REV. 108 (2005). It also appears that state regulation was not effective in addressing environmental problems before the federal government stepped in, although this is subject to some dispute. *See* William L. Andreen, *Of Fables and Federalism: A Re-Examination of the Historical Rationale for Federal Environmental Regulation*, 42 ENV. L. 627 (2012).

[100] Jonathan H. Adler, *Fables of the Cuyahoga: Reconstructing a History f Environmental Protection*, 14 FORDHAM L. REV. 89 (2002). Adler concludes:

> The conventional view criticizes state and local governments for failing to act to control water pollution. As already noted, state and local efforts in the 1960s were making environmental progress, and there is reason to believe that such efforts would pick up steam in the years to come. Before 1969, many localities, including Cleveland, had already embarked on a long, difficult road to reverse the course of local pollution trends.

Id. at 138.

[101] Jonathan H. Adler, *Jurisdictional Mismatch in Environmental Federalism*, 14 NYU ENV. L. REV. 112, 157 (2005).

than mandates to prevent interstate harms."[102] Even when a basis for federal involvement existed, Adler argued that federal regulatory efforts were mismatched with the problem. He asserted, "current federal air quality regulations focus far more on whether a given metropolitan area meets national ambient air quality standards and on the development state plans to meet such standards than on interstate air pollution."[103] Adler viewed excessive federal involvement as leading to rigidity and excessive national uniformity at the expense of local interests.[104] Adler also suggested that it resulted in redirecting state efforts into areas that were really much better suited for federal action, such as climate change.[105]

Overall, there has been little change in the federal-state balance of power in the environmental era, given that the major environmental statutes criticized by Revesz and Adler are still intact. However, there has been one very important development. Adler may have been wrong about the causal mechanism, but events have proved him right about the expansion of the state role in addressing climate change. Indeed, as discussed in the next section, states and other non-federal actors have joined a complex transnational climate governance system, to which the federal contribution to date has been secondary. The next section explores this development.

B. State and Local Governments as Climate Policy Initiators

Climate policy is on a path that was largely unanticipated when the issue of climate change began to receive serious global attention. At one extreme, climate policy might be set by a global international agreement, with other actors merely playing an implementing role. That was likely the dominant expectation twenty years ago. At the other extreme, jurisdictions might turn inward, focusing on reducing their own emissions independent of the actions of others. At times, despair at international negotiations may have made such purely unilateral action seem like an appealing alternative. What has actually evolved, however, is a complex array of climate policies, with international agreements, global networks, and initiatives by individual jurisdictions all playing a role.[106]

When delegates met to negotiate the UN Framework Convention on Climate Change three decades ago, few would have expected that the most vigorous responses to climate change would take place far below the lofty heights of international diplomacy. One unexpected development in climate policy has been the vigorous role that individual nations, states and provinces, and even cities have played in climate policy. In the United States, state governments have

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[102] *Id.*
[103] *Id.* at 157-158.
[104] *Id.* at 169.
[105] *Id.* at 175.
[106] *See* Hari M. Osofsky, *Polycentrism and Climate Change*, Daniel A. Farber and Marjan Peeters (eds.), CLIMATE CHANGE LAW (2016).

played an active role in regulating carbon emissions.[107] Considering that it is far from being a localized problem, states often do so with much greater vigor than the federal government. It is worth taking a closer look at these state efforts, some of which are surprisingly ambitious.

Actions by U.S. states have varied depending on local conditions and political forces. California has taken a leading role in addressing climate change in a meaningful way. California's action on climate change began as early as 1988 with legislation mandating an inventory of the State's greenhouse gas emissions.[108] In 2006, Governor Arnold Schwarzenegger signed the California Global Warming Solutions Act, referred to as AB 32,[109] which requires California to reduce emissions to the 1990 level by 2020. The California effort received worldwide attention because the Governor was an international celebrity and because it was such a stark contrast with the Bush Administration's refusal to address climate change. California also actively entered into discussions with a number of foreign governments, including China. California's active role on climate change was built on the expertise it had acquired in addressing urban air pollution, especially in the Los Angeles area.[110] California's air pollution agency, the California Air Resources Board (CARB), had gained both the expertise and public trust needed to address a problem of the magnitude of climate change.

California aggressively implemented AB 32. The law itself is notably broad and gives the government enormous discretion about how to achieve its goals, though it does rule out a carbon tax. Without trust in CARB, the legislature would undoubtedly have provided much more detailed restrictions on its actions. CARB first developed nine "early action" measures, some of which focused on reducing emissions of non-CO_2 greenhouse gases. One important early action was a mandate to reduce the carbon intensity of transportation fuels by ten percent by 2020.[111]

But CARB's most important action may have been establishing an emissions trading system. AB 32 left it up to CARB to decide whether to adopt emissions trading, an approach favored more by Governor Schwarzenegger than by the legislature. The program originally covered about six hundred industrial facilities, with fuel distributors having been added to the program more recently. California's cap-and-trade program set a declining, statewide cap on greenhouse gas emission. Thus, over time, restrictions on carbon emitters become stricter. Many allowances have been distributed free to firms, but an increasing percentage

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[107] *See* Kirsten H. Engel, *Climate Change Federalism*, Daniel A. Farber and Marjan Peeters (eds.), CLIMATE CHANGE LAW 337 (2016).
[108] AB 4420 (Sher), Chapter 1506, Statutes of 1988.
[109] AB 32 (Nunez), Chapter 488, California Statutes of 2006, codified at CAL. HEALTH & SAFETY CODE §§ 38500 *et seq*.
[110] *See* Ann Carlson, *Regulatory Capacity and State Environmental Leadership: California's Climate Policy*, 24 FORDHAM ENV. L. REV. 63 (2013).
[111] This provision was upheld against a claim that it discriminated against biofuel producers in other states in *Rocky Mountain Farmer's Union v. Corey*, 730 F.3d 1070, 1107 (9th Cir. 2013).

are auctioned. The auctions generate significant amounts of revenue for California.[112] More recently, the state increased the level of ambition in the course of extending its emissions trading program past 2020 and mandated a forty percent cut in greenhouse gases below 1990 levels by 2030.[113] Other climate actions are outside CARB's jurisdiction. For instance, California's Renewable Portfolio Standard, which is administered by the Public Utility Commission, requires utilities to obtain half of their energy from renewable sources by 2030.[114] A 2018 Executive Order by Governor Jerry Brown called for the state to achieve carbon neutrality not later than 2045.[115]

Apart from individual efforts such as California's, states have also combined efforts in regional programs.[116] One such program is the Regional Greenhouse Gas Initiative (RGGI), which is currently composed of nine states: Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont.[117] RGGI created a multistate trading system for power plant emissions with the goal of achieving a ten percent reduction by 2019.[118] In 2013, the cap was reset to ninety-one million tons of carbon, down from 165 million tons.[119] Auction proceeds finance energy efficiency programs, or reduce fee hikes caused by the program.[120] Indeed, many of the carbon reductions associated with the program have stemmed from these energy efficiency programs rather than from the cap itself. The allowance prices remain low, indicating that the cap is still generous, but the cap is set to decline by 2.5 percent annually which should raise prices.[121]

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[112] For a discussion of revenue generation and consequent spending programs, *see* Mac Taylor, THE 2017-18 BUDGET: CAP-AND-TRADE (Feb. 2017), https://lao.ca.gov/reports/2017/3553/cap-and-trade-021317.pdf.

[113] For a summary of California's recent efforts, *see* AB32 Scoping Plan, https://www.arb.ca.gov/cc/scopingplan/scopingplan.htm. The cap-and-trade scheme was extended by AB 398, while SB 32 set the 2030 goal.

[114] California Energy Commission, Renewable Portfolio Standard (RPS), https://www.energy.ca.gov/portfolio/.

[115] Exec. Order No. B-55-18 (2018), to Achieve Carbon Neutrality, https://www.gov.ca.gov/wp-content/uploads/2018/09/9.10.18-Executive-Order.pdf.

[116] *See* Kirsten H. Engel, *Mitigating Global Climate Change in the United States: A Regional Approach*, 14 NYU Envtl. L.J. 54 (2005). For discussion of the legal issues raised by state efforts to limit carbon emissions, *see* Jody Freeman, *The Uncomfortable Convergence of Energy and Environmental Law*, 41 HARV. ENVTL. L. REV. 339 (2017).

[117] The Regional Greenhouse Gas Initiative, https://www.rggi.org/.

[118] *See id*. Emissions across the region dropped by much more than that: "Across the RGGI region, CO2 emissions have dropped over 35% since the program's launch in 2009—thanks in large part to fuel-switching (away from the dirtiest power plants), improved energy efficiency, and growing renewable energy output." CERES. *The Regional Greenhouse Gas Initiative: A Fact Sheet* 2, https://www.ceres.org/sites/default/files/Fact%20Sheets%20or%20misc%20files/RGGI%20Fact%20Sheet.pdf. It seems unlikely that the modest price of RGGI allowances was the driving force behind the bulk of this production, but RGGI may have had an impact on the margin, in part as a source of funding for efficiency improvements.

[119] *See* RGGI, Program Overview, https://www.rggi.org/program-overview-and-design/elements.

[120] *See* RGGI, Investment of Proceeds, https://www.rggi.org/investments/proceeds-investments.

[121] The clearing price at the December 2018 auction was $5.35, generating around $71 million in total revenue.

In another example of coordinated state action, last year the Western Governors' Association passed a bipartisan policy statement related to methane.[122] The statement says that methane is "a potent greenhouse gas emitted from a variety of sources, including oil and gas operations, coal mines, landfills, agriculture, and natural sources."[123] Thus, the statement continues, "[t]here are environmental and economic benefits of reducing methane emissions and opportunities for the beneficial use of this natural resource."[124] Consequently, the statement calls for federal methane regulation to:

> (1) ensure that the capture, commoditization, and sale of methane is promoted; (2) give states the flexibility to integrate a variety of technologies and tools to achieve methane emission reduction standards; (3) recognize methane emissions reductions that result from existing state regulation of volatile organic compounds; and (4) work with states to ensure the consistent use of a single, clear method of quantifying methane emissions.[125]

This statement is especially noteworthy because the Association includes governors of all the Western states, including several conservative Republican governors.

In addition to actions at the state level, many cities have adopted climate action plans.[126] Although cities have less extensive regulatory powers under U.S. law than state governments, some specific aspects of emission reduction directly relate to municipal activities. Urban planning and land use control are important municipal functions with significant implications for climate change. American cities are prone to urban sprawl, in which they expand geographically and increase the number of people commuting in automobiles. Good planning can limit sprawl by encouraging development near mass transit or reducing barriers to the use of public transportation. Cities may also use their building codes to encourage more energy-efficient buildings and take steps to promote greater use

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[122] Western Governors Association, Policy Resolution 2018-05: *Air Quality and Methane Emissions Regulation* (2018), http://westgov.org/images/editor/WGA_PR_2018-05_Air_Quality.pdf. The Western Governors Association consists of the governors of nearly twenty states in the Western United States.

[123] *Id*.

[124] *Id*.

[125] *Id*.

[126] For an overview of what U.S. cities are doing, *see* Cynthia Rosenzweig and William D. Solecki, CLIMATE CHANGE AND CITIES: SECOND ASSESSMENT REPORT OF THE URBAN CLIMATE CHANGE RESEARCH (2018). For more on climate action by cities, *see* Magali Dreyfus, *Are Cities a Relevant Scale of Action to Tackle Climate Change?*, CARBON & CLIMATE L. REV. 283 (2013); *Richard B. Stewart, States And Cities as Actors in Global Climate Regulation: Unitary vs. Plural Architectures*, 50 ARIZ. L. REV. 681 (2008). A more internationally focused discussion of local climate action can be found in Benjamin J. Richardson, *Local Authorities and Climate Change in Cities and Other Localities*, (Benjamin J. Richardson ed. 2012).

of renewable energy, such as eliminating zoning restrictions that could hinder rooftop solar.

In addition, city governments can reduce their own energy use and can adopt renewable sources of energy, such as generating electricity from methane produced by waste. Municipalities own a significant number of buildings and numerous vehicles such as police cars, so potential emissions reductions are not trivial. Finally, a number of cities run their own electrical utilities (as opposed to the more common pattern of private ownership), which sometimes have adopted ambitious renewable energy and energy efficiency programs. Given the proportion of the population and the economy found in urban areas, these are not necessarily insignificant steps.

We do not have rigorous social science evidence to explain why some states and cities have moved forward so dramatically on climate policy.[127] The jurisdictions that have had the strongest programs tend to share some common characteristics. They tend not to be coal producers. Apart from California, they tend not to be oil producers either. They are often highly urbanized with strong local economies. They also tend to favor the Democratic Party politically. Motives for climate action could take many forms. Some jurisdictions may see economic advantages, either from the jobs and investment stemming from renewable energy projects or from developing new energy technologies, an especially important consideration in California given the economic role of Silicon Valley. States and cities may be expressing their opposition to presidents such as Bush or Trump by taking contrary action. Or they may want to start the shift toward a low-carbon economy early, so as to manage a smoother transition, rather than having to take more drastic steps later.

It is important to note that states, cities, and corporations are not merely acting on their own. They are also establishing strong cooperative networks. For instance, the Under2 coalition crosses international borders, with members in the United States along with areas as diverse as Canada, Brazil, and Indonesia.[128] The coalition's Memorandum of Understanding (MOU) states that the

> guiding principle for reduction of greenhouse gas emissions by 2050 must be to limit global warming to less than 2°C. For parties to this MOU this means pursuing emission reductions consistent with a trajectory of 80 to 95 percent below 1990 levels by 2050 and/or achieving a per capita annual emission goal of less than 2 metric tons by 2050.[129]

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[127] For thoughts on this issue, *see* 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 URBAN LAYWER 1015 (2006).

[128] The Climate Group, *About the Under 2 Coalition*, https://www.under2coalition.org/about (last visited Apr. 25, 2019).

[129] RGGI, *Memorandum of Understanding* 1-2, https://www.theclimategroup.org/sites/default/files/under2-mou-with-addendum-english-us-letter.pdf (last visited Apr. 25, 2019).

The C40 coalition is a similar network composed of cities rather than states around the world.[130] Another coalition brings together dozens of U.S. city mayors.[131] On the business side, the CERES organization represents 163 institutional investors, collectively managing more than $25.4 trillion in assets.[132] CERES "works with investors specifically to better manage carbon, water and supply chain risks, and ramp up global investments in clean energy and sustainable food and water systems."[133] In addition, its members "pressure stock exchanges and capital market regulators to improve climate and sustainability risk disclosure, and opportunities to advocate for stronger climate, clean energy and water policies at all levels of government."[134] With membership from all these sectors, We're Still In includes ten states, over 250 cities and counties, and over two thousand businesses and investors,[135] having begun as "a promise to world leaders that Americans would not retreat from the global pact to reduce emissions and stem the causes of climate change."[136]

The national political switch from Obama to Trump does not seem to have discouraged these efforts. Indeed, if anything, non-federal climate action seem to have redoubled since Trump's election, with important new initiatives in 2018.[137] To take only three examples from that year: (1) California mandated that all new homes have solar energy[138] and adopted bold new goals in a statute mandating 100% carbon-free electricity by 2045;[139] (2) Connecticut adopted new laws requiring utilities to get forty percent of their power from renewable sources by 2030, mandating that the state cut greenhouse gases forty-five percent below 2001 levels by 2030, and requiring that government-funded coastal projects take

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[130] C40 Cities, *Cities Will Shape Our Future*, https://www.c40.org/cities (last visited Apr. 25, 2019).
[131] Climate Mayors, *Members*, http://climatemayors.org/about/members/ (last visited Apr. 25, 2019).
[132] Ceres, *Investor Network on Climate Risk and Sustainability*, https://www.ceres.org/networks/ceres-investor-network (last visited Apr. 25, 2019).
[133] *Id*.
[134] *Id*.
[135] We Are Still In, *Who's In*, https://www.wearestillin.com/signatories (last visited Apr. 25, 2019).
[136] *Id*.
[137] *See* Daniel A. Farber, *States Rally Around Renewables: States have Ignored Trump to Promote Clean Energy within Their Borders*, Legal Planet (Oct. 25, 2018), http://legal-planet.org/2018/10/25/despite-trump-energy-policy-moves-forward/ (listing actions in multiple states.).
[138] Ivan Penn, *California Will Require Solar Power for New Homes*, NY TIMES (May 9, 2019), https://www.nytimes.com/2018/05/09/business/energy-environment/california-solar-power.html.
[139] Marianne Lavelle, *California Ups Its Clean Energy Game: Gov. Brown Signs 100% Zero-Carbon Electricity Bill*, Inside Climate News (Sept. 20, 2018), https://insideclimatenews.org/news/28082018/california-100-percent-clean-energy-electricity-vote-climate-change-leadership-zero-carbon-electric-vehicles.

into account a projected sea rise of two feet by 2050;[140] (3) New Jersey's Governor signed an executive order to begin rejoining the RGGI regional carbon trading system,[141] and he also signed new legislation increasing the renewable energy mandate to thirty-five percent by 2025 and fifty percent by 2030, with special provisions to encourage solar and offshore wind.[142] Thus, the impetus for nonfederal climate actions seems robust enough to survive a harsh national political climate.

It is always tempting to oversell a new development as transformational. But it would be hard to come up with other examples of states, cities, and corporations taking serious cooperative action to address a global problem, environmental or otherwise. Moreover, when the federal government does someday—hopefully not too far in the future—undertake a major role in reducing emissions, it will be acting in a setting in which many jurisdictions have active programs of their own. It is conceivable that the federal government could preempt the entire field of carbon emissions reductions, but it would surely face strong pressure against doing so from many jurisdictions. It seems more likely that any federal plan will attempt to leverage state and local efforts rather than abandon the serious investment those jurisdictions have already made in climate action. Notably, even though the European Union is far ahead of our federal government in climate action, individual jurisdictions such as Germany still have their own strong climate programs.[143] There is no obvious reason why something similar would not happen in the United States. Thus, it seems likely that state and local activity will prove durable and will interact with, rather than being eliminated by, a strong federal program.

Assuming that state and local climate policies, not to mention independent corporate action, are likely to be long-term, significant features of climate change mitigation, it behooves us to try to understand how they operate. Part III undertakes this task by seeking to understand the ways in which these governmental programs interact with each other and with the energy sector.

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[140] Bill Cummings, *Malloy Signs Clean Energy and Climate Bills*, CT Post (June 20, 2018), https://www.ctpost.com/news/article/Malloy-signs-clean-energy-and-climate-bills-13010842.php?utm_source=Federal+State+Policy+Updates+June+2018&utm_campaign=State.

[141] Peter Maloney, *New Jersey to Rejoin RGGI in New Executive Order*, Utility Dive (Jan. 29, 2018),https://www.utilitydive.com/news/new-jersey-to-rejoin-rggi-in-new-executive-order/515802/.

[142] David Roberts, *The latest state to get serious about climate change is ... New Jersey?*, VOX (May 24, 2018), https://www.vox.com/energy-and-environment/2018/4/20/17255872/new-jersey-nuclear-renewable-energy-phil-murphy.

[143] On the German program, *see* Kerstine Appunn & Julian Wettengel, *Germany's Greenhouse Gas Emissions and Climate Targets*, CLEAN ENERGY WIRE (Jan. 21, 2019), https://www.cleanenergywire.org/factsheets/germanys-greenhouse-gas-emissions-and-climate-targets.

III. An Emerging Climate Governance Regime

The current blossoming of state and local climate policies do not fit the model of states making their own tradeoffs between local pollution and local economies. Nor do the voluntary actions by major multinational corporations fit our traditional conceptions of industry behavior. They have mutually supported each other and influenced climate policies elsewhere. In many areas where state governments are active, such as their traditional roles in family and criminal law, state activities are relatively independent of each other. But important synergies between the actions of individual states and local governments magnify their impacts, synergies that may also include the private sector. Section A discusses important feedback effects between efforts in different jurisdictions. Because of the complexity of these interactions, Section B suggests that the best analogy for the emerging climate regime is a biological ecosystem—or in this case, a governance ecosystem.

A. Feedback Effects

Any single jurisdiction or corporation can at best make a modest contribution to reducing global emissions on its own. Only for the largest nations such as China or the United States will those contributions be substantial standing alone. But if emissions reductions in one jurisdiction strengthen climate policy in others, feedback effects could amplify the impact of a jurisdiction's actions. The potential exists for a snowball effect, in which mutually reinforcing actions by governments and the private sector escalate and ultimately transform the energy system.

It is worth trying to tease out the ways in which feedback could arise. Emission reductions could promote further mitigation if they either increase the economic or political benefits of further reductions (by the same emitters or others), or else decrease the economic or political costs of those reductions. There are several ways that this kind of beneficial feedback could take place. One is that expansion of renewable energy in some jurisdictions can contribute to economies of scale, reducing the cost of renewables and promoting their adoption in other jurisdictions.[144] As the cost of renewable energy and other technologies such as

[144] At some point, the process may become self-sustaining. *See Renewable Energy 'Economies Of Scale' Propel Sector Despite Falling Subsidies*, ENGINEERING AND TECHNOLOGY (Feb. 18, 2018), https://eandt.theiet.org/content/articles/2018/02/renewable-energy-economies-of-scale-propels-sector-despite-falling-government-subsidies/ ("We are at that point where things are starting to become self-propelled and the incentives themselves are no longer coming from government, but from the economies of scale and the value of the assets themselves."). Consider this comment from Australia, a country strong committed to the production and use of coal: "Falling renewables prices may be the most important development in the climate situation today. The rapidly falling cost of renewable energy and batteries is 'chilling' for the future of the fossil fuels sector, raising doubts about the viability of new coal power stations." Cole Latimer, *Falling Renewable Costs*

storage fall, adopting stronger climate mitigation efforts becomes less costly and therefore less politically challenging.

A more subtle effect involves technological innovation.[145] As Zachary Liscow and Quentin Karpilow have pointed out, the incentives for innovation increase with an expansion in the markets for the relevant technologies.[146] They argue that this can produce innovation snowball effects, in which innovations expand market sizes, which then create the opportunity for additional innovation to thrive, and so forth. Liscow and Karpilow draw on an extensive body of economic research to analyze the dynamics of this process. For example, they say, "if there is a blockbuster solar innovation, innovators will flock to solar and away from dirtytech because solar is now the cheapest technology, meaning new solar innovations can be immediately commercialized for a larger number of users." [147] Consequently:

> [f]ollow-up solar innovations will only further reduce the costs of solar and attract even more innovators from dirtytech to cleantech, accelerating cleantech innovation even more. Innovation in solar will, in other words, snowball, gathering speed, mass, and momentum as more innovations and innovators gravitate toward the technology with the largest stock of knowledge.[148]

To launch this cycle, they call for a "big push" in investment for research and development: "innovation policy should be at the core of environmental policy—and likely other areas of policy as well. In particular, environmental policy should include innovation policy that specifically encourages cleantech, since cleantech innovation needs a big push so that its innovation will snowball beyond that of dirtytech."[149] State and local level carbon reduction strategies can contribute to this effect by expanding the market for clean technologies, creating an incentive for innovation.

'Chilling' tor Fossil Fuels, SYDNEY MORNING HERALD (March 30, 2018), https://www.smh.com.au/business/the-economy/falling-renewable-costs-chilling-for-fossil-fuels-20180329-p4z6vb.html.

[145] On the importance of designing climate policies to foster innovation, *see* David Adelman and Kirsten H. Engel, *Reorienting State Climate Change Policies to Induce Technological Change*, 50 ARIZ. L. REV. 833 (2008).Adelman and Engel presciently argued that:

> States clearly have a role to play in promoting technological change. To the extent that market size matters, state programs will be inferior to federal regulation. However, while state-level regulation may provide weaker overall incentives, its compensating virtue is the diversity of approaches and experimentation that are a hallmark of state policies. Moreover, where innovation is subject to substantial uncertainties, diversity is often more important than the coordination and large scale found in federal programs.

Id. at 852.

[146] Zacharty Liscow & Quentin Karpilow, *Innovation Snowballing and Climate Law*, 95 WASH. U. L. REV. 385 (2017).

[147] *Id.* at 390.

[148] *Id.*

[149] *Id*. at 391.

Pressure by firms exporting into a jurisdiction could provide another mechanism by which mitigation in some jurisdictions could broaden to include others. A firm that has invested in methods to reduce emissions, or has developed in-house expertise, has an incentive to capitalize on its strength by expanding its efforts to sell similar technology in other jurisdictions.

A related form of leverage available to individual jurisdictions involves industry aversion to patchwork regulations. Lack of uniformity imposes significant costs on multinationals like Walmart. This can lead industry to support uniform regulation across jurisdictions, even if industry's ideal outcome would be to have no regulation at all.[150] Manufacturers' desire for uniformity helped spark international action to protect the ozone layer.[151] A similar desire for uniformity may have contributed to the enactment of major federal environmental legislation in the 1970s.[152]

Lack of uniformity is also a problem for the international transportation industry. The European Union (EU) used this form of leverage to prompt international action on aviation emissions. The EU has brought international flights under its trading system, requiring allowances or offsets for all emissions during a flight (both inside and outside European air space).[153] The EU hinted, however, that it would relent if an international agreement on airline emissions were in store.[154] Ultimately, the international body governing aviation adopted a global plan for reducing emissions.[155]

Climate action in one jurisdiction can also make action more appealing to others. Successful climate programs can serve as models for other jurisdictions, reducing the difficulty of adopting new policies. Expertise developed under a successful program can be used to advise other programs or help train program staff. Local climate actions may also be self-sustaining politically. As the use of clean technologies such as renewable energy expands, industry firms gain wealth and increase their number of employees. This may expand their political influence

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[150] *See* J.R. DeShazo and Jody Freeman, *Timing and Form of Federal Regulation: The Case of Climate Change*, 155 U. PA. L. REV. 1499, 1506–10 (2006–07).

[151] Kirsten H. 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 URBAN L. 1015, 1026–27 (2006).

[152] *See* E. Donald Elliott, Bruce A. Ackerman, and John C. Millian, *Toward a Theory of Statutory Evolution: The Federalization of Environmental Law*, 1 J. L. ECON. & ORG. 313, 326–28 (1985).

[153] *See* Joshua Meltzer, *Climate Change and Trade—The EU Aviation Directive and the WTO*, 15 J. INT'L ECON. L.111, 114 (2012) (questioning whether the directive complies with WTO requirements).

[154] *See* Daniel Pruzin, *Official Says EU Will Not Suspend Inclusion of Airlines in Trading Plan as Talks Continue*, 43 ENVIR. REP. (BNA) 742 (2012).

[155] Julia Fioretti, *EU Pushes Back Against Weakening of Aviation Emissions Deal*, FORBES (June 5, 2018), https://www.reuters.com/article/us-climatechange-aviation-eu/eu-pushes-back-against-weakening-of-aviation-emissions-deal-idUSKCN1J128E.

within a jurisdiction.[156] At the same time, fossil-fuel related activities lose revenue and employees as they contract, incrementally diminishing their political base. Moreover, with successful deployment of clean technologies, it becomes harder to argue that their use is impractical or economically unacceptable. The result is that the further a jurisdiction moves toward reducing emissions, the more politically appealing that further reductions become. The extensive scholarly literature on policy diffusion confirms the existence of a tendency to follow the lead of jurisdictions with seemingly successful programs.[157] Moreover, countries often emulate similar countries even without evidence of policy success.[158] Notably, diffusion is well documented in terms of environmental policies.[159]

Although the emphasis in this discussion has been on governmental action, major corporations are also in a position to contribute to these feedback effects. They may pressure their suppliers to reduce carbon emissions. Corporate efforts to reduce their own emissions can contribute to expanding the demand for clean technology, and at least some firms may also be active as technology innovators. Moreover, in order to meet their own targets for emission reductions, corporations may pressure jurisdictions to make regulatory changes conducive to use of renewable energy—a kind of race to the top mechanism. Finally, the expanding web of carbon mitigation regulations in multiple jurisdictions may give companies an incentive to take proactive measures to reduce their own emissions, closing the feedback loop between regulatory and firm activity.

This section has outlined some of the economic and political dynamics that could increase cooperation, as jurisdictions gain confidence in each other and their individual economics and political dynamics shift in favor of mitigation. There is no guarantee that such dynamics will occur, but the possibility does provide support for independent action at the national or sub-national level without waiting for an international mandate. It would be difficult to provide definitive proof about the relative strength of positive versus negative feedback effects in the adoption of local mitigation efforts and in international bargaining positions. For example, it is possible that some jurisdictions would decide to "free ride" on the climate mitigation efforts of others. The widespread adoption of carbon mitigation strategies suggests, however, that the positive effects outweigh the negative ones.

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[156] *See* Eric Biber, *Cultivating a Green Political Landscape: Lessons for Climate Change Policy from the Defeat of California's Proposition*. 23 VAND. L. REV. 400 (2013).

[157] *See* Chang Kil Lee and David Strang, *The International Diffusion of Public-Sector Downsizing: Network Emulation and Theory-Driven Learning*, 60 INT'L ORG. 883, 905 (2006); Fabrizio Gilardi, Katharina Füglister, and Stéphane Luyet, *Learning and the Conditional Diffusion of Health-Care Cost-Sharing Policies in Europe* 2–3 (Working Paper, 2010), http://www.fabriziogilardi.org/resources/papers/refprice_july2010.

[158] Katerina Linos, *Diffusion through Democracy*, 55 AM. J. POL. SCI. 678, 691 (2011).

[159] Joanne Scott, *From Brussels with Love: The Transatlantic Travels of European Law and the Chemistry of Regulatory Attraction*, 57 AM. J. COMP. L. 897 (2009); Per-Olof Busch, Helge Jörgens, and Kerstin Tews, *The Global Diffusion of Regulatory Instruments: The Making of a New International Environmental Regime*, 598 ANNALS OF THE AM. ACAD. OF POL. AND SOC. SCI.146 (2005); David John Frank, Ann Hironaka, and Evan Schofer, *The Nation-State and the Natural Environment over the Twentieth Century*, 65 AM. SOC. REV. 96 (2000).

The rich interactions between different jurisdictions, along with the diffusion of climate governance among many entities, present a novel situation in terms of environmental governance. The next section will provide an effort to conceptualize these developments.

B. Conceptualizing Climate Governance as Ecosystem

One available model that might be used is that of network governance. The importance to climate policy of networks of jurisdictions is not an unfamiliar idea.[160] These networks provide "useful services that maximize a city's emissions reduction efforts, including (1) direct assistance through on-the-ground support staff and expert consultative services; (2) peer-to-peer exchange; and (3) research, data, knowledge, and communication management services that identify problems and successes, and measure the progress of the network."[161] They also provide the opportunity for learning through policy experimentation.[162] These accounts stress the important role that networks play in information exchange and public outreach and coalition-building.[163]

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[160] *See* Devani G. Adams, *Why We Cannot Wait: Transnational Networks as a Viable Solution to Climate Change Policy*, 13 SANTA CLARA J. INT'L L. 307, 321 (2015); Hari M. Osofsky and Janet Koven Levit, *The Scale of Networks: Local Climate Change Coalitions*, 9 CHI. J. INT. L. 409 (2008). The idea of network governance has broader roots in international law. Anne Marie Slaughter, A NEW WORLD ORDER (2004); Kenneth Anderson, *Squaring the Circle? Reconciling Sovereignty and Global Governance through Global Government Networks*, 118 HARV. L. REV. 1255 (2005). In the environmental sphere, *see* Daniel Bodansky, *The Legitimacy of International Governance: A Coming Challenge for International Environmental Law*, 93 AM. J. INTL. L. 596, 619-23 (1999).

[161] *Id*. at 322.

[162] *Id*. at 328.

[163] Adams lists several such informational functions:

> First, transnational networks provide an alternative forum for policymakers to discuss issues of concern without the pressures or rigidity of traditional lawmaking. . . .
>
> Second, crucial to the conversation, transnational networks provide a direct way of sharing information and experiences. For local policymakers, an organization like the U.S. Conference of Mayors provides a forum to share similar experiences. . . .
>
> Third, transnational networks create more institutions to deal with climate change. . . . For example, the network has made the voice of its 700 participants heard by speaking at the 18th Conference of the Parties to the UNFCCC at Doha.
>
> Fourth, transnational networks function to educate individuals, communities, and nations. Networks educate others not only about their own perspectives on climate change and what they do, but they also provide a forum for science transparency. . . .

Id. at 329-330. Finally, Adams says, the members of these networks are at least taking action, which is more than can be said for some nation states. *Id.* at 330.

The network model captures some important features of the emerging climate governance regime, but there are other aspects it overlooks. First, rather than a single network, there are multiple, overlapping networks, with members from multiple sectors and jurisdictions, including national, state, and local governments, as well as corporations. Second, as the list above indicates, not all the activities within the network are information flows between members. Networks also provide opportunities to build political coalitions that can take action outside the coalition. Third, organizations of jurisdictions may also increase the political rewards for politicians in adopting climate policies, incentivizing them to do more. Membership in a coalition is also a way for politicians to communicate their commitments to constituents and obtain external validation for their climate policies. Fourth, group efforts can also provide the setting for financial support. The Paris Agreement can be considered a coordination mechanism, and it has the earmarks of a voluntary association rather than a treaty.[164] It not only provides a mechanism for jurisdictions to make public commitments to control emissions but also calls for financial support to be directed to developing countries.[165]

As discussed earlier, another crucial impact of climate action by individual jurisdictions or coordinated action through networks involves another channel having nothing to do with information flows. As more jurisdictions demand the use of clean technologies, the markets for these technologies grow. The increase in economies of scale and the opportunity for businesses to engage in learning-by-doing reduce prices, making it possible for the use of these technologies to expand in other jurisdictions. Awareness of this economic dynamic provides another incentive to join coalitions.

In short, the operation of bottom-up climate governance is more complex than the network analogy. Networks are important for many reasons other than information exchange between members. They give jurisdictions a way of publicizing and obtaining validation for their work, increase the visibility of local politicians, help organize efforts to exercise joint political influence, and provide options for financial support. There are multiple, overlapping networks. Moreover, the members of these networks interact with the private sector in multiple ways, not simply by reducing their own emissions. Some networks may include industry members or obtain financial support from industry. Concerted regulatory efforts by jurisdictions can shift the cost curve for clean technologies, encouraging their expansion elsewhere and expanding markets for technological innovations.

Because governmental and non-governmental actors influence each other, attract new network members, and impact non-network members through multiple direct and indirect channels, networks such as the Internet provide an inadequate

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[164] For the text of the Paris Agreement, *see* United Nations, Paris Agreement, https://unfccc.int/sites/default/files/english_paris_agreement.pdf.

[165] Paris Agreement, Article 9(1) provides: "Developed country Parties shall provide financial resources to assist developing country Parties with respect to both mitigation and adaptation in continuation of their existing obligations under the Convention."

model. The situation with the closest resemblance, in terms of the varied and complex relationships between entities, would seem to be an ecosystem. Within an ecosystem, species also interact in multiple ways, providing food sources for some other species, engaging in predation, modifying habitat in ways that are favorable or unfavorable to others, and providing habitat themselves in many cases. Within a species, there can be cooperation or competition between different members of the species. None of these is exactly parallel to the behavior of governmental entities or firms, but the analogy seems closer than networks such as the Internet or the electric grid.

A benefit of the ecosystem analogy is that it captures both the complexity of the energy/policy system and also the diverse types of interactions that take place. There are many channels for policy decisions to affect the energy mix, and vice versa, and for actions at one time and place to have ripple effects throughout the system. Of course, we are (often) intelligent actors who adjust our behavior according to available information, which makes the ecosystem analogy inexact, but it still captures something about the way the system works.

The ecosystem model becomes even more appealing when we take into account the existence of competing actors, primarily the fossil fuel industry and their political allies. The complexity of these mutually beneficial or harmful interactions seems most reminiscent of an ecosystem in which various species interact in many ways: predation, symbiotic relationships, providing habitat or diminishing it, and so forth. The multiplicity of the available actors is also reminiscent of an ecosystem.

From this perspective, we can see the effort to decarbonize in a different light. The old "ecosystem" of fossil fuels has been invaded by new species such as solar power, wind energy, electric vehicles, and energy storage. The political symbionts of the fossil fuel sector are also being challenged by new political ideas and organizations. The open question is whether the invasive species will be successful in dominating the ecosystem and pushing the native species toward extinction. In a sense, this is a simple question about whether the invaders' reproduction rate exceeds their death rate, leading their expansion to continue. (And correspondingly, whether the natives have a higher death rate than replacement.) Sometimes this can happen simply because individual members of the invading species outcompete the natives. The counterpart for energy would be that renewable energy just gets cheaper and more appealing, driving out less efficient fossil fuels. We've actually started to see this in the United States, with renewables and natural gas combining to push coal out of the market. Whether this continues at the global level remains to be seen. Part of the answer depends on the cost curve for mitigation methods. The more rapidly costs fall over time, the better. This requires that the bottom-up efforts are sufficiently widespread and sufficiently ambitious to provide markets for increased production efficiency and for innovation. Some of this depends on characteristics of technologies that may not be known at the outset. But other factors include whether jurisdictions

are willing to invest in research and development to improve mitigation technologies and whether there is a sufficiently large initial core of committed jurisdiction—enough of a critical mass to get the process going.

The invasive species can succeed in another way, however, not just by one-on-one superiority. They can modify the environment in a way that is more favorable to them than to the natives—perhaps by causing habitat modifications or changes in prey/predator relationships. The more invaders there are, the stronger this process becomes. Human beings are really good at this. We're individually weaker than many other species, but we're good at modifying the habitat to our benefit, and we do so more readily as we increase population and access to resources. This is akin to the process described in this Article, whereby multiple jurisdictions create a more welcoming habitat for clean technologies, which in turn makes it easier for additional jurisdictions to join the effort.

IV. Conclusion

The blossoming of environmental statutes in the 1970s left us with a complex statutory regime, centered on uniform federal regulations. In rough terms, the basic structure involved the EPA creating environmental mandates based on uniform standards for environmental quality or the best available technology for emissions reductions. Sometimes these standards might apply directly to polluters without any participation by state governments, in others states were charged with writing permits or adopting compliance plans, which then became binding on industry. Despite these variations, the basic idea was that the EPA would create uniform national standards for industry, with states playing a purely subordinate role. This picture undoubtedly was an oversimplification, but it contained enough truth to give bite to the arguments of critics.

Those critics proposed a variety of remedies. As explained in Part I, some critics argued for the adoption of emissions fees or emission trading systems as a more flexible means of achieving environmental standards. Another group of critics argued for a less hierarchical relationship with industry, making more use of collaboration and informational tools. Yet another group of critics, discussed in Part II, argued for a diminished federal role, leaving it to the states to create their own standards depending on how much they were willing to trade off environmental quality for economic welfare. These reform proposals have not succeeded in replacing the 1970s regulatory framework. Yet, they have supplemented it in important ways.

These reform proposals have also found a place in the emerging regime for governing climate change, which contains emissions trading schemes, flourishing state regulatory schemes, and collaboration with industry. But in other respects, the current regime seems at odds with the reform proposals. Conventional regulations are also an important part of the climate regime. The state role has emerged in dealing with pollutants that have global causes and effects, rather than localized impacts where the state role seems more obvious. Not only states but also cities have taken action, and some parts of the private sector have aggressively pursued voluntary emissions reductions. And none of

this has taken place on a purely state-by-state basis; instead, it has involved multiple networks for cooperation between jurisdictions that cross national borders. The federal government has not been able to play a substantial role to date, and when it (hopefully) takes real action it will need to do so in the context of the existing efforts of other actors. Those existing efforts should make federal action easier because implementation will be less costly and much of the necessary regulatory expertise is already in existence.

Others have viewed the climate governance regime as a network. Because of the complexity of the interactions between these actors, however, a more appropriate model for this climate regime is an ecosystem. The network model is too limited to capture the complex interactions between individual jurisdictions and the private sector. It also overlooks another important fact: while actors have mutually beneficial interactions, they also compete with other networks representing fossil fuel producers and jurisdictions that economically benefit from them. There may also be snowball effects in those interactions: the more jurisdictions that join the climate-reduction effort, the more the clean energy industry grows as a counterweight to fossil fuels, and the weaker the political influence of the pro-fossil fuels jurisdictions.

Models and analogies can never capture the full dynamics of social institutions, and they risk oversimplifying or exaggerating features of reality. Whether or not the ecosystem paradigm is the right way to capture recent developments, it seems clear that we are something rather different in the way of environmental governance. While the federal environmental apparatus seems to have evolved organically by adding new features such as emissions trading, the role of non-federal actors seems to have mutated to fill the empty niche left by the unsteady federal response to climate change. This seems on the whole to be a very positive development, though we must hope that the federal government does eventually establish a robust presence. Only time will tell whether this process will intensify and expand quickly enough to head off the worst effects of climate change.