STREAMS OF ENVIRONMENTAL INNOVATION: FOUR DECADES OF EPA POLICY REFORM

BY

DANIEL J. FIORINO*

The dynamic and rapidly changing field of the environment presents many examples of policy innovation. These various efforts may be organized in streams of environmental policy innovation. Of the many such innovation streams undertaken by the United States Environmental Protection Agency in recent decades, five are examined and compared on the basis of the perceived deficiency that led to the policy change, their design and applications, the conceptual basis for the innovation, and the durability of the change. The five innovation streams are emissions trading, program integration, risk-based planning, regulatory and permitting flexibility, and voluntary programs. Among the factors that may be associated with the more durable innovations are consensus on a need for change; demonstrable, near-term gains in economic efficiency and environmental effectiveness, rather than in institutional capacity; and a strong theoretical and statutory foundation. The difficulty of meeting these conditions explains, at least in part, why innovation in environmental policy has been so challenging over the years.

* Director of the Center for Environmental Policy and Distinguished Executive in Residence in the School of Public Affairs, American University, Washington, D.C.

I. INTRODUCTION

The idea of innovation has become almost a mantra for all organizations, public and private. The world is changing rapidly and organizations must adapt. For the private sector, economic relationships change, customers demand new products and services, technologies become outdated, and pressure from competitors is relentless. For public agencies, demands for efficiency and quality increase, budgets become more constrained, political executives want measurable results, and citizens want greater engagement. Doing things a certain way because that was how they were done in the past is no longer acceptable. The white water conditions of modern society demand innovation.

This innovation imperative would seem as or more relevant to organizations in the field of environmental policy. Indeed, the concept of the environment raises some of the most dynamic and rapidly changing issues faced by government. Forty years ago, air and water pollution from large industrial sources were defined as the main environmental problem.[1] Then, abandoned hazardous waste sites, residential radon, and ozone-depleting chemicals were added to the list.[2] More recently, climate change, energy and water security, deforestation, and habitat loss have figured more prominently on policy agendas.[3] Along with a growing list of problems has come a reconceptualization of the policy field more generally. Concerns about environmental *protection* have largely been replaced with a greater focus on environmental *sustainability*, in recognition of the complex interrelationships that exist among economic, political, and social choices.[4]

The institutional and social aspects of environmental policy also have changed. Reflecting, in part, the ideas of "new" public management, problem solving is viewed in most developed countries not just as the responsibility

1 *See* Federal Water Pollution Control Act, Pub. L. No. 92-500, 86 Stat. 816 (codified as amended at 33 U.S.C. §§ 1251–1387 (2006)); *see also* Clean Air Act of 1970, Pub. L. No. 91-602, 84 Stat. 1676 (codified as amended at 42 U.S.C. §§ 7401–7671q (2006)).

2 *See* Toxic Substances Control Act 15 U.S.C. §§ 2661–2671 (2006). *See generally* 26 U.S.C. §§ 4681–4682 (2006) (imposing prohibitive taxes on production and sale of ozone-depleting chemicals); 42 U.S.C. § 9601(22) (2006) (defining the term "release" to include abandoned or discarded hazardous waste containers).

3 *See, e.g.*, EXECUTIVE OFFICE OF THE PRESIDENT, THE PRESIDENT'S CLIMATE ACTION PLAN 6–7, 14–15, 18–20 (2013), *available at* http://www.whitehouse.gov/sites/default/files/image/president27sclimateactionplan.pdf.

4 *See* Robert F. Durant, *Reconceptualizing Purpose*, *in* ENVIRONMENTAL GOVERNANCE RECONSIDERED: CHALLENGES, CHOICES, AND OPPORTUNITIES 29, 30–32 (2004); TOWARD SUSTAINABLE COMMUNITIES: TRANSITION AND TRANSFORMATIONS IN ENVIRONMENTAL POLICY (Daniel A. Mazmanian and Michael E. Kraft eds., 2d ed. 2009); NATIONAL RESEARCH COUNCIL OF THE NATIONAL ACADAMIES, SUSTAINABILITY AND THE U.S. EPA 93–94 (2011) (discussing EPA's implementation of a culture shift toward sustainability); *see also* Daniel J. Fiorino, *Sustainability as a Conceptual Focus for Public Administration*, 70 PUB. ADMIN. REV. (SPECIAL ISSUE) S78, S82–83 (2010) (positing that environmental policies require public administration based on sustainability).

of government but of a range of institutions in society.[5] Leading firms have moved from a culture of resisting regulation to internalizing it and moving beyond compliance in their environmental performance.[6] Nonprofit organizations and collaborative institutions play an increasingly prominent role in finding and promoting solutions. From an initial focus on hierarchical, expert-based regulation, environmental policy in most countries increasingly incorporates economic incentives, information-based approaches, public-private partnerships, as well as other tools.[7] At the same time, the resources available to government agencies are falling as compared to the number of environmental problems they confront.[8] In sum, the innovation imperative common to all organizations is alive and well in environmental policy.

Despite this imperative, innovation as an area of systematic study has drawn only scattered attention from environmental policy practitioners and researchers. To be sure, many studies of specific innovations exist, and several are discussed below.[9] The task of defining and categorizing policy innovation generally, however, has drawn less attention. What types of innovation have been attempted? What have been their objectives? How have they evolved? What explains their success or failure? What are their assumptions and conceptual foundations? What lessons for policy design and implementation may be drawn from them? The purpose of this Article is

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5 *See* John M. Kamensky, *Role of the "Reinventing Government" Movement in Federal Management Reform,* 56 PUB. ADMIN. REV. 247, 250–52 (1996). *See generally* JAN KOOIMAN, MODERN GOVERNANCE: NEW GOVERNMENT-SOCIETY INTERACTIONS (1993) (providing a social and legal theory perspective on allocating responsibility across the public–private sphere); Andrew Stark, *What is the New Public Management?*, 12 J. PUB. ADMIN. RESEARCH AND THEORY 137, 137–51 (2002) (summarizing the concept of "new public management" and the related concept of government reinvention); Gunther Teubner, *Substantive and Reflexive Elements in Modern Law*, 17 LAW & SOC'Y REV. 239, 239–81 (1983); GUNTHER TEUBNER ET AL., ENVIRONMENTAL LAW AND ECOLOGICAL RESPONSIBILITY: THE CONCEPT AND PRACTICE OF ECOLOGICAL SELF-ORGANIZATION (1994) (discussing ecological contracts, positive management, ecological covenants, self-regulation in environmental law, and environmental management, among other related matters).

6 *See generally* DANIEL C. ESTY & ANDREW S. WINSTON, GREEN TO GOLD: HOW SMART COMPANIES USE ENVIRONMENTAL STRATEGY TO INNOVATE, CREATE VALUE, AND BUILD COMPETITIVE ADVANTAGE 10–12 (2006); FOREST L. REINHARDT, DOWN TO EARTH: APPLYING BUSINESS PRINCIPLES TO ENVIRONMENTAL MANAGEMENT 233 (2000).

7 For discussions, see Theo de Bruijn & Vicky Norberg-Bohm, *Introduction: Toward a New Paradigm for the Transition to a Sustainable Industrial Society?*, *in* INDUSTRIAL TRANSFORMATION: ENVIRONMENTAL POLICY INNOVATION IN THE UNITED STATES AND EUROPE 1 (Theo de Bruijn & Vicky Norberg-Bohm eds., 2005); Thomas Dietz & Paul C. Stern, *Exploring New Tools for Environmental Protection, in* NEW TOOLS FOR ENVIRONMENTAL PROTECTION: EDUCATION, INFORMATION, AND VOLUNTARY MEASURES, 3–7 (Thomas Dietz & Paul C. Stern eds., 2002).

8 Juliet Eilperin, *Obama's EPA Budget: 1.2.% Cut Would Reduce Aid to States, but Chesapeake Bay Would Get More Funds*, WASH. POST, Feb. 13, 2012, http://www.washingtonpost.com/blogs/44/post/obamas-epa-budget-12percent-cut-would-reduce-aid-to-states-but-chesapeake-bay-would-get-more-funds/2012/02/13/gIQAb4O3AR_blog.html (last visited July 26, 2014).

9 *See, e.g.*, *infra* note 22 and accompanying text.

to begin to answer such questions by setting out a basic framework for describing and studying environmental policy innovation.

This Article is organized around the concept of "streams" of environmental innovation. Streams refer not to specific innovations but to categories of innovation that share characteristics. Among these characteristics are the goals, design, application, and theoretical underpinnings of the innovations. Table 1 lists several identifiable streams of environmental innovation. Within each stream, one may identify specific actions or policies as innovations. Within the emissions trading stream, for example, are the bubble policy, sulfur dioxide allowance trading, and point–nonpoint water pollution trading.[10] Among the voluntary programs are such specific innovations as 33/50, Energy Star, and WasteWise.[11] Different goals are more or less important among the various streams. Some, such as citizen participation or alternative conflict resolution, are designed mainly to promote policy and agency legitimacy, while others—economic incentives or voluntary programs—are justified more on the basis of improved efficiency and effectiveness.[12] For each stream, it is possible to identify a deficiency or need that led to the consideration and adoption of specific innovations. In the case of risk-based planning, for example, the need was for a more rational way of setting priorities in the face of a rapidly expanding policy agenda.[13] By defining these streams of innovation, this Article aims to impose some degree of analytical order on the diverse range of activities viewed as environmental innovations and undertaken since the 1970s.

Part II provides a definition of environmental policy innovation and an explanation for placing the innovations into streams. Part III discusses several innovation streams that may be identified since the existing mold for environmental protection was cast in the 1960s and 1970s. Part IV draws several conclusions and then discusses the implications for designing, implementing, and evaluating innovations.

10 A. DENNY ELLERMAN ET AL., EMISSIONS TRADING IN THE U.S.: EXPERIENCE, LESSONS, AND CONSIDERATIONS FOR GREENHOUSE GASES 8, 11 (2003) (discussing EPA emissions trading programs under the Clean Air Act); *see also* EPA, *Frequently Asked Questions About Water Quality Trading*, http://water.epa.gov/type/watersheds/trading/tradingfaq.cfm (last visited July 26, 2014) (discussing EPA's water quality trading program).

11 Keith Brouhle et al., *Evaluating the Role of EPA Policy Levers: An Examination of a Voluntary Program and Regulatory Threat in the Metal-Finishing Industry*, 57 J. ENVTL. ECON. & MGMT. 166, 171 (2009).

12 *See* Dietz & Stern, *supra* note 7, at 6; Geoff Vigar & Patsy Healey, *Developing Environmentally Respectful Policy Programmes: Five Key Principles*, 45 J. ENVTL. PLAN. & MGMT. 517, 526–27 (2002) (discussing the importance of legitimizing environmental policy through engaging a broad range of stakeholder groups).

13 *See* Daniel J. Fiorino, *Environmental Policy as Learning: A New View of an Old Landscape*, 61 PUB. ADMIN. REV. 322, 326 (2001).

Table 1: Illustrative Streams of Environmental Innovation

1. Environmental conflict resolution • *Policy dialogues, negotiated rulemaking, site-specific mediation*
2. Emissions trading • *Offsets, nitrogen dioxide trading, acid rain allowance trade, greenhouse gas cap and trade*
3. Risk-based planning • *Unfinished Business, regional and state comparative risk, budget planning*
4. Citizen participation • *Superfund community relations, electronic rulemaking, citizen advisory panels*
5. Program integration • *Integrated analyses, cluster projects, integrated permitting*
6. Regulatory and permit flexibility • *Project XL, flexible air permits, integrated pulp and paper rules*
7. Voluntary programs • *Climate Leaders, Performance Track, Energy Star, 33/50*
8. Collaborative planning • *National Estuaries Program, watershed planning, civic environmentalism*
9. Information tools • *Toxics Release Inventory, drinking water advisories, risk communication*
10. Analytical tools[14] • *Risk assessment, cost benefit analysis, strategic planning and budgeting*

II. THE CONCEPT OF ENVIRONMENTAL INNOVATION

The concept of innovation is often studied but not always well understood. Critical to the concept is that an innovation is seen as something new. In his work on the diffusion of innovation, Everett Rogers describes innovation as "an idea perceived as new by the individual."[15] In a more recent book on environmental innovation, Toddi Steelman defines

14 The analytical tools innovation stream could be broken down into even more specific streams.

15 EVERETT M. ROGERS, DIFFUSION OF INNOVATIONS 13 (1962).

innovation as "a new program or process for the individuals adopting it."[16] Laurence O'Toole takes a process perspective in defining innovation as "patterns of activities to achieve a new goal or improve the pursuit of an established one."[17] In these terms, an innovation is not only perceived as being new but is motivated by the intent to achieve new goals or realize existing ones more effectively. In his excellent study of policies for supporting environmental innovation by business in six countries, David Wallace defines innovation broadly as "any change in technology, production processes or organizational and managerial structure and techniques."[18] In this brief sampling, innovation is a combination of perceived newness, the "thing" that is innovative—a process, program, technique, structure, and so on—and an intent to develop something perceived as being new and improves results or performance.

Defining innovation is far less complicated than explaining when and why it occurs and, more importantly, why some innovations persist over time while others fail. In Implementing Innovation, Toddi Steelman provides a useful typology of explanations from the social science and public policy literature on the success and durability of innovation. For innovations to succeed over time, there should be a combination of motivated *individuals* in a culture that supports change; *structures* that promote communication, provide incentives, and define a political environment that is amenable to change; and *strategies* to frame problems, draw upon shocks in the system that open windows for change, and use innovation to enhance legitimacy.[19] A key part of Steelman's argument is that innovation occurs in the context of larger institutional processes. It is these overarching institutional processes that determine the success and durability of innovation more than the actions of dedicated entrepreneurs, whatever catalytic significance individuals may have on change.[20] Wallace, adopting an institutional perspective as well, argues the characteristics of the larger political and regulatory system determine the likelihood that firms will seek out and adopt innovative practices and technologies.[21] In particular, much of the environmental policy literature suggests the potential for continuous and long-term innovation in the private sector depends on government policies that provide incentives, allow flexibility, build trust with accountability, and reduce uncertainty for firms.[22] Innovation in government and public policies

16 TODDI A. STEELMAN, IMPLEMENTING INNOVATION: FOSTERING ENDURING CHANGE IN ENVIRONMENTAL AND NATURAL RESOURCE GOVERNANCE 5 (2010).

17 Laurence O'Toole, Jr., *Implementing Public Innovations in Network Settings*, 29 ADMIN. & SOC'Y 116 (1997); STEELMAN, *supra* note 16, at 5.

18 DAVID WALLACE, ENVIRONMENTAL POLICY AND INDUSTRIAL INNOVATION: STRATEGIES IN EUROPE, THE USA AND JAPAN 11 (1995).

19 STEELMAN, *supra* note 16, at 4.

20 *Id.* at 3–4.

21 WALLACE, *supra* note 18, at 16.

22 DANIEL J. FIORINO, THE NEW ENVIRONMENTAL REGULATION 221–24 (2006); NEIL GUNNINGHAM ET AL., SMART REGULATION: DESIGNING ENVIRONMENTAL POLICY 387–421 (1998) (setting forth desirable environmental regulation design principles); Daniel Press & Daniel A.

thus may affect the potential for innovation in the private sector and throughout the broader policy system.

Innovation is defined here as institutionalized change in government policies or practices that is designed to improve outcomes or processes, or to implement and achieve outcomes more cost effectively, or any combination of the above. This Article focuses on innovations undertaken since the 1970s, when the current model for environmental protection was established. The late 1960s and 1970s were periods of sweeping innovation and change in U.S. environmental policy, and for that matter in many affluent democracies.[23] For purposes of this Article, the model created in such laws as the National Environmental Policy Act (NEPA)[24]; Clean Air Act[25]; Federal Water Pollution Control Act[26]; Toxic Substances Control Act (TSCA)[27] and others of that era is the foundation on which the innovations discussed here were built.[28] In terms used in the policy literature, these foundational environmental laws were a manifestation of a "punctuated equilibrium" in U.S. environmental policy, while the policy innovations discussed here were an expression of more incremental change.[29]

There are several elements to this definition of innovation. The condition of "institutionalized" change requires that a policy or practice go beyond being considered or proposed to being incorporated into government policy. In the language of studies of innovation, it must be adopted.[30] The definition also specifies that there be intent behind the

Mazmanian, *Toward Sustainable Production: Finding Workable Strategies for Government and Industry*, *in* ENVIRONMENTAL POLICY: NEW DIRECTIONS FOR THE TWENTY-FIRST CENTURY 221, 226 (Norman J. Vig & Michael E. Kraft eds., 7th ed. 2010) (describing pollution reduction versus pollution prevention, which involves incentive-based, self-regulatory, and voluntary policy approaches); Daniel J. Fiorino, *Rethinking Environmental Regulation: Perspectives on Law and Governance*, 23 HARV. ENVTL. L. REV. 441, 468–69 (1999) (arguing that reflexive law, social-political governance, and policy learning offer an intriguing starting point from which to revise regulatory systems); Michael Porter & Claas van der Linde, *Toward a New Conception of the Environment-Competitiveness Relationship*, J. ECON. PERSPECTIVE, Fall 1995, 97, 110 (arguing that for environmental standards to foster innovation, they should: 1) leave the approach of innovation to industry; 2) foster continuous improvement; and 3) leave as little uncertainty as possible).

23 MIRANDA A. SCHREURS, ENVIRONMENTAL POLITICS IN JAPAN, GERMANY, AND THE UNITED STATES 32 (2002); Richard N. L. Andrews, *Introduction* to NATIONAL ENVIRONMENTAL POLICIES: A COMPARATIVE STUDY OF CAPACITY-BUILDING v (Martin Janicke & Helmut Weidner eds., 1997).

24 National Environmental Policy Act of 1969, 42 U.S.C. §§ 4321–4347 (2006).

25 Clean Air Act, 42 U.S.C. §§ 7401–7671q (2006).

26 Federal Water Pollution Control Act, 33 U.S.C. §§ 1251–1387 (2006).

27 Toxic Substances Control Act, 15 U.S.C. §§ 2601–2692 (2006).

28 *See generally* J. CLARENCE DAVIES III, THE POLITICS OF POLLUTION (1970); DANIEL J. FIORINO, MAKING ENVIRONMENTAL POLICY (1995) (providing background on environmental policymaking); MARY GRAHAM, THE MORNING AFTER EARTH DAY: PRACTICAL ENVIRONMENTAL POLITICS (1999); RICHARD J. LAZARUS, THE MAKING OF ENVIRONMENTAL LAW (2004) (providing background on the creation, expansion, and future of environmental laws); ALFRED A. MARCUS, PROMISE AND PERFORMANCE: CHOOSING AND IMPLEMENTING AN ENVIRONMENTAL POLICY (1980).

29 FRANK R. BAUMGARTNER & BRYAN D. JONES, AGENDAS AND INSTABILITY IN AMERICAN POLITICS 37–38 (1993).

30 STEELMAN, *supra* note 16, at 4.

change. The conditions of the definition are that innovation represents an effort to improve policy outcomes—cleaner air, less waste, safer drinking water—or processes—better data, more participation, more sensible priority setting—or lead to a desired level of policy outcomes or process quality at less cost. Given that some of the innovations discussed here were adopted for reasons of economic efficiency, it is necessary to include some element of cost effectiveness in the definition. The concept of "streams" of innovation makes it possible to group related policies or practices that meet the above definition of innovation into discernible categories for study and analysis.

Devising an analytical framework also means having criteria and terminology for describing, comparing, and evaluating environmental innovations. How may one stream of innovation, such as risk-based planning, be distinguished from, or compared to, others, such as partnerships and voluntary programs or alternative conflict resolution?

One way is by the intended goals. Some innovations are adopted to improve effectiveness, in the sense of achieving a higher level of a desired outcome. Others focus on efficiency; they are designed to achieve outcomes or implement processes at less cost. In other cases, an innovation is designed to enhance the legitimacy of an agency or process by making it more acceptable to the targets of the policy or other affected parties. Still others are defined by the goal of creating or enhancing capacities for future problem solving. The description and analysis of the several streams of environmental innovation in this Article is based on these four goals: effectiveness, efficiency, legitimacy, and capacity. Many researchers give attention to the first two but neglect the latter two, which may be difficult to measure or viewed as unimportant evaluation criteria. Table 2 defines these four goals.

Table 2: The Goals of Environmental Policy Innovations

Effectiveness • *Achieving a higher level of environmental outcomes*
Efficiency • *Achieving desired environmental outcomes at less cost*
Legitimacy • *Achieving outcomes in more politically acceptable ways*
Capacity • *Improving the ability to achieve future environmental outcomes*

Each of these innovation streams may be seen as attempts to meet all of the goals to some degree. In most cases, however, it is possible to distinguish one or two primary goals for a given stream, with others being secondary. For example, economic efficiency is almost always cited as the

primary goal of using emissions trading.[31] Few observers would associate efficiency with efforts to enhance citizen participation, which often reduces efficiency, at least in the near-term. Participation is justified more on the basis of enhancing the legitimacy of institutions, processes, and outcomes.[32] Secondarily, participation also may be justified as a way to build capacity for future problem solving.[33] A potential, often ignored benefit of voluntary programs is that they build capacity for future problem solving, especially for issues less amenable to conventional regulation. In this Article, the streams of environmental innovation are described according to the relative importance of each goal.[34]

III. STREAMS OF ENVIRONMENTAL INNOVATION

This section proposes a way of imposing some order on the array of U.S. Environmental Protection Agency (EPA) innovations that have been undertaken over the last four decades. As one would expect, the range of attempted or successful innovations is large. They reflect all four goals listed above; were aimed at many stages of policy making, from agenda setting to implementation; and grew from many conceptual origins and sources of dissatisfaction with what existed. Their durability and long-term effects have varied, as the comparisons below suggest. The argument here is that grouping specific activities into streams of innovation is useful for comparing and analyzing specific initiatives. The five streams examined in this Article are: 1) emissions trading; 2) program integration; 3) risk-based planning; 4) regulatory and permitting flexibility; and 5) voluntary programs. Although most involve actors in addition to EPA, such as state agencies or regulated firms, all five innovation streams focus on actions by EPA and the federal government.[35]

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31 Mustafa Babiker et al., *Is International Emissions Trading Always Beneficial?*, 25 ENERGY J., no. 2, 2004, at 33, 33.

32 Daniel J. Fiorino, *Citizen Participation and Environmental Risk: A Survey of Institutional Mechanisms*, 15 SCI., TECH., & HUM. VALUES 226, 229 (1990).

33 *See generally* CAPACITY BUILDING IN NATIONAL ENVIRONMENTAL POLICY: A COMPARATIVE STUDY OF 17 COUNTRIES (Helmut Weidner & Martin Janicke eds., 2002) (defining and examining the concept of institutional capacity at a national level); Helmut Weidner, *Capacity-Building for Ecological Modernization: Lessons from Cross-National Research*, 45 AM. BEHAV. SCIENTIST 1340 (2002).

34 *See generally* Tomas M. Koontz & Craig W. Thomas, *What Do We Know and Need to Know About the Environmental Outcomes of Collaborative Management?*, 66 PUB. ADMIN. REV. (SPECIAL ISSUE) 111, 117 (2006) (explaining the social benefits of innovation).

35 *See* Daniel J. Fiorino, *Innovation in U.S. Environmental Policy: Is the Future Here?*, 44 AM. BEHAV. SCIENTIST 538 (2000). (discussing background material on state environmental innovations). *See generally* Barry G. Rabe, *Racing to the Top, the Bottom, or the Middle of the Pack: The Evolving State Government Role in Environmental Protection*, *in* ENVIRONMENTAL POLICY: NEW DIRECTIONS FOR THE TWENTY-FIRST CENTURY 27 (Norman J. Vig & Michael E. Kraft eds., 2010); Alka Sapat, *Devolution and Innovation: The Adoption of State Environmental Policy Innovations by Administrative Agencies*, 64 PUB. ADMIN. REV. 141 (2004).

Other streams of innovation could be identified from the past thirty years, as suggested in Table 1.[36] Among these are citizen participation; such analytical methods as cost–benefit and risk analysis; environmental conflict resolution; collaborative planning; and information-gathering tools. For our purposes, however, the five innovation streams listed above provide a place to start defining related categories of innovation, drawing conclusions about the adoption and durability of innovations, and conducting a preliminary assessment of innovation capacities at federal and state levels. Although only five of these many streams are considered in this Article, the framework is suggested as a way to describe and assess environmental innovation more generally. Each innovation stream is examined according to its theoretical basis; its definition and evolution; its perceived strengths and weaknesses; and its impact on environmental policy.

A. Emissions Trading

The conceptual basis for environmental regulation lies in bureaucratic theory. In an approach John Dryzek terms "administrative rationalism," government regulators use technical expertise to develop standards, usually based on definitions of best available technology or a similar standard, and apply them to sources of pollution.[37] Agencies monitor compliance and assign legal penalties to sources that fail to meet the standards and administrative provisions—e.g., reporting and monitoring—associated with them. Typically, uniform technology standards apply to sources in a defined category, with limited allowances for variations in costs or circumstances.[38] Compliance is defined in either–or terms; that is, the incentive is to meet the standards, but not to exceed them.[39]

In contrast, the foundation for market incentives comes from economic theory.[40] The goal is to maximize economic efficiency by allowing regulated sources the discretion to determine the least costly methods for meeting the policy objectives. These incentives are provided in many forms: pollution fees—such as a carbon tax, emissions trading—cap and trade, and deposit

36 A stream is commonly defined as "a steady succession (as of words or events)" or "a continuous procession moving in one direction." WEBSTER'S THIRD NEW INTERNATIONAL DICTIONARY 2258 (unabr. ed., 2002). It suggests that there are identifiable boundaries around the fluids, ideas, or thoughts in the stream and they persist over time and space. Of course, streams dry up, and innovations end. They also may disappear for a time and reemerge when conditions again become favorable.

37 *See* JOHN DRYZEK, THE POLITICS OF THE EARTH: ENVIRONMENTAL DISCOURSES 86–87 (2d ed. 2005).

38 *See id.* at 78–79.

39 FIORINO, *supra* note 22, at 75–78.

40 *See generally* ALLEN V. KNEESE & CHARLES L. SCHULTZE, POLLUTION, PRICES, AND PUBLIC POLICY (1975); T. H. TIETENBERG, EMISSIONS TRADING: PRINCIPLES AND PRACTICE (2d ed. 2006) (summarizing economic incentives, including trading); Robert W. Hahn & Gordon L. Hester, *Marketable Permits: Lessons for Theory and Practice*, 16 ECOLOGY L.Q. 361 (1989); T. H. Tietenberg, *Economic Instruments for Environmental Regulation*, 6 OXFORD REV. ECON. POL'Y 17 (1990).

refund, among others.[41] By far, the most significant innovation in U.S. environmental policy has been emissions trading, which is the focus here.[42] Pollution trading has become firmly established in air quality, is used to some degree in water quality, and has become the centerpiece of a possible U.S. response to climate change. Indeed, after initially being skeptical about emissions trading in the 1970s and 1980s, many environmentalists now embrace a cap-and-trade framework as the best and most politically feasible way of putting a price on carbon.[43] Of all the innovations discussed in this Article, emissions trading has been the most fully implemented and has had the greatest long-term effect.[44]

Like most innovations, emissions trading moved from theory to practice as a matter of perceived necessity. In the 1970s, air quality in southern California exceeded the health-based National Ambient Air Quality Standard for ozone.[45] Under the Clean Air Act, California could not grant more air permits that would allow emissions to increase. In effect, this would have frozen industrial development. The solution was to allow new emissions only if the source asking for a permit could offset them with at least equivalent reductions from existing sources. In addition, the new source would also have to meet the most stringent technology standards available.[46] From these relatively simple origins, a variety of trading systems began to emerge in the late 1970s and 1980s.[47] Under the "bubble" policy, facilities had flexibility to modify controls at specific release points so long as plantwide emissions met permitted levels.[48] Gradually, markets emerged for brokering trades among different sources. To justify this flexibility environmentally, the rules built in trading ratios, meaning that some emissions had to be

41 DRYZEK, *supra* note 37, at 129–34.

42 *See* A. DENNY ELLERMAN ET AL., EMISSIONS TRADING IN THE U.S.: EXPERIENCE, LESSONS, AND CONSIDERATIONS FOR GREENHOUSE GASSES iii (2003), *available at* http://www.c2es.org/docUploads/emissions_trading.pdf.

43 *See* Richard Conniff, *The Political History of Cap and Trade*, SMITHSONIAN, Aug. 2009, http://www.smithsonianmag.com/air/the-political-history-of-cap-and-trade-34711212/?all (last visited July 26, 2014).

44 *See generally* Robert N. Stavins, *Market-Based Environmental Policies*, *in* PUBLIC POLICIES FOR ENVIRONMENTAL PROTECTION 31 (Paul R. Portney & Robert N. Stavins eds., 2d ed. 2000) (providing an excellent overview of trading).

45 *See* Alexander K. Wang, *Southern California's Quest for Clean Air: Is EPA's Dilemma Nearing an End*, 24 ENVTL. L. 1137, 1139 (1994) (discussing California's difficulties in achieving compliance with the ozone NAAQS during the 1970s).

46 *Emission Offsets: EPA Rules Clean Air Act Allows New Sources in Nonattainment Areas*, 7 ENVTL L. REP. 10,029, 10,030 (1977).

47 *See generally* BRIAN J. COOK, BUREAUCRATIC POLITICS AND REGULATORY REFORM: THE EPA AND EMISSIONS TRADING (1988) (describing emissions trading under the Clean Air Act); Robert W. Hahn, *Economic Prescriptions for Environmental Policy Instruments: Lessons from the United States and Continental Europe*, *in* MARKETS, THE STATE, AND THE ENVIRONMENT: TOWARDS INTEGRATION, 129, 134–38 (Robyn Eckersley ed., 1995) (discussing emissions trading and its evolution in the United States); RICHARD A. LIROFF, REFORMING AIR POLLUTION REGULATION: THE TOIL AND TROUBLE OF EPA'S BUBBLE (1986) (discussing emissions trading).

48 *See* Hahn, *supra* note 47, at 135.

retired as part of the trades.[49] The outcome could be justified as more effective, as well as less costly, than a conventional approach.

Applied administratively in the 1980s, trading was codified in the Clean Air Act Amendments of 1990.[50] Congress directed that sulfur dioxide emissions be nearly cut in half—some ten million tons—from a 1980 baseline by 2000.[51] The targets of the cuts were large utilities, which had several options, including meeting new emission standards, exceeding them and selling excess emission allowances to other utilities, or not meeting them and buying allowances from someone else.[52] The premise was that sources with high marginal costs would purchase allowances, while those with low costs would create a surplus to sell to others.[53] This would minimize marginal control costs by redistributing them to all sources and reduce the overall costs to society.[54] Using trading rather than technology standards is estimated to have saved approximately $1 billion.[55] The program's success made trading more credible to groups that previously had been skeptical of trading as granting sources little more than a license to pollute.[56]

As a sign of its durability, a cap-and-trade system became the leading policy option for cutting greenhouse gases in the United States. The American Clean Energy and Security Act (ACES or Waxman–Markey),[57] passed by the House in June 2009, created a system in which 75% of emission allowances would be allocated and the remainder auctioned.[58] The proportion available by auction would have increased over time.[59] Using 2005

49 *See* EPA, *National Center for Environmental Economics: Offset Program*, http://yosemite.epa.gov/ee/epa/eed.nsf/dcee735e22c76aef85257662005f4116/aa3d2e8d44f91af38525777d000cbcba!OpenDocument (last visited July 26, 2014) (describing the evolution of EPA's offset program).

50 *See generally* JUDITH A. LAYZER, THE ENVIRONMENTAL CASE: TRANSLATING VALUES INTO POLICY 375–403 (2d ed. 2006) (discussing trading under the acid rain program after the 1990 amendments); Robert N. Stavins, *What Can We Learn from the Grand Policy Experiment? Lessons from SO_2 Allowance Trading*, J. ECON. PERSPECTIVE, Summer 1998, at 69, 69–88; Dallas Butraw and Byron Swift, *A New Standard of Performance: An Analysis of the Clean Air Act Acid Rain Program*, 26 ENVTL. L. REP. 10,411, 10,411–23 (1996).

51 LAYZER, *supra* note 50, at 389–90.

52 *See* Stavins, *supra* note 50, at 70–71.

53 *Id.*

54 Paul R. Portney, *Air Pollution Policy*, *in* PUBLIC POLICIES FOR ENVIRONMENTAL PROTECTION 77, 112–15 (Paul R. Portney & Robert N. Stavins eds., 2d ed. 2000) (discussing differences on marginal control costs associated with trading).

55 Dallas Butrow et al., *The Costs and Benefits of Reducing Acid Rain* 22–23 (1997) (Discussion Paper 97-31-REV, RESOURCES FOR THE FUTURE, 1997).

56 *See* MICHAEL J. SANDEL, *It's Immoral to Buy the Right to Pollute (with replies)*, *in* ECONOMICS OF THE ENVIRONMENT: SELECTED READINGS 355–56 (Robert N. Stavins ed., 5th ed. 2005).

57 American Clean Energy and Security Act, H.R. 2454, 111th Cong. (2009).

58 Center for Climate and Energy Solutions, *Distribution of Allowances Under the ACES Act*, http://www.c2es.org/publications/distribution-allowances-under-aces-act (last visited July 26, 2014).

59 *Id.*

as a baseline, ACES established increasingly tighter targets for cuts in greenhouse gases: 17% by 2020; 42% by 2030; and over 83% by 2050.[60] The value of a permit to emit one ton of carbon was expected to rise as the emissions targets were tightened.[61] The revenue from permit auctions would have been used to offset higher energy costs for low-income households, fund climate adaptation, and support clean energy research, among other activities.[62] While also setting national renewable electricity standards and authorizing other climate actions, the cap-and-trade framework was the centerpiece and the most contested part of the legislation.[63] Though the House passed the bill by a seven-vote margin, the Senate failed to pass it.[64] Greenhouse gas trading has been adopted regionally in the United States, such as in the Regional Greenhouse Gas Initiative in the northeastern states and in California, as well as in the European Union and other countries.[65]

Although not as widespread as in the air program, trading also has been applied to water pollution.[66] A promising application is point–nonpoint source trading. The advantage in this case, as with air quality, is minimizing the marginal costs of control across sources. Large point sources of pollution—such as industrial facilities and sewage treatment plants—have had to meet stringent standards over the last few decades, to the extent that the marginal costs of additional units of pollution reduction are high.[67] The

60 Center for Climate and Energy Solutions, *Waxman-Markey Short Summary*, http://www.c2es.org/federal/congress/111/acesa-short-summary (last visited July 26, 2014).

61 *See* Center for Climate and Energy Solutions, *Distribution of Allowances Under the ACES Act*, http://www.c2es.org/publications/distribution-allowances-under-aces-act (last visited July 26, 2014).

62 *Id.*

63 *See* Center for Climate and Energy Solutions, *Waxman-Markey Short Summary*, http://www.c2es.org/federal/congress/111/acesa-short-summary (last visited July 26, 2014).

64 Carl Hulse & David M. Herszenhorn *Democrats Call off Climate Bill Effort*, N.Y. TIMES, July 22, 2010, http://www.nytimes.com/2010/07/23/us/politics/23cong.html?_r=0 (last visited July 26, 2014) (explaining that Senator Harry Reid would no longer pursue passing legislation to reduce carbon emissions); *Waiting for the Other Shoe to Drop*, ECONOMIST, Sept. 10, 2009, http://www.economist.com/node/14419395 (last visited July 26, 2014) (explaining the difficulties presented in moving ACES through the Senate).

65 *See* Christian Egenhofer, *The Making of the European Emissions Trading Scheme: Status, Prospects, and Implications for Business*, 25 EUR. MGMT. J., 453, 453–63 (2007) (discussing whether the trading scheme is a cost-effective tool for reducing greenhouse gas emissions). On regional trading programs in the United States, see Michele M. Betsill & Barry G. Rabe, *Climate Change and Multilevel Governance: The Evolving State and Local Roles*, *in* TOWARD SUSTAINABLE COMMUNITIES: TRANSITION AND TRANSFORMATIONS IN ENVIRONMENTAL POLICY, 201, 205 (Daniel A. Mazmanian & Michael E. Kraft eds., 2d ed. 2009) ("[T]wenty-one states are actively involved in establishing regional zones for capping and trading carbon emissions from electrical utilities."); Barry G. Rabe, *States on Steroids: The Intergovernmental Odyssey of American Climate Policy*, 25 REV. POL'Y RES. 105, 121–23 (2008) (discussing cap-and-trade programs in the United States).

66 *See* EPA, *Water Quality Trading*, http://water.epa.gov/type/watersheds/trading.cfm (last visited July 26, 2014) (discussing water quality trading).

67 *See* David Letson, *Point/Nonpoint Source Pollution Reduction Trading: An Interpretive Survey*, 32 NAT. RESOURCES J. 219, 223 (1992) (discussing the economics of point–nonpoint trading in the context of sewage treatment plants).

marginal costs are much lower for nonpoint sources, including agriculture and storm water, which are less amenable to regulation through technology controls.[68] By focusing reductions on nonpoint sources, whose actions are funded and facilitated by point sources through trading effluent programs, more reductions are achieved at less cost.[69] Effluent trading has drawn attention as a strategy for reducing nutrients in such areas as the Chesapeake Bay, driven by Clean Water Act provisions on Total Daily Maximum Loads (TMDLs).[70]

Pollution trading programs have been successful and durable, with an influence that extends beyond the United States.[71] With a history extending over more than three decades, it illustrates the capacity of the U.S. environmental policy system to learn from experience and apply lessons learned to the next iteration of policies. A record of results, lower costs, and increasing political acceptability brought trading into the mainstream of U.S. environmental policy. As discussed later, it also rests on a sound theoretical foundation. Of the five innovation streams discussed in this Article, pollution trading has proven to be the most durable and has sustained the most current policy relevance. Indeed, the failure of the United States to adopt a national cap-and-trade program in 2009 was attributable more to political opposition to imposing any limits on greenhouse gases than to trading itself.[72] The reality of American politics was such that no policy strategy would likely have drawn enough legislative support to be enacted in the midst of the greatest economic crisis in eight decades.

B. Program Integration

The issue of program integration may be traced to aspects of bureaucratic theory and organization as well as to the incremental features of the U.S. policy system. Complex organizations rely on specialization and division of labor to understand issues, organize expertise, assign responsibility, and complete tasks.[73] These features are a source of strength

68 *See* MINDY SELMAN ET AL., WORLD RESOURCES INST., WATER QUALITY TRADING PROGRAMS: AN INTERNATIONAL OVERVIEW 1–2 (2009) (identifying 57 water trading programs, of which 51 were located in the United States).

69 EPA, EPA WATER QUALITY TRADING EVALUATION: FINAL REPORT 1-1 (2008), *available at* http://www.epa.gov/evaluate/pdf/water/epa-water-quality-trading-evaluation.pdf.

70 *See* CY JONES ET AL., HOW NUTRIENT TRADING COULD HELP RESTORE THE CHESAPEAKE BAY 2 (Working Paper, WORLD RESOURCES INST., 2010). *See generally* James Boyd, *The New Face of the Clean Water Act: A Critical Review of the EPA's Proposed TMDL Rules* (Discussion Paper, RESOURCES FOR THE FUTURE, 00-12, 2000) (discussing TMDLs).

71 *See* SELMAN, *supra* note 68.

72 *See* John Miller, *Can Cap-and-Trade Actually Reduce World Carbon Emissions?*, http://theenergycollective.com/jemillerep/143451/draft-progresscan-cap-and-trade-actually-reduce-world-carbon-emissions (last visited July 26, 2014) (discussing history of the sulfur dioxide cap-and-trade program).

73 *See* FROM MAX WEBER: ESSAYS IN SOCIOLOGY 196–244 (H.H. Gerth & C. Wright Mills eds., 1946) (discussing bureaucracy); HERBERT A. SIMON, ADMINISTRATIVE BEHAVIOR: A STUDY OF

as well as weakness in bureaucratic organization. Given the complexity of environmental issues, breaking problems and strategies into manageable pieces was a logical strategy. Reinforcing this tendency to simplify complex problems was the nature of policy change in the United States. Although the "environmental decade" of the 1970s represented a period of rapid change, it did not emerge in the form of an overall strategy for addressing issues comprehensively. As issues emerged on the policy agenda—first air and water pollution, then toxic chemicals, hazardous wastes and others—and political coalitions formed in response, legislative and bureaucratic strategies emerged piecemeal. The result was a highly fragmented environmental policy system that persists to this day.[74]

This fragmentation has been a recurring source of dissatisfaction. When it was passed in 1969, many observers saw NEPA as an integrating statute. It established the "environment" holistically as a subject of national concern and a responsibility of the federal government.[75] Similarly, creating EPA in the 1970s was viewed as a major step toward program integration.[76] Established by executive order, the EPA reorganization consolidated functions from the Departments of Health, Education, and Welfare (air quality), Interior (water quality), Agriculture (pesticide regulation), and the Atomic Energy Commission (radiation health standards), among others.[77] William Ruckelshaus, EPA's first administrator, decided early to follow the medium-based organization reflected in the statutes rather than a functionally based approach.[78] He decided that it was more important at the

DECISION-MAKING PROCESSES IN ADMINISTRATIVE ORGANIZATIONS 30 (4th ed. 1997) (discussing the role of specialization in maximizing administrative efficiency).

74 J. CLARENCE DAVIES & JAN MAZUREK, POLLUTION CONTROL IN THE UNITED STATES: EVALUATING THE SYSTEM 27–38 (1998).

75 *See* Lynton K. Caldwell, *Environment: A New Focus for Public Policy?*, 23 PUB. ADMIN. REV. 132 (1963) (setting out the case for making the environment a focus for public policy). *See generally* LYNTON KEITH CALDWELL, THE NATIONAL ENVIRONMENTAL POLICY ACT: AN AGENDA FOR THE FUTURE (1998) (discussing the enactment and interpretation of NEPA, and its place in environmental policy and the global environment).

76 *See* Lakshman Guruswamy, *Integrated Thoughtways: Reopening of the Environmental Mind?*, 1989 WIS. L. REV. 463, 463–527 (1989) (arguing that the twin objectives of efficiency and effectiveness could be achieved through adoption of an integrated approach to pollution control).

77 Daniel J. Fiorino, *Environmental Bureaucracies: The Environmental Protection Agency*, *in* THE OXFORD HANDBOOK OF U.S. ENVIRONMENTAL POLICY 331–37 (Sheldon Kamieniecki & Michael E. Fraft ed., 2013); Reorganization Plan No. 3, 35 Fed. Reg. 15,623 (July 9, 1970).

78 ALFRED A. MARCUS, PROMISE AND PERFORMANCE: CHOOSING AND IMPLEMENTING AN ENVIRONMENTAL POLICY 103–04 (1980). *See generally* J. CLARENCE DAVIES III, THE POLITICS OF POLLUTION 98–119 (1970) (discussing the organization of pollution control agencies in the executive branch before 1970); J. CLARENCE DAVIES III & BARBARA S. DAVIES, THE POLITICS OF POLLUTION 109–11 (2d ed. 1975) (discussing issues associated with internal agency structure that arose early in EPA's history). The concept of a "medium-based" statute refers to the environmental medium or pathway by which problems are defined, such as air, water, waste, and chemicals. *See* Robert L. Fischman, *The Divides of Environmental Law and the Problem of Harm in the Endangered Species Act*, 83 IND. L.J. 661, 668 (2008).

time to demonstrate a capacity for action, especially in enforcement, than to devote time and resources to a major reorganization.[79]

Three laws once seen as paths to integration—NEPA, TSCA, and the Pollution Prevention Act (PPA)[80]—have not fulfilled that role. NEPA encourages federal agencies to look holistically at the environment and establishes requirements for Environmental Impact Statements, but it lacks a direct connection with the regulatory decisions that drive the pollution control system.[81] TSCA has hardly been used as a gap filler—let alone an integrating statute—largely because of its limitations, especially with respect to existing chemical issues.[82] More a set of principles and goals than a source of regulatory authority, the PPA has not been able to compete with mainstream regulatory laws.[83] In contrast to other developed countries, the United States lacks an integrated environmental statute.[84] For example, comprehensive environmental planning in the Netherlands and integrated pollution control in Sweden and the United Kingdom are cited in the literature for their higher capacities for program integration.[85]

EPA has attempted several specific innovations over the years to overcome this fragmentation. Congress has rarely been interested in addressing an issue that is so firmly rooted in the legal framework. EPA's efforts reached a peak in the late 1980s and 1990s, though as with many innovations, interest fell off after 2000. At times, EPA has attempted to overcome the statutory constraints by integrating on the basis of chemicals, industry sectors, and geography.[86] Probably the most successful effort at integrating by chemical was the multimedia lead strategy adopted in 1991.[87]

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79 *See* MARCUS, *supra* note 78, at 88 ("Ruckelshaus' first priority as administrator was to try to build the reputation of the new agency as a vigorous enforcer of pollution control laws.").

80 Pollution Prevention Act of 1990, 42 U.S.C. §§ 13101–13109 (2006).

81 MARK A. CHERTOK, OVERVIEW OF THE NATIONAL ENVIRONMENTAL POLICY ACT: ENVIRONMENTAL IMPACT ASSESSMENTS AND ALTERNATIVES 1–2 (2005), *available at* http://www.sprlaw.com/pdf/spr_nepa_eli_05.pdf.

82 *See generally* J. Clarence Davies, *Some Thoughts on Implementing Integration*, 22 ENVTL. L. 139, 140–41 (1992) (explaining that TSCA was originally written as a "gap-filling" statute that was "designed to plug the few remaining loopholes in existing legislation").

83 *Id.*

84 *See id.* at 140. *See generally id.* at 142–44 (identifying steps that can be taken under existing environmental statutes that can "move pollution control efforts in a more integrated direction."); BARRY G. RABE, FRAGMENTATION AND INTEGRATION IN STATE ENVIRONMENTAL MANAGEMENT 29–38 (1986) (discussing state efforts to coordinate environmental management).

85 *See* Graham Bennett, *Policy Planning in the Netherlands*, *in* INTEGRATED POLLUTION CONTROL IN EUROPE AND NORTH AMERICA 209 (Nigel Haigh & Frances Irwin eds., 1990); Don Hinrichsen, *Integrated Permitting and Inspection in Sweden*, *in* INTEGRATED POLLUTION CONTROL IN EUROPE AND NORTH AMERICA, *supra*, at 147; Susan Owens, *The Unified Pollution Inspectorate and Best Practicable Environmental Option in the United Kingdom*, *in* INTEGRATED POLLUTION CONTROL IN EUROPE AND NORTH AMERICA, *supra*, at 169.

86 Jurgen Schmandt, *Managing Comprehensive Rule Making: EPA's Plan for Integrated Environmental Management*, 45 PUB. ADMIN. REV. 309, 312–14 (1985).

87 *See* EPA, STRATEGY FOR REDUCING LEAD EXPOSURES (1991), *available at* http://www.epa.gov/ttn/naaqs/standards/pb/data/leadstrategy1991.pdf; Odelia Funke, *Struggling with*

The strategy set out explicit goals for reducing lead risks and drew upon several laws and programs in addressing the complex issue of reducing lead exposure.[88] With EPA support, the Conservation Foundation developed two model integrated environmental statutes in the late 1980s and early 1990s.[89] At about the same time, EPA experimented with a series of regulatory "clusters" that were aimed at integrating—or at a minimum, coordinating—actions that could be linked on the basis of chemical, affected resource, industry sector, or other principles.[90] The goal was to establish shared definitions of the problems associated with each cluster, and draw upon the available resources more systematically in solving them.[91] In the mid-1990s, the Common Sense Initiative (CSI) was created, in part, to reorient policies and actions more on the basis of industry sector than environmental medium.[92]

Although these programs encouraged issue- and time-specific progress toward integration, none overcame the constraints of the fragmented legal framework. Nor could they offset the existing bureaucratic implementation and congressional oversight systems. Program integration at EPA has been an ad hoc response to perceived needs for coordination at specific points in time for particular sets of issues; it has not achieved long-term, structural change or displaced entrenched legal and institutional frameworks.

In contrast to the record with emissions trading, the program integration stream has shown little staying power. Advocates were never able to make a convincing case to the congressional oversight committees that the deficiencies of the existing, medium-based statutory framework were serious enough to justify change. Once established, legislative and bureaucratic arrangements have proven difficult to change. The EPA "stovepipes" became entrenched in agency operations and culture and in relationships with state agencies. Although integration efforts on such specific issues as groundwater and lead yielded modest, short-term success, they were not institutionalized. At this point, there is little interest in

Integrated Environmental Policy: The EPA Experience, 12 POL'Y STUD. REV. 137, 148–50 (1993) (discussing EPA efforts to integrate and coordinate a cross-media approach to lead planning).

88 EPA, *supra* note 69, at 8–9, 11–12 (summarizing the goals, objectives, and major action elements of EPA's lead reduction strategy).

89 The two model statutes were the Environmental Protection Act and the Environmental Information and Integration Act. Frances H. Irwin, *An Integrated Framework for Preventing Pollution and Protecting the Environment*, 22 ENVTL. L. 1, 25–26 (1992); Terry Davies, *The United States: Experimentation and Fragmentation*, *in* INTEGRATED POLLUTION CONTROL IN EUROPE AND NORTH AMERICA, *supra* note 85, at 51, 63–65.

90 EPA, EPA 230-F-92-013, EPA'S CLUSTERS: A NEW APPROACH TO ENVIRONMENTAL MANAGEMENT 1 (1992) (describing "clusters" as a holistic method in contrast to the orthodox program-by-program approach).

91 *Id.* at 3–4.

92 Cary Coglianese & Laurie K. Allen, *Building Sector-Based Consensus: A Review of the US EPA's Common Sense Initiative*, *in* INDUSTRIAL TRANSFORMATION 65, 68 (Theo de Bruijn and Norberg Bohm eds., 2005). The six industry sectors were metal finishing, iron and steel, computers and electronics, auto manufacturing, printing, and petroleum refining. *Id.* at 69.

addressing integration, from EPA or from Congress.[93] In recent years, a constituency for achieving more integration across programs has been lacking, and such issues are rarely reflected in EPA's internal agenda, especially in the atmosphere of highly charged conflicts that have characterized recent American environmental politics.

C. Risk-Based Planning

The origins of risk-based planning lie with the emergence of a tool—quantitative risk assessment—and the perceived need to rationalize a rapidly growing environmental policy agenda in the 1980s. Risk assessment emerged in the late 1970s and the 1980s as a powerful tool for improving the factual bases of environmental policy and regulatory decision making.[94] Having quantitative estimates of risk allows policy makers to determine the likely level of harm presented by problems, and whether government should intervene. It defines a quantitative metric for decisions that is based in an empirical understanding of threats to health and ecology.[95]

The innovation stream in this case is the use of risk information to set priorities. Risk-based planning, also termed comparative risk analysis, was part of a second environmental policy "epoch" in which policy makers wanted to rationalize processes for setting priorities and allocating resources among them.[96] In effect, agencies wanted to gain more control over their policy agendas in the face of a growing list of problems. As always, political factors created the demand for innovation. The resignations in 1983 of the initial Reagan administration appointees at EPA led to the return of William Ruckelshaus, the agency's first and then fourth administrator, whose goal was to restore EPA's credibility and

93 One possible sign of an interest in program integration may be found in a report that the EPA commissioned from the National Academies of Sciences. While integration is not a major theme in the report, sustainability is an inherently integrating discourse. *See generally* NATIONAL RESEARCH COUNCIL OF THE NATIONAL ACADAMIES, SUSTAINABILITY AND THE U.S. EPA (2011) (discussing and proposing application of sustainability initiatives to EPA's work); Shari K. Grossarth & Alan D. Hecht, *Sustainability at the U.S. Environmental Protection Agency: 1970–2020*, 30 ECOLOGICAL ENGINEERING 1 (2007) (discussing EPA's haphazard attempts to achieve sustainability and suggesting improvements for EPA to specifically address).

94 Richard N. L. Andrews, *Risk-Based Decision Making: Policy, Science, and Politics*, *in* ENVIRONMENTAL POLICY: NEW DIRECTIONS FOR THE TWENTY-FIRST CENTURY 215 (Norman J. Vig and Michael E. Kraft eds., 2006).

95 *Id.*

96 *See* Daniel J. Fiorino, *Environmental Policy as Learning: A New View of an Old Landscape*, 61 PUB. ADMIN. REV. 322, 326–27 (2001) (discussing an example of conceptual learning). For a discussion of the concept of environmental policy epochs, see Daniel A. Mazmanian & Michael E. Kraft, *Toward Sustainable Communities: Transition and Transformations in Environmental Policy*, *in* TOWARD SUSTAINABLE COMMUNITIES: TRANSITION AND TRANSFORMATIONS IN ENVIRONMENTAL POLICY 3, 7–12 (Daniel A. Mazmanian and Michael E. Kraft eds., 2009).

effectiveness.[97] A centerpiece of the second Ruckelshaus term was incorporating risk into policy making.[98] In particular, Ruckelshaus drew upon the risk assessment–risk management model set out by the National Academy of Sciences in an influential 1983 report.[99] The policy distinguished the more neutral, science-based process of quantitatively describing risk assessment from the arguably more value-based, political process of deciding what to do about risk management.[100]

The application of risk as a metric for making regulatory decisions evolved in the 1980s into a means of setting priorities. The list of environmental problems to which government was expected to give attention had grown rapidly since 1970. From an initial focus on large air and water pollution sources and chemicals, the agenda now included such problems as abandoned hazardous waste sites, stratospheric ozone depletion, habitat loss, residential radon, household chemicals, and global warming.[101] In particular, many regulators thought that hazardous waste issues were drawing more resources and attention than problems that empirically were posing greater health and ecological risk.[102] Later in the 1980s, EPA Administrator William Reilly compared environmental agenda setting to a video game of "Space Invaders": "whenever you see an enemy ship on the screen, you blast at it with both barrels—typically missing the target at least as often as you hit it .... The last two decades of environmental policy in this country have been similar in some ways to that video game."[103] Political institutions typically react to problems piecemeal without an overall sense of priority. Risk-based planning responded to the perceived need for better priority setting and more efficient use of resources.[104]

The innovations that made up the risk-based planning stream came in stages. The pacesetter was a national comparative risk ranking issued as the *Unfinished Business* report of 1987. EPA commissioned agency and outside experts, in four groups, to rank thirty-one problems on the basis of cancer

97 *See* EPA, *Charting a New Course,* EPA J., July 1983, at 1 (discussing Ruckelshaus' duty to ensure that EPA "is trusted and respected by all").

98 EPA, *Science, Risk, and Public Policy,* EPA J., July 1983, at 3, 4–5.

99 COMM. ON THE INST. MEANS FOR ASSESSMENT OF RISKS TO PUB. HEALTH ET AL., RISK ASSESSMENT IN THE FEDERAL GOVERNMENT: MANAGING THE PROCESS 18–19 (1983); *see also Science, Risk, and Public Policy*, *supra* note 98, at 4.

100 RISK ASSESSMENT IN THE FEDERAL GOVERNMENT, *supra* note 99, at 18–19.

101 *See supra* notes 1–3.

102 *See generally* MARC K. LANDY ET AL., THE ENVIRONMENTAL PROTECTION AGENCY: ASKING THE WRONG QUESTIONS: FROM NIXON TO CLINTON (1994) (listing the regulatory priorities at this stage—the 1980s—in EPA's history).

103 William K. Reilly, *Aiming Before We Shoot: The Quiet Revolution: in Environmental Policy*, http://www2.epa.gov/aboutepa/aiming-we-shoot-quiet-revolution-environmental-policy (last visited July 26, 2014).

104 Daniel J. Fiorino, *Can Problems Shape Priorities? The Case of Risk-Based Environmental Planning*, 50 PUB. ADMIN. REV. 82, 82 (1990).

health, non-cancer health, ecological, and welfare risks.[105] That was followed by a series of regional, state, and local comparative risk projects in the late 1980s and early 1990s. At the same time, EPA and other agencies were incorporating the concept and metrics of risk into internal planning and budgeting.[106] The explicit goal was to direct more resources to problems that empirically posed higher risks.[107] The obverse, of course, is that problems seen as posing less risk received fewer resources.

The national and regional risk projects suggested that existing agency priorities did not always match the evidence regarding relative risk. Highly ranked health risks included radon and indoor air pollution, household chemicals, pesticides, conventional air pollution, and drinking water contaminants.[108] Highly ranked ecological risks included stratospheric ozone depletion, global warming, aquatic habitat alteration—e.g., wetlands, nonpoint source water pollution, and effects of mining, oil, and gas wastes.[109] Risk-based planning received a boost from EPA's Science Advisory Board in 1990 when it endorsed not only the concept, but also the logic, underlying the various risk ranking projects.[110]

A further round of projects, conducted at the state and local levels, applied the overall methodology but added an element of citizen participation and engagement. The state projects in particular incorporated a large degree of public participation, including citizen advisory boards, public meetings and hearings, and media outreach.[111] The state and regional projects also went beyond priority setting by proposing management strategies for highly ranked risks.[112] They based the strategies on evaluations of EPA's legal authority, the feasibility and costs of controls, and public perceptions of problems.[113]

If asked, sponsors of risk-based planning would probably name capacity and efficiency as their primary goals. The capacity goal is reflected in the desire to bring risk analysis into planning as a basis for more rational decisions. The efficiency goal is promoted by targeting resources on problems that pose more health and ecological threats, leading to more risk reduction for the resources expended. There also is a case to be made for the goal of legitimacy, given that citizen participation was incorporated into the state and local projects, and that having an empirical basis for allocating scarce resources would earn greater public confidence. These state and local projects aimed not only to integrate risk analysis into priority setting,

105 EPA, NO. 000R87901, UNFINISHED BUSINESS: A COMPARATIVE ASSESSMENT OF ENVIRONMENTAL PROBLEMS: OVERVIEW REPORT xiii (1987).

106 Fiorino, *supra* note 104, at 82.

107 *Id.*

108 EPA, NO. SAB-EC-90-021, REDUCING RISK: SETTING PRIORITIES AND STRATEGIES FOR ENVIRONMENTAL PROTECTION 14 (1990).

109 *Id.* at 13.

110 *Id.* at 5.

111 *See* FIORINO, *supra* note 22, at 161.

112 *Id.* at 161.

113 *Id.*

but also to involve communities.[114] To this day, the state and local projects constitute one of the more thoughtful efforts by EPA or any federal agency to engage the public in upstream—i.e., earlier in the decision-making process—policy making.[115]

On the surface, risk-based planning did not face as much political opposition as some of the other innovation streams discussed here. Yet there were reservations from some quarters, and these probably helped undermine support for the concept after the presidential transition of 1993.[116] To its critics, risk analysis was seen as justification for not taking or delaying action when there was empirical uncertainty about levels of risk. One concern was the prospect of "paralysis by analysis" in making regulatory decisions.[117] Another was that risk-based planning would substitute elite, technocratic preferences for priorities that had been defined through the political process. Among environmentalists, there was suspicion that risk assessment increased the factual burdens of regulatory "proof" and this would spill over into processes for priority setting. The worry generally has been that injecting risk estimates into priority setting imposes too high a regulatory burden of proof on agencies, as compared to the "precautionary principle" favored by many environmental advocates, which urges regulatory action in the face of scientific uncertainty.[118]

The long-term effects of risk-based planning did not match the high expectations that emerged around the national, regional, state, and local projects. Interest declined in the transition from EPA Administrator William Reilly to his successor in Bill Clinton's administration, Carol Browner. The most serious attempt to infuse risk-based thinking into EPA priority setting after that came in the late 1990s, when the planning and analysis staff within the budget office required risk justifications from program offices and matched risk data against funding for various programs.[119] This exercise,

114 COMPARING ENVIRONMENTAL RISKS: TOOLS FOR SETTING GOVERNMENT PRIORITIES 35 (J. Clarence Davies ed., 1996).

115 *See generally id.* (analyzing comparative risk and its application in government).

116 *See generally* James E. Krier & Mark Brownstein, *On Integrated Pollution Control*, 22 ENVTL. L. 119 (1992) (expressing skepticism about risk-based planning); *Risk Based Decisionmaking at the Environmental Protection Agency: Joint Hearing Before the Subcomm. on Env't., Energy, & Natural Res. and Subcomm. on Legis. & Nat'l Sec. of the Comm. on Gov't Operations*, 103d Cong. 77 (1994) (statement of Robert V. Percival, Professor of Law, University of Maryland School of Law).

117 A tactic employed by critics of regulation is to use requirements for risk assessments to tie up the regulatory process and curtail rulemaking, most notably evidenced by the "Contract with America" in the mid-1990s. *See* Michael E. Kraft, *Environmental Policy in Congress*, *in* ENVIRONMENTAL POLICY: NEW DIRECTIONS FOR THE TWENTY-FIRST CENTURY 99, 109–11 (Norman J. Vig and Michael E. Kraft eds., 2010).

118 *See generally* Robert F. Durant, *The Precautionary Principle*, *in* ENVIRONMENTAL GOVERNANCE RECONSIDERED: CHALLENGES, CHOICES, AND OPPORTUNITIES 105 (Robert F. Durant, Daniel J. Fiorino & Rosemary O'Leary, eds., 2004).

119 *See, e.g., Office of Policy, Econ., and Innovation, U.S. Envtl. Prot. Agency Before the S. Comm. on Env't and Pub. Works*, 106th Cong. 9–10 (2000) (discussing the role of comparative risk analysis in budgeting and priority setting).

however, has had limited effects on funding decisions. As of 2011, risk-based planning has had, at best, a minimal and ad hoc effect on planning and decisions, except perhaps at the margins of choice.

D. Regulatory Flexibility

Regulatory flexibility emerged as a response to the design and operation of the national system for environmental regulation in the United States. It reflected several trends in the 1990s. One was dissatisfaction with the costs, adversarialism, and lack of adaptability of the system that had been adopted in the 1970s. Unlike most of the earlier critics, who challenged the existence or stringency of regulation, these "revisionist" critics were concerned that the regulatory system was not keeping pace with changes in environmental problems and economic conditions.[120] A second trend was a political climate that had become skeptical of regulation. The 1994 midterm congressional elections yielded a Republican majority that led, especially in the House of Representatives, to a conservative backlash against the environment.[121] Third was the increasing interest, as a result of the 1992 Earth Summit in Rio de Janeiro, in environmental sustainability.[122] In Rio's wake, for example, the Clinton administration created a President's Council for Sustainable Development, many firms launched sustainability programs, and nongovernmental organizations stressed a sustainability theme.[123] A fourth trend was a "Reinventing Government" initiative launched by the Clinton administration in the mid-1990s.[124]

Regulatory flexibility is probably the most politically charged of the innovation streams discussed in this Article. To many environmentalists,

120 *See* FIORINO, *supra* note 21, at 121–55 (discussing revisionist support of environmental values while favoring new approaches to the regulatory system); *see also* William D. Ruckelshaus, *Stepping Stones*, 15 ENVTL. F., Mar./Apr. 1998, at 30, 34–35 (1998) (expressing revisionist perspective on a policy level).

121 Michael E. Kraft, *Environmental Policy in Congress*, *in* ENVIRONMENTAL POLICY: NEW DIRECTIONS FOR THE TWENTY-FIRST CENTURY 99, 109 (Norman J. Vig & Michael E. Kraft eds., 2010).

122 *See, e.g.*, PRESIDENT'S COUNCIL FOR SUSTAINABLE DEVELOPMENT, SUSTAINABLE AMERICAN: A NEW CONSENSUS FOR PROSPERITY, OPPORTUNITY, AND A HEALTHY ENVIRONMENT FOR THE FUTURE (1996) http://clinton2.nara.gov/PCSD/Publications/TF_Reports/amer-chap7.html (last visited July 26, 2014) (stating that most national councils on sustainable development organized in response to the 1992 Earth Summit).

123 *Id.*

124 Several environmental initiatives were announced by the Clinton White House in March 1996. *See* PRESIDENT BILL CLINTON & VICE PRESIDENT AL GORE, REINVENTING ENVIRONMENTAL REGULATION 1–2 (1996); *see also* U.S. GOV'T ACCOUNTABILITY OFFICE, GAO/RCED-97-155, ENVIRONMENTAL PROTECTION: CHALLENGES FACING EPA'S EFFORTS TO REINVENT ENVIRONMENTAL REGULATION 5 (1997), *available at* http://www.gao.gov/archive/1997/rc97155.pdf (assessing the results of these initiatives). A list of EPA reinvention initiatives may be found in Appendix I of this report. *See generally* Walter A. Rosenbaum, *Escaping the Battered Agency Syndrome: EPA's Gamble with Regulatory Reinvention*, *in* ENVIRONMENTAL POLICY: NEW DIRECTIONS FOR THE TWENTY-FIRST CENTURY 165, 170 (Norman J. Vig & Michael E. Kraft eds., 4th ed. 2000) (discussing the Clinton Administration's attempt to reinvent the EPA).

such flexibility posed direct challenges to the stringency and effectiveness of the regulatory system that had been built up over the preceding decades.[125] For them, "flexibility" was a cover word for "rollback," and reinvention was little more than an attempt to capitalize on anti-regulatory sentiment that had been brewing for decades. That this innovation stream was so contested politically made it vulnerable to the swings from the Clinton, to the Bush, to the Obama administrations from 1993 to 2009.[126] What began as a "third-way" group of innovations under President Bill Clinton in the mid-1990s had, by the end of the polarized Bush years, become to many environmentalists a symbol of the decline of the environmental regulatory state.[127]

By far the most visible and revealing of the innovations within the regulatory flexibility stream was Project XL. Shorthand for "Project Excellence and Leadership," this initiative directly confronted the long-standing criticism that rigidity and fragmentation in regulation were, at times, impeding progress. The premise for Project XL was not that regulation was unnecessary or even too stringent, but that it was poorly designed and applied.[128] Project XL's conceptual foundations could be found not in conservative or anti-regulatory think tanks, but among politically moderate environmental officials and reformers. Among the advocates of more flexible regulation were the President's Council for Sustainable Development; the Progressive Policy Institute, the policy arm of the Democratic Leadership Council; the National Academy of Public Administration; and the Aspen Institute.[129] Among the high-profile supporters

125 *See* Rena I. Steinzor, *Reinventing Environmental Regulation: The Dangerous Journey from Command to Self-Control*, 22 HARV. ENVTL. L. REV. 103, 104 (1998).

126 *See* Daniel J. Fiorino, *Regulating for the Future: A New Approach for Environmental Governance*, in TOWARD SUSTAINABLE COMMUNITIES: TRANSITION AND TRANSFORMATIONS IN ENVIRONMENTAL POLICY 63, 81–82 (Daniel A. Mazmanian & Michael E. Kraft eds., 2d ed. 2009) ("Polarization in U.S. national politics makes consensus difficult, especially on such subtle issues as regulatory structures, styles, and relationships.").

127 Lauren Woodall, *The Administrative Presidency: Influencing Environmental Policy in the United States, 1970–2008*, *in* A DIALOGUE ON PRESIDENTIAL CHALLENGES AND LEADERSHIP: SELECTED PAPERS OF THE 2007–2008 PRESIDENTIAL FELLOWS 347, 353–54 (Julie E. Manus et al. eds., 2008), *available at* http://www.thepresidency.org/component/content/article/289%20Woodall%20article!.

128 *See* Steinzor, *supra* note 125, at 107.

129 Some excellent resources on the case for innovation in the 1990s are the three reports of the National Academy of Sciences. *Setting Priorities, Getting Results: A New Direction for the Environmental Protection Agency* (1995); NAT'L ACAD. OF PUB. ADMIN., ENVIRONMENT.GOV: TRANSFORMING ENVIRONMENTAL PROTECTION IN THE 21ST CENTURY 17 (2000); *see* Jonathan Howes et al., *Resolving the Paradox of Environmental Protection*, ISSUES IN SCI. & TECH., Summer 1998, at 57, 58; *see also* Debra S. Knopman, *Statement by Debra S. Knopman to the Democratic Platform Committee,* http://www.dlc.org/ndol_ci5aaa.html?kaid=116&subid=150&contentid=1486 (last visited July 26, 2014) (demonstrating the Progressive Policy Institute's perspective); THE ASPEN INST., A CALL TO ACTION TO BUILD A PERFORMANCE-BASED ENVIRONMENTAL MANAGEMENT SYSTEM 1 (200), *available at* http://www.aspeninstitute.org/sites/default/files/content/docs/ee/eeeperform.pdf (demonstrating the Aspen Institute's perspective). *See generally* MARC ALLEN EISNER, GOVERNING THE ENVIRONMENT: THE TRANSFORMATION OF ENVIRONMENTAL REGULATION 96 (2007); Shelley H. Metzenbaum, *Measurement That Matters:*

of a third way for environmental regulation were Vice President Al Gore, EPA Administrator Carol Browner, and former Administrator William Ruckelshaus, all of whom held strong, pro-environmental records.[130] As former EPA official Karl Hausker wrote, "it would be supremely ironic if the hundreds of participants in the next generation policy forums had come up with a recipe for environmental disaster, despite their commitments to, and credentials in, environmental protection."[131] Despite having strong support, reinvention initiatives, such as Project XL, aroused suspicions among some environmentalists as a source of unraveling the environmental regulatory state.[132]

Project XL invited regulated facilities to propose changes to the rules that would allow them to achieve better environmental results.[133] It was a simple quid pro quo, in which flexibility would be exchanged for measurably better performance. The Project XL story has been recounted many times.[134] The topics of interest here are Project XL's conceptual foundations, the assumptions behind them, and the reasons for Project XL's success or failure. To a large degree, Project XL's origins may be traced to the core ideas of reinvention. These core ideas assert that characteristics of bureaucracy, which evolved over the years, are responsible for many of the failures associated with government. The reinvention critique was that agencies were more focused on rules, standardization, constraints, and procedures, than on missions and results.[135] A precept of reinvention was that regulatory agencies and the organizations they regulate should be given more discretion in adapting to situations as they exist on the ground. Project

Cleaning Up the Charles River, *in* ENVIRONMENTAL GOVERNANCE: A REPORT ON THE NEXT GENERATION ENVIRONMENTAL POLICY 58, 62 (Donald F. Kettle ed., 2002).

130 *See, e.g.*, Ruckelshaus, *supra* note 120, at 30–36.

131 DANIEL J. FIORINO, *Stepping-Stones or Just Rocks in the Stream? The Reinvention Era*, *in* THE NEW ENVTL. REG. 121, 127 n.14 (2006) (citation omitted).

132 *See, e.g.*, Bradford C. Mank, *The Environmental Protection Agency's Project XL and Other Regulatory Reform Initiatives: The Need for Legislative Authorization*, 25 ECOLOGY L.Q. 1, 58–63 (1998) (discussing concerns environmentalists had regarding EPA's Project XL).

133 EPA, *What is Project XL?*, http://www.epa.gov/projectxl/file2.htm (last visited July 26, 2014) (summarizing the purpose, goals, and intent of EPA's Project XL).

134 *See generally* ALFRED A. MARCUS ET AL., REINVENTING ENVIRONMENTAL REGULATION: LESSONS FROM PROJECT XL (2002); Mank, *supra* note 132, at 1 (discussing EPA's current lack of legal authority to undertake reform, and how to maintain environmental and health protections when reforms are made); Dennis D. Hirsch, *Understanding Project XL: A Comparative Legal and Policy Analysis*, *in* ENVIRONMENTAL CONTRACTS: COMPARATIVE APPROACHES TO REGULATORY INNOVATION IN THE UNITED STATES AND EUROPE 115–42 (Eric W. Orts & Kurt Deketelaere eds., 2001) (describing the context and structure of Project XL and comparing it to its Dutch counterpart); Daniel J. Fiorino, *Toward a New System of Environmental Regulation: The Case for an Industry Sector Approach*, 26 ENVTL. L. 457 (1996); Dennis D. Hirsch, *Bill and Al's XL-ent Adventure: An Analysis of the EPA's Legal Authority to Implement the Clinton Administration's Project XL*, 1998 U. ILL. L. REV. 129 (1998) [hereinafter Bill and Al's XL-ent Adventure] (examining XL's legal foundations and the potential to use implied waiver authority to reform EPA's environmental enforcement strategy).

135 For an analysis, see generally EUGENE BARDACH & ROBERT A. KAGAN, GOING BY THE BOOK: THE PROBLEM OF REGULATORY UNREASONABLENESS (2002).

XL fit this mindset perfectly. It invited companies and other organizations to propose modifications in regulations that would lead to improved environmental performance at less cost, based on their on-the-ground knowledge.[136]

The program continued through the remainder of the Clinton Administration.[137] Eventually, more than fifty specific projects were authorized.[138] Some served as demonstrations for regulatory changes that were adopted more widely. Many were one-time changes that were not extended or replicated beyond the specific project. EPA found that it was difficult, from a political and legal perspective, to justify deviations from its own rules or to allow flexibility within the context of its often highly specific statutes.[139] Some environmental groups challenged the intent and justification for the idea of regulation by exception, especially when they were perceived as a threat to the stringency of the existing regulatory system and to their leverage.[140] The Bush administration demonstrated little interest in Project XL, and the program eventually was terminated as the projects came to a conclusion in 2003.[141]

Another innovation that may be associated with the regulatory flexibility stream, and that may have staying power, is flexible air permits. Permitting is a core process in environmental regulation, yet it has been remarkably resistant to reform.[142] Permits are vehicles for translating standards into practical, enforceable limits, and applying them to individual or groups of sources. They are also among the most resource intensive of the regulatory functions assigned to state agencies, which issue over 90% of all environmental permits.[143] A major issue is the time and uncertainty involved in permitting, especially when facilities need approval for new processes in response to customer demands, and must implement changes on tight production schedules.[144] For conventional permits, process changes

136 *See* Steinzor, *supra* note 125, at 122–23.

137 EPA, *Project XL*, http://www.epa.gov/projectxl/ (last visited July 26, 2014) (noting the program continued to accept project proposals through 2002).

138 *Id.*

139 MARCUS, *supra* note 134, at 172.

140 *See* ROBERT GOTTLIEB, ENVIRONMENTALISM UNBOUND: EXPLORING NEW PATHWAYS FOR CHANGE 86 (2001).

141 Max H. Bazerman, *Barriers to Acting in Time on Energy and Strategies for Overcoming Them*, *in* ACTING IN TIME ON ENERGY POLICY 162, 171 (Kelly Sims Gallagher eds., 2009).

142 TERRY DAVIES ET AL., REFORMING PERMITTING 8, 83 (2001).

143 Barry G. Rabe, *Racing to the Top, the Bottom, or the Middle of the Pack?*, *in* ENVIRONMENTAL POLICY: NEW DIRECTIONS FOR THE TWENTY-FIRST CENTURY 29 (Norman J. Vig & Michael E. Kraft eds., 7th ed. 2010). States also complete more than 90% of environmental enforcement actions and collect almost 95% of environmental data used by the federal government. *Id.*

144 For a discussion of this issue in the semiconductor industry, see generally JAN MAZUREK, MAKING MICROCHIPS: POLICY, GLOBALIZATION, AND ECONOMIC RESTRUCTURING IN THE SEMICONDUCTOR INDUSTRY (1999). The need for more rapid permit approvals was the factor behind some of the Project XL initiatives discussed above. A prime example is the project with the Intel Corporation. *See* EPA, EVALUATION OF IMPLEMENTATION EXPERIENCES WITH INNOVATIVE AIR PERMITS 4, 26 (2003), *available at* http://www.epa.gov/ttn/caaa/t5/memoranda/iap_eier.pdf.

typically require permit modifications and regulatory approvals.[145] Flexible permits differ by allowing sources to operate within limits that are more stringent but also more flexible; permitted sources may make limited operational changes, as defined in the permit, without having to obtain prior approval from regulatory agencies.[146]

Starting in the late 1990s, EPA developed several flexible permits on a pilot basis.[147] It found that flexible permits encouraged emissions reductions and pollution prevention that exceeded the requirements under existing permits.[148] Such permits also helped sources operate more efficiently by reducing the time and uncertainty in changing processes. A third benefit was reducing administrative burdens on regulators by not requiring so many permit modifications.[149] After several pilot programs and an evaluation of flexible air permits during 2001–2002, EPA began an effort to codify flexible air permitting in regulations.[150] The final rule was signed on January 13, 2009. After a review by the incoming Obama administration in early 2009, this rule was released unchanged on September 25, 2009;[151] the number of flexible permits was expected to increase as more staff became experienced in developing them.[152] Flexible permits thus illustrate a successful innovation that is currently being implemented. It may be that the more specific boundaries around flexible air permitting as an innovation made it more politically acceptable than the broader, more generic scope of Project XL.

The highly contested innovations in the regulatory flexibility stream are the most obvious casualties of the polarization that has characterized environmental politics in the last decade. Although there were critics of this innovation stream in the 1990s, even while the EPA was in Democratic hands, the core idea of flexibility applied selectively was endorsed by many strong supporters of the environment.[153] In Congress, members of both

145 *See* EPA, EVALUATION OF IMPLEMENTATION EXPERIENCES WITH INNOVATIVE AIR PERMITS 4 (2004).

146 *Id.* at 7.

147 OFFICE OF POLLUTION PREVENTION AND TOXICS, EPA, EVALUATION OF EPA EFFORTS TO INTEGRATE POLLUTION PREVENTION POLICY THROUGHOUT EPA AND AT OTHER FEDERAL AGENCIES 26 (2008).

148 *Id.* at 48.

149 *See generally* EPA, *supra* note 145.

150 EPA, FACT SHEET: FINAL FLEXIBLE AIR PERMITTING RULE (2009), *available at* http://www.epa.gov/NSR/documents/FAP_FactSheet.pdf.

151 Operating Permit Programs, 74 Fed. Reg. 51,418 (Oct. 6, 2009) (codified at 40 C.F.R. pts. 70–71).

152 *See* EPA, EVALUATION OF IMPLEMENTATION EXPERIENCES WITH INNOVATIVE AIR PERMITS: RESULTS OF THE U.S. EPA FLEXIBLE PERMIT IMPLEMENTATION REVIEW 8 (2002), *available at* http://www.epa.gov/ttn/oarpg/t5/memoranda/iap_eier.pdf (concluding from the results of the U.S. EPA Flexible Permit Review that "[p]ermitting authorities expressed interest in . . . expanding the use of flexible permits within their jurisdictions and believed that finalization of EPA policy and/or guidance for flexible permits should increase national interest and efficiency in expanding their use").

153 *See generally* Bill and Al's XL-ent Adventure, *supra* note 134 (discussing possible approaches to Project XL to ensure flexibility); Mank, *supra* note 134, at 3–5 (discussing both support for and concern about Project XL's flexibility).

parties had proposed "second generation" legislation granting discretion to the EPA to use more flexible, performance-based tools.[154] By the 2000s, interest in flexible approaches was gone, overshadowed by the more fundamental political conflicts over environmental policy, especially after the 2010 midterm congressional elections when the House switched to a Republican majority.[155]

E. Partnerships and Voluntary Programs

The greater use of partnerships and voluntary programs in environmental policy since the early 1990s shares many characteristics with the regulatory flexibility innovation stream. The political climate for regulation was generally hostile or wrapped up in congressional gridlock. Supporters of environmental values were frustrated with limits in conventional regulation, while business wanted to be able to make or claim progress without new regulation.

These factors, however, do not fully explain the interest in voluntary programs and partnerships. What was apparent by the late 1990s was that many countries and levels of government were pursuing non-regulatory, collaborative action as a means of complementing, preparing for, or even displacing regulation.[156] Japanese environmental policy, for example, was built largely on the basis of local agreements adopted in the context of national policy.[157] European countries also moved toward greater use of voluntary action and negotiated agreements during the 1990s.[158] At local and state levels in the United States, collaborations focused on watersheds and

154 *See* Richard B. Stewart, *A New Generation of Environmental Regulation?*, 29 CAP. U. L. REV. 21, 63–64 (2001).

155 Michael E. Kraft, *Environmental Policy in Congress*, *in* ENVIRONMENTAL POLICY: NEW DIRECTIONS FOR THE TWENTY-FIRST CENTURY 99, 108–09 (Norman J. Vig & Michael E. Kraft eds., 2010).

156 *See* Richard D. Morgenstern & William A. Pizer, *The Challenge of Evaluating Voluntary Programs*, *introduction to* REALITY CHECK: THE NATURE AND PERFORMANCE OF VOLUNTARY ENVIRONMENTAL PROGRAMS IN THE UNITED STATES, EUROPE, AND JAPAN 1–2 (Richard D. Morgenstern & William A. Pizer eds., 2007); Dinah A. Koehler, *The Effectiveness of Voluntary Environmental Programs—A Policy at the Crossroads?*, 35 POL'Y STUD. J. 689, 691 (2007).

157 *See* Eric W. Welch & Akira Hibiki, *An Institutional Framework for Analysis of Voluntary Policy: The Case of Voluntary Environmental Agreements in Kita Kyushu, Japan*, 46 J. ENVTL. PLAN. & MGMT. 523, 536–37 (2003); Eric W. Welch & Akira Hibiki, *Japanese Voluntary Environmental Agreements: Bargaining Power and Reciprocity as Contributors to Effectiveness*, 35 POL'Y SCI. 401, 414–15 (2002).

158 *See, e.g.*, EDOARDO CROCE, THE HANDBOOK OF VOLUNTARY ENVIRONMENTAL AGREEMENTS: DESIGN, IMPLEMENTATION AND EVALUATION ISSUES (2005); INDUSTRIAL TRANSFORMATION: ENVIRONMENTAL POLICY INNOVATION IN THE UNITED STATES AND EUROPE (Theo de Bruijn & Vicki Norberg Hohme eds., 2005) (discussing voluntary programs that took place during the 1990s in the United States and various European countries); David J. E. Grimeaud, *Convergence or Divergence in the Use of "Negotiated Environmental Agreements" in European and U.S. Environmental Policy: An Overview*, *in* GREEN GIANTS? ENVIRONMENTAL POLICIES OF THE UNITED STATES AND THE EUROPEAN UNION 159 (Norman J. Vig & Michael G. Faure eds., 2001) (describing European environmental agreements and comparing them to U.S. agreements).

habitats have drawn attention in recent decades.[159] Dewitt John's concept of "civic environmentalism" aimed to capture the increasing uses of improvised bottom-up, place-based approaches.[160] Voluntary programs respond to the recognized deficiencies in conventional regulatory approaches.

Of the streams of innovation discussed in this Article, the conceptual foundations of voluntary programs and partnerships are probably the least developed and least coherent. These innovations have proven to be difficult to define by researchers and practitioners alike.[161] To be sure, shared characteristics come to mind. The "voluntary" aspect means that participation in these innovations is not legally required and occurs at the discretion of the participants. The "collaborative" aspect suggests the opportunity for diverse interests to cooperate in achieving shared goals. The idea of "partnerships" is that there is a formal agreement to act in specified ways and to meet expectations that are mutually defined.[162] These terms, however, provide a list of shared characteristics rather than a useful conceptual foundation.

Reflecting this disjointed foundation, voluntary programs take many forms. Potoski and Prakash have set out a theoretical basis for one type, known as "green clubs."[163] These induce members "to produce positive social externalities beyond what government regulations require them to produce."[164] Green clubs accomplish this by providing benefits to members that are unavailable to non-members.[165] These excludable benefits usually consist of recognition, access to information, and preferential treatment.[166] Benefits also are non-rival, such that making them available to one member of the club does not make them unavailable to others.[167] Many clubs, such as certification for environmental management systems—ISO 14001—or nongovernmental business codes of conduct, such as the Forest Stewardship Council—do not involve government directly.[168] Others do.[169]

159 *See* TOMAS M. KOONTZ ET AL., COLLABORATIVE ENVIRONMENTAL MANAGEMENT: WHAT ROLES FOR GOVERNMENT? 7–8 (2004).

160 DEWITT JOHN, CIVIC ENVIRONMENTALISM: ALTERNATIVES TO REGULATION IN STATES AND COMMUNITIES 7 (1994); Dewitt John, *Civic Environmentalism*, *in* ENVIRONMENTAL GOVERNANCE RECONSIDERED: CHALLENGES, CHOICES, AND OPPORTUNITIES 219 (Robert F. Durant et al. eds., 2004).

161 *See* DANIEL J. FIORINO, VOLUNTARY INITIATIVES, REGULATION, AND NANOTECHNOLOGY OVERSIGHT: CHARTING A PATH 14–15 (2010), *available at* http://www.nanotechproject.org/process/assets/files/8347/pen-19.pdf.

162 *See generally id.*

163 ASEEM PRAKASH & MATTHEW POTOSKI, THE VOLUNTARY ENVIRONMENTALISTS: GREEN CLUBS, ISO 14001, AND VOLUNTARY ENVIRONMENTAL REGULATIONS 2 (2006).

164 Matthew Potoski & Aseem Prakash, *A Club Theory Approach to Voluntary Programs*, *in* VOLUNTARY PROGRAMS: A CLUB THEORY PERSPECTIVE 17, 20 (Matthew Potoski & Aseem Prakash eds., 2009).

165 PRAKASH & POTOSKI, *supra* note 163, at 2.

166 *See id.* at 2, 47; FIORINO, *supra* note 164, at 15.

167 FIORINO, *supra* note 139, at 19.

168 *Id.* at 25.

169 *See* Potoski & Prakash, *supra* note 162, at 17.

Examples of EPA-sponsored green clubs created in recent decades include 33/50, WasteWise, Climate Leaders, the National Environmental Performance Track, Energy Star, and WaterSense.[170]

Two issues affect the credibility of green clubs: 1) whether they limit free riding, and 2) whether they avoid or minimize shirking. Sponsors of green clubs limit shirking and minimize free riding by requiring third-party auditing of qualifications and performance, public disclosure of member conformance with program criteria, and sanctioning mechanisms, such as removal.[171] What Potoski and Prakash term *weak* sword clubs include just third-party auditing; *medium* sword clubs require third-party auditing and public disclosure of member conformance with program criteria; and *strong* sword clubs involve third-party auditing, public disclosure of member conformance with program criteria, and sanctioning mechanisms.[172] Club theory provides a conceptual underpinning for a subset of voluntary programs. It may apply to voluntary programs sponsored by government as well as those without agency involvement.

Voluntary programs also take other forms, with less theoretical foundations. In the chemicals area, they may expand access to data. The High Production Volume Chemicals and Nanomaterials Stewardship Programs are examples.[173] These encourage, but do not compel, firms to submit data needed for regulatory decisions.[174] Other programs, such as Design for the Environment, build partnerships with industry for developing environmentally preferable technologies.[175] The Green Suppliers Network provides data and other resources, such as technical reviews, to leverage supply chains for economic and environmental gains.[176] The Sustainable

170 EPA, *33/50 Program: The Final Record*, http://www.epa.gov/opptintr/3350/ (last visited July 26, 2014); EPA, *Conserving Resources, Preventing Waste*, http://www.epa.gov/epawaste/conserve/smm/wastewise/index.htm (last visited July 26, 2014); EPA, *Climate Leadership Awards*, http://www.epa.gov/climateleadership/awards/ (last visited July 26, 2014); EPA, *Performance Track*, http://www.epa.gov/performancetrack/ (last visited July 26, 2014); EPA, *Partnership Programs List of Programs*, http://www.epa.gov/partners/index.htm (last visited July 26, 2014). *See also* Madhu Khanna & Lisa A. Damon, *EPA's Voluntary 33/50 Program: Impact on Toxic Releases and Environmental Performance of Firms*, 37 J. ENVTL ECON. & MGMT 1, 1–25 (1999) (examining the motivations for participating in the program and its impacts).

171 FIORINO, *supra* note 164, at 21, 26.

172 Matthew Potoski & Aseem Prakash, *Covenant with Weak Swords: ISO 14001 and Facilities' Environmental Performance*, 24 J. POL'Y ANALYSIS & MGMT. 745, 747–48 (2005).

173 EPA, *Status and Future Directions of the High Production Volume (HPV) Challenge Program*, http://www.epa.gov/hpv/pubs/general/hpvstatr.htm (last visited July 26, 2014); EPA, *Nanoscale Materials Stewardship Program*, http://www.epa.gov/oppt/nano/stewardship.htm (last visited July 26, 2014).

174 EPA, *Status and Future Directions of the High Production Volume (HPV) Challenge Program*, http://www.epa.gov/hpv/pubs/general/hpvstatr.htm (last visited July 26, 2014); EPA, *Nanoscale Materials Stewardship Program*, http://www.epa.gov/oppt/nano/stewardship.htm (last visited July 26, 2014).

175 EPA, *About Us: Design for Environment*, http://www.epa.gov/dfe/pubs/about/index.htm (last visited July 26, 2014).

176 EPA, *Green Suppliers Network*, http://www.epa.gov/oppt/ar/2007-2009/working/gsn.htm (last visited July 26, 2014).

Futures Initiative complements the new chemical reviews EPA conducts under section 5 of TSCA.[177] The complementary review enables firms to conduct their own screening process, with training and an approved methodology, to qualify for expedited reviews for their new chemical submissions.[178] The voluntary programs are justified as a means of acquiring data that would otherwise be unavailable to agencies, preparing the ground for mandatory reporting or testing, and determining what data are available from industry as a basis for making regulatory decisions on chemicals.[179]

The goals of voluntary programs are not always clear to supporters or critics. To many advocates, their primary goal is to enhance capacities for future problem solving. By demonstrating the value of collaboration toward mutual goals, building trust through recurring relationships, and improving the ability to measure results, these programs are designed to enhance institutional capacity, not only for the issue at hand but those issues that may arise in the future. For other advocates, voluntary programs are all about delivering environmental results; they exist to obtain reductions in greenhouse gases, solid waste generation, water use, and so on. Of course, for many supporters, voluntary programs may achieve both kinds of goals. Yet most evaluations of voluntary programs have focused almost entirely on whether or not they may be proven to deliver results beyond what would have been achieved under "business as usual." Although the capacity-building—often termed "social"—benefits of voluntary programs often are recognized, they are difficult to define and measure.

Voluntary programs occupy a tenuous political, administrative, and legal space in the overall environmental policy scheme. They are rarely authorized specifically in statutes. EPA has relied on general language in the PPA to justify most of them.[180] Although many business firms support these initiatives, they also argue that the benefits of joining are few, and the attention drawn to participants creates political risks.[181] Among environmentalists, voluntary programs often are seen as an excuse not to regulate, a way for business to claim credit without necessarily delivering verifiable results, and a diversion of resources from the core functions of regulation and enforcement.[182] Environmental agencies have not been able, theoretically or practically, to articulate the relationship of voluntary to

177 EPA, *Basic Information: Sustainable Futures*, http://www.epa.gov/oppt/sf/pubs/basic.htm (last visited July 26, 2014).

178 *Id.*

179 *See id.* (describing the shortcomings of TSCA before implementation of the supplementary program).

180 *See* 42 U.S.C. § 13103 (2006).

181 *See* TERRY DAVIES & JAN MAZUREK, INDUSTRY INCENTIVES FOR ENVIRONMENTAL IMPROVEMENT: EVALUATION OF U.S. FEDERAL INCENTIVES 39, 41 (1996) (underscoring that firms face the threat of regulatory enforcement and citizen suits); *see also* U.S. GOV'T ACCOUNTABILITY OFFICE, GAO/RCED-97-155, ENVIRONMENTAL PROTECTION: CHALLENGES FACING EPA'S EFFORTS TO REINVENT ENVIRONMENTAL REGULATION 52 (2007) (acknowledging industry's desire for special protections in exchange for joining voluntary programs).

182 Morgenstern & Pizer, *supra* note 156, at 3–4.

existing regulatory, grant, and enforcement programs. As a result, voluntary programs operate at the margins of agency policy. One reliable estimate is that voluntary programs draw about 1.6% of EPA's budget.[183] Despite the attention given to voluntary programs in recent years, and in contrast to experiences elsewhere, they have not been systematically incorporated into national policy in the United States and operate at the margins of current policy. But failure to integrate voluntary programs into the existing framework does not necessarily mean they could not contribute to national policy capacities.

IV. PATTERNS IN ENVIRONMENTAL INNOVATION

Given that the innovation streams profiled represent only a portion of EPA innovations over the last forty years, one should be careful about drawing general conclusions. Because these innovations as a whole, rather than as specific initiatives, have received scattered attention in the policy literature, it is worth considering the implications of this discussion and conclusions that may be drawn from it. Table 3 summarizes the characteristics of each of the five innovation streams.

One issue raised by these five streams is the importance of having an underlying theory to explain and justify innovation. As the discussion above suggests, varying levels of theoretical justification exist for each of these streams of innovation. A theoretical justification is most developed for emissions trading, which is grounded in economic theory.[184] It is probably least developed for voluntary programs, although the recent applications of club theory may remedy that to some degree. Both program integration and risk-based planning draw, more implicitly than explicitly, on the public administration literature regarding rational and incremental models. The flexibility stream has a shallow but identifiable theoretical foundation coming from the self-reflective tendencies of U.S. environmental policy in the 1980s and 1990s, which in turn drew upon the reinvention concept within government.[185] The shallowness of that foundation is apparent in the ease with which critics of flexibility have been able to portray such efforts as

183 *Id.* at 2 (stating that voluntary programs comprised 1.6% of EPA's 2006 operating budget).

184 *See, e.g.*, Melissa Newham & Beatrice Conradie, Centre for Social Science Research, *A Critical Review of South Africa's Carbon Tax Policy Paper: Recommendations for the Implementation of an Offset Mechanism* 3 (Working Paper, CTR. FOR SOC. SCI. RESEARCH, No. 334, 2013).

185 *See generally* Nicole Darnall & Stephen Sides, *Assessing the Performance of Voluntary Environmental Programs: Does Certification Matter?*, *in* VOLUNTARY ENVIRONMENTAL PROGRAMS: A POLICY PERSPECTIVE 213–14 (Peter deLeon & Jorge E. Rivera eds., 2010); Peter deLeon, Jorge E. Rivera & Laurie Manderino, *Voluntary Environmental Programs: An Introduction*, *in* VOLUNTARY ENVIRONMENTAL PROGRAMS: A POLICY PERSPECTIVE, *supra*, at 2–3 (discussing the widespread changing philosophy in government in the late 1980s, away from overregulation and toward more flexible mechanisms).

rollback or deregulation rather than as a source of legitimate policy reforms.[186]

Table 3: Summary of Characteristics of the Five Innovation Streams

	Perceived Need/Deficiency	**Theoretical Basis**	**Examples**	**History/Status**
Emissions Trading	Accommodating health-based goals with growth & efficiency	Economic theory	• Offsets • Bubble policy • Water trading • Acid rain • Cap and trade	Gradual expansion and incorporation into mainstream policy, especially air
Program Integration	Accounting for cross-media effects & need for more holistic strategies	Administrative theory	• Toxics integration • International Ecosystem Management Partnership • Clusters initiative	Ad hoc adjustments but no systematic incorporation in regulatory policy
Risk-Based Planning	Lack of means to set priorities with growing list of problems; need to restore agency credibility	Rational policy model	• Unfinished Business • Regional/state projects	Adopted in late 1980s/early 1990s, but limited long-term effects
Regulatory Flexibility	Evidence of barriers to more effective solutions	Reinvention movement; second generation critique	• Project XL • Flexible air permits	Highly contested and limited use, except flexible air permitting
Voluntary Programs	New problems for which regulatory solutions are unavailable or no authority exists	Club theory; otherwise weak theoretical foundation	• 33/50 program • Climate Leaders • Performance Track	Many existing programs; not incorporated systematically in mainstream policy

It arguably helped for the emissions trading stream to be based on an underlying economic theory. On the other hand, the same economic theory could be applied to emission fees, which are rarely used in U.S. policy.

186 *See supra* Part III.D.

Indeed, despite strong support from economists and others, the carbon tax has gone nowhere as an option for reducing carbon dioxide.[187] The lesson is that a theoretical foundation may help, but practical and symbolic politics are more important. Having a theoretical foundation allied with practical politics, the right goals, and a demonstrable set of benefits may be necessary to provide a winning combination from an innovation perspective. It also may help to provide a clear solution to a pressing problem, as was the case with sulfur dioxide trading and the 1990 Clean Air Act Amendments, where the reduced costs achieved through trading probably cleared the legislative path.[188]

Viewing the program integration and risk-based planning streams as steps toward more rational policy making sheds light on their strengths and limitations. These streams are conceptually similar to such rationality-based reform initiatives as Programming, Planning Budgeting Systems; Zero-Based Budgeting; and the Government Performance and Results Act.[189] The program integration stream stresses the need for more comprehensive, synoptic approaches as an antidote to the fragmentation of U.S. environmental policy. The risk-based planning stream reflects an interest in having more objective and evidence-based methods for setting priorities and countering the "problem of the day" syndrome. Like their cousins, Programming, Planning Budgeting Systems, Zero-Based Budgeting, and the Government Performance and Results Act, risk-based approaches impose high cognitive and information demands. Also, like these reforms, risk-based methods challenge the existing constituency- and politics-based methods for decision making. All of these innovation streams illustrate the limits of rationality when faced with the realities of practical politics, limited time and information, and interest group pressure.

Having an underlying theory provides more coherence to streams of innovation, and probably also helps in defining sources of intellectual support for them. On their own, however, theoretical foundations do not determine success, as emission fees illustrate. One could argue, based on the regulatory flexibility and voluntary initiatives experience, that the lack of an underlying theory to justify a change is a potential weakness.

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187 *See generally* Thomas Sterner and Henrik Hammar, *Designing Instruments for Climate Policy*, *in* EMISSIONS TRADING FOR CLIMATE POLICY: US AND EUROPEAN PERSPECTIVES 17, 17–36 (Bernd Hansjürgens ed., 2005) (regarding the feasibility of a carbon tax as compared with other mechanisms to address climate change).

188 *See* Part III.A.

189 *See generally* Matthew Andrews & Herb Hill, *The Impact of Traditional Budgeting Systems on the Effectiveness of Performance-Based Budgeting: A Different Viewpoint on Recent Findings*, 26 INT'L J. OF PUB. ADMIN. 135 (2003) (regarding performance-based budgeting); Charles E. Lindblom, *The Science of "Muddling Through,"* 19 PUB. ADMIN. REV. 79 (1959) (articulating conceptual distinctions between incremental and rational comprehensive models of decision making); Beryl A. Radin, *The Government Performance and Results Act (GPRA): Hydra-Headed Monster or Flexible Management Tool*, 58 PUB. ADMIN. REV. 307, 307–16 (1998) (discussing the Government Performance and Results Act); Government Performance and Results Act of 1993, Pub. L. No. 103-62, 107 Stat. 285 (1993).

What may we observe about the practical origins of innovations? From where did the interest in change arise in the first place? Each of these innovation streams began with a perceived deficiency in the status quo and a recognition of the need for change.[190] In the case of emissions trading, it was the need to reconcile the demands of the air quality standards with the political imperative for economic growth, and later to demonstrate more efficient ways of achieving air quality goals.[191] The initial offsets program was a pragmatic adjustment to accommodate the decision made by Congress in the 1970s Clean Air Act to establish health-based air quality standards.[192] With the offsets, the health standards were maintained, while the means of implementing them was modified.[193] The evolution—through the various trading programs in the 1980s, to acid rain allowance trading to proposals for capping and trading greenhouse gases—enabled policy makers to maintain air quality goals while also allowing sources to cost effectively reduce emissions.

For risk-based planning, the perceived deficiencies were a lack of control over a policy agenda that had grown rapidly, an agency whose credibility had suffered greatly, and the lack of any apparent basis for determining priorities. Once William Ruckelshaus returned to EPA for his second tour as Administrator in 1983, he saw a need to take EPA away from the political arena and move it to a more empirical, scientific ground.[194] The origins of the program integration stream may be traced back to the founding of EPA.[195] In relative terms, even creating a national environmental agency was a step toward integration, as what had been scattered among many agencies became consolidated into one. The importance of the next step, of connecting better across environmental media—air, water, waste, and chemicals—has been asserted at various points throughout EPA's history,[196] but it never achieved enough political support to lead to a long-term solution.

The flexibility stream responded to the perception that a fragmented, rigid, and legalistic regulatory system was not only costly, but could stifle innovation and results. This was the narrative put forth by advocates of a second generation of environmental policy in the 1990s, most of whom strongly supported environmental progress. The competing narrative was that regulatory flexibility would lead to less stringent standards, not simply

190 *See supra* Part III.A–E. *See generally* Richard Rose, *Lesson-Drawing in Public Policy: A Guide to Learning Across Time and Space* (1993).

191 *See* Richard Coniff, *The Political History of Cap and Trade,* SMITHSONIAN, August 2009, *available at* http://www.smithsonianmag.com/air/the-political-history-of-cap-and-trade-34711212/?no-ist; Part III.A.

192 T. H. Tietenberg, EMISSIONS TRADING: PRINCIPLES AND PRACTICE 6–7 (2d ed. 2006).

193 *Id.* at 7.

194 William D. Ruckelshaus, *Science, Risk, and Public Policy*, 221 SCI. 1026–28 (1983).

195 *See id.*

196 *See* EPA, Pollution Prevention (P2), http://www.epa.gov/p2/pubs/laws.htm (last visited July 26, 2014).

more flexible and efficient ways of meeting the same standards.[197] Voluntary programs were viewed as a way to solve problems without having to get new laws passed by a gridlocked Congress, while using a more flexible, collaborative model.[198] The Bush administration's efforts to undermine regulation in the early 2000s reinforced critics of both the regulatory flexibility and voluntary program innovation streams, and by 2009 pushed EPA back into full regulatory mode.[199]

What about goals? Are some more politically appealing than others? This Article proposed four goals that underlie most innovations: effectiveness, efficiency, capacity, and legitimacy. The cases suggest that effectiveness and efficiency are more marketable politically than capacity and legitimacy. This is not surprising, given that effectiveness and efficiency are easier to define, explain, and measure, than the more abstract concepts of capacity and legitimacy. The political demand that innovations pay relatively quick returns also could reduce the success rate of innovations aimed at the latter two goals. The emissions trading stream was suspect in many quarters for some time, but it became more acceptable as experience demonstrated that trading could achieve at least the same result as technology-based regulation, although at less cost. While issues remain with respect to emissions trading, such as environmental justice implications of redistributing pollution locally or regionally, the case for effectiveness and efficiency largely has been made.[200] A national cap-and-trade program, after all, was the centerpiece of the 2009 legislation that would have created a national carbon dioxide reduction program, and nutrient trading is considered to be an option for improving water quality in the Chesapeake Bay.[201]

The goals of the other streams are less clear; as a result, their effects are more difficult to measure and justify. The importance of institutional capacity is recognized in the environmental policy literature.[202] Advocates of voluntary programs view them as a way to transform relationships, establish trust, improve measurement techniques, and adapt to new issues. All of these specific objectives relate to the general goal of building future problem-solving capacities. A primary goal of regulatory flexibility is to

197 Fiorino, *supra* note 135, at 458–59.

198 *See* Janice Gorin, *Caught Between Action and Inaction: Public Participation Rights in Voluntary Approaches to Environmental Policy*, 24 STAN. ENVTL. L.J. 151, 168 (2005).

199 Margaret Kriz Hobson, *The Greenest White House in History*, NAT'L J., Sept. 26, 2009, at 20–29.

200 Lily N. Chinn, *Can the Market Be Fair and Efficient—An Environmental Justice Critique of Emissions Trading*, 26 ECOLOGY L.Q. 80, 81–82 (1990) (critiquing pollution markets through an environmental justice lens).

201 *See* Jones, *supra* note 70, at 1.

202 For example, see generally the discussion of comparative environmental policy capacities in Martin Janicke, *The Political System's Capacity for Environmental Policy*, *in* NATIONAL ENVIRONMENTAL POLICIES: A COMPARATIVE STUDY OF CAPACITY-BUILDING 1–24 (Martin Janicke & Helmut Weidner eds., 1997); Helmut Weidner, *Capacity-Building for Ecological Modernization: Lessons from Cross-National Research*, 45 AMERICAN BEHAVIORAL SCIENTIST, 1340, 1340–68 (2002).

remove barriers to problem solving and allow organizations to focus more on environmental results. Such benefits of innovation not only are difficult to define and measure, they often accrue well into the future. Especially with the emphasis on achieving outcomes under initiatives like the Government Performance and Results Act, these long-term, qualitative benefits are less than compelling politically.

Given the dynamism that characterizes environmental issues, and the transition toward sustainability occurring in much of the world, it is surprising that environmental innovation has received limited systematic analysis. This Article has focused on a subset of policy innovations, all of which were undertaken nationally by the EPA.[203] Some have been more successful than others. All arose from a sense of dissatisfaction with the status quo and reflected a perceived need for change. One innovation stream had a well-defined theoretical foundation; others did not. Some exhibited more clarity in goals than others, with readily documented benefits. Each specific innovation is part of a group of actions. These streams offer a useful way of describing, comparing, and evaluating policy change.

This Article concludes with brief mention of three issues. First is the value of the "streams" concept in studying environmental innovation. The notion of streams provides a mid-level conceptual framework for thinking about innovation, falling between the specific actions, practices, or policies that constitute the innovations and the general, abstract concept. It allows us to organize related sets of innovations that share characteristics. This makes it possible to identify the characteristics of different initiatives, track them over time, and determine the common factors that led to change. Although specific innovations come and go, factors leading to a search for and adoption of a stream of innovations typically do not. For example, although program integration has not been a priority within EPA in recent years, it almost certainly will return at some point as a concern and stimulate additional policy change. Specific innovations may disappear, but the ideas themselves, the goals they are meant to achieve, and the needs they are aimed at meeting remain.

A second issue is the relationship between policy innovations undertaken within government and the prospects for innovation in society. At its core, government policy aims to change behavior. Much behavioral change consists of innovations in technology and management that lead to environmental progress. The five innovation streams discussed here were focused, in part, on making EPA and state agencies more effective, efficient, capable, and legitimate. To the extent that they promote these goals, the streams may be seen as successful. Even more critical, however, are the effects of government policy on private sector innovation. Although effective in forcing changes in the near-term, there is evidence that technology-based regulation may not be the best way to induce long-term, continuous

203 *See supra* Part III.A–E (discussing EPA-driven innovations).

innovation.[204] Stringent strategies that also are flexible and predictable may be effective in inducing long-term innovation. Of the five innovation streams discussed here, regulatory flexibility and voluntary programs were aimed in part at this objective.

A third issue is the link between federal and state innovation. Environmental policy making occurs in the context of close and complex interdependence among federal and state agencies.[205] EPA depends on states to implement innovative approaches; states depend on EPA for policy discretion, intellectual capital, lesson sharing, and funding. In a study of federal–state–provincial relationships, Barry Rabe compared environmental innovation in the United States and Canada.[206] This study assessed the notion that a decentralized regulatory federalism, such as that of Canada, is more conducive to innovation than is a more centralized one like that of the United States.[207] This is based on the assumption that the more autonomous Canadian provinces would be freer to explore innovative ideas than the states, which are subject to closer federal oversight. The study concluded, however, that in four areas of innovation—pollution prevention, cross-media integration, information disclosure, and outcome-based performance measures—states have been more successful innovators than the Canadian provinces.[208] It appears from this analysis that federal–state interdependence may encourage more diffusion of innovation in the United States.[209] Indeed,

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204 *See* Nick Johnstone et al., *Environmental Policy Design Characteristics and Technological Innovation: Evidence from Patent Data* 6 (Working Paper, OECD ENV'T, No. 16, 2010), *available at* http://www.oecd-ilibrary.org/docserver/download/5kmjstwtqwhd.pdf?expires=1394406329&id=id&accname=guest&checksum=D40186D992C90EE8049A647C89D72CDA ("[M]arket-based instruments such as environmentally-related taxes and tradable permits are more likely to induce innovation than direct regulations such as technology-based standards."). *See generally* ENVTL. LAW INST., BARRIERS TO ENVIRONMENTAL TECHNOLOGY AND USE 1, 2 (1998) (discussing needed reforms in environmental regulations to achieve technological innovation); WALLACE, *supra* note 18 (arguing that open dialogue between agencies and regulated entities, as well as consistent environmental policies, play a fundamental role in driving technological innovation); Michael E. Porter & Claas van der Linde, *Toward a New Conception of the Environment-Competitiveness Relationship*, J. ECON. PERSPECTIVE, Fall 1995, at 97 (arguing that strict and effective environmental regulation can increase technological innovation within industrial sectors).

205 *See generally* DENISE SCHEBERLE, FEDERALISM AND ENVIRONMENTAL POLICY: TRUST AND THE POLITICS OF IMPLEMENTATION (2d ed. 2004) (arguing generally that positive relationships between federal and state officials facilitate implementation of environmental programs); Michael E. Kraft & Denise Scheberle, *Environmental Federalism at Decade's End: New Approaches and Strategies*, PUBLIUS: J. FEDERALISM, Spring 1998, at 131 (discussing the effects of recent legislation on federal–state relationships).

206 Barry G. Rabe, *Federalism and Entrepreneurship: Explaining American and Canadian Innovation in Pollution Prevention and Regulatory Innovation*, 27 POL'Y STUD. J. 288, 289 (1999).

207 *Id.*

208 *Id.* at 288.

209 There have been several signs of EPA's reduced support for state innovation under the Obama administration. It has eliminated the National Center for Environmental Innovation, cancelled a long-standing state innovation grants program, and terminated or scaled back work on such projects as integrated permitting and sector-based innovation projects. The EPA website, for example, notes that information on sector-based innovation projects was last

facilitating and supporting innovation and lesson sharing among the states was a primary function of the EPA's National Center for Environmental Innovation before it was reorganized and eliminated early in the Obama administration.[210]

The capacity for organizational innovation and change is critical to success in dealing with environmental problems in the coming decades. Environmental issues and the contexts in which they are addressed are dynamic and complex. This Article has examined a number of past EPA innovations and proposed an approach to studying and evaluating them. By looking at related groups of innovations, it is possible to identify factors that promote or impede organizational change and determine how best to design innovations for long-term success. Specific innovations may come and go, but the reasons they are adopted, the factors affecting their success, and the goals they are meant to achieve continue. The concept of streams of innovation offers a way to compare, study, and evaluate the four decades of EPA environmental policy innovations.

updated in March 2010. *See* Office of Strategic Environmental Management, EPA, *Integrated Permitting: An International Collaboration Effort*, www.epa.gov/osem/integrated/index.htm (last visited July 26, 2014) (providing useful resources on integrated permitting).

210 The former National Center for Environmental Innovation became the Office of Strategic Environmental Management early in the Obama administration. *See* EPA, *Historical Information*, http://www.epa.gov/osem/historical.htm (last visited July 26, 2014).