

**Punctuated Equilibrium
and the Dynamics of U.S.
Environmental Policy**

Punctuated Equilibrium and the Dynamics of U.S. Environmental Policy

Edited by Robert Repetto

Foreword by James Gustave Speth

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Foreword

James Gustave Speth

This book grew out of conversations between Robert Repetto and myself regarding the failure of U.S. politics to come to grips with such global-scale environmental threats as climate change. In my book about these threats, *Red Sky at Morning*, I quoted extensively from Frank Baumgartner and Bryan Jones's *Agendas and Instability in American Politics* because they had given genuine analytical rigor to the impression we all have that policy progress is made not steadily but, as Repetto puts it, in fits and starts. If Baumgartner and Jones were right, their thesis offered hope that today's bleak political prospects for global environmental threats might rapidly change, giving way to the sea change of progress on global challenges that we saw on domestic environmental issues in the 1970s.

Given the seriousness of the global environmental threats, especially climate change, it seemed important to us to understand as much as possible about the workings of Baumgartner and Jones's "punctuated equilibria" in American environmental politics and policy development. Has this been the pattern followed to date? What factors lead to these periods of rapid change, when the status quo logjam breaks and

rapid policy movement occurs? In particular, if we understand the dynamics of major policy change, might it be possible to hasten the day when it occurs?

Repetto took up this challenge, and support from the William and Flora Hewlett Foundation and the K. Vann Rasmussen Foundation made it possible to launch the investigation reflected in this admirable and important book. Robert Repetto is one of America's most accomplished economists working on environmental policy analysis. With great skill he assembled an outstanding team of social scientists—experts familiar with both political change theory and practical environmental affairs. Together they developed a study design and produced the insightful contributions collected here. Repetto's introductory chapter will surely whet the appetite for the excellent conceptual foundation chapters and case studies that follow.

The foundation chapters by Frank Baumgartner and William Brock explain processes that can lead to the political dynamics associated with punctuated equilibria in the policy domain and do so in a way that provides useful insights for those interested in understanding what brings about policy change. The case studies applying this framework are remarkable not only for the wide range of resource and environmental policy issues that they address but also for the fact that they analyze both issues that have undergone dramatic and abrupt change and those that have remained persistently blocked or stagnant. The use of punctuated equilibrium concepts to analyze policy change prospectively is one of this book's unique contributions.

Among those policy issues that have shown little progress in the United States, global warming is the most serious environmental challenge we face today or have ever faced. Some knowledgeable observers go further—Sir David King, the government's chief scientist in Britain, wrote recently in the January 9, 2004, issue of *Science* that "Climate change is the most severe problem that we are facing today—more serious even than the threat of terrorism." My own view is that King is right.

Are we near a tipping point in U.S. policy toward climate change? There are reasons to be doubtful. Since 9/11, advocates of preventive action on climate change have had to struggle even harder than usual to get attention from the public and politicians. Inattention to other issues has been part of the collateral damage from the war on terror and the war in Iraq. Evidence is rapidly mounting of the devastating consequences of the unchecked releases of climate-altering gases, but in 2004 America again elected national leaders in the presidency, and many in the Congress who have shown little evidence that they know there is a threat at all.

Wishing we were close to a major shift in climate policy in the United States does not make it so. I may be guilty of wishful thinking, but I do believe our national condition of denial is so fundamentally challenged by real-world events that the rationale for the established policy is, or soon will be, successfully challenged. When BP's CEO John Browne, former Secretary of State James Baker, former Central Intelligence Agency director James Woolsey, and many others from business and elsewhere outside the environmental community, including numerous state governors and attorneys general, advocate action to protect climate, we are seeing the emergence of a shared perception among stakeholders that business-as-usual is no longer feasible.

If this analysis is correct, a key question that emerges is what type of precipitating event will be the spark that sets off major change. Have the underpinnings of the status quo eroded so badly that small disturbances can have large consequences, shifting the system into a quite different behavioral path? Such a small disturbance might be the proposed establishment of a regional cap-and-trade program for reducing greenhouse gas emissions, involving the northeastern states, or a Stop the Warming March on Washington. Let's hope that we are at this stage. The alternative that would almost certainly set off a major transformation in policy would be a major transformation in the environment caused by global warming. The melting of the earth's ice at high latitudes and high altitudes may already be signaling an emerging calamity.

Robert Repetto and his colleagues have produced a volume that should have an important effect on how we view the development of environmental policy and on how we nurture that process. I am delighted that the Yale School of Forestry and Environmental Studies had a hand in facilitating this effort.

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Chapter 1 Introduction

Robert Repetto

Nineteen-seventy saw the American environmental movement blossom. The first Earth Day brought millions of Americans outdoors to demonstrate support for environmental protection and resource conservation, a massive outpouring that surprised not only the Nixon administration and the Congress but also the corporate world and the old-line conservation organizations (Shabecoff 2003). The Environmental Protection Agency was created that year, bringing together many agencies and programs previously scattered around the executive branch. The Council on Environmental Quality was set up as a White House staff body to inform and coordinate environmental policy. Also in 1970, the enormously important National Environmental Policy Act was adopted, mandating environmental protection as an overarching national policy goal, providing for citizen access in protecting the environment and requiring environmental impact assessments for important actions and decisions by federal agencies.

In the months that followed, other important environmental laws were passed in rapid succession. Before 1970 was over, the Clean Air Act was passed, establishing mandatory air quality standards. So was

the Occupational Health and Safety Act. In 1972 Congress passed the Federal Water Pollution Control Act, establishing goals for “fishable and swimmable” waters throughout the country and providing for large investments in municipal sewage treatment facilities. Then it passed the Noise Control Act, the Coastal Zone Management Act and the Marine Mammal Protection Act. In 1973 came the Federal Insecticide, Fungicide and Rodenticide Act, requiring safety testing and labeling of all chemical pesticides sold or used. Also in 1973, Congress passed the far-reaching Endangered Species Act, requiring the identification of threatened and endangered species and the development of recovery plans. Then in 1974, the Safe Drinking Water Act was enacted. In this brief period of time, most of the legislative framework for national environmental protection policy was created and the new Environmental Protection Agency, greatly expanded, was set to work devising and promulgating regulations.

Of course, the story didn’t end there. In the subsequent years the Toxic Substances Control Act and the Resource Conservation and Recovery Act were passed, dealing with toxic substances and wastes, the Clean Air and Clean Water Acts were strengthened, and the Energy Policy and Conservation Act was passed in response to the oil shocks of the mid-1970s. The legislative and regulatory process has continued, producing other environmental and resource conservation laws at intervals. Nonetheless, that four- or five-year period was exceptional. In terms of public concern over environmental protection, political mobilization, and legislative consensus, there had been nothing like it earlier in American history and there has been nothing like it since.

Over the next twenty-five years, until about 2000, changes in environmental policy can best be described as incremental. Compared to those seminal years, change has certainly been modest. Environmentalists and business interests have skirmished in and out of court over regulatory issues. Contests have arisen in Congress over appropriations and legislative mandates. During the first Reagan administration there were strong ideological challenges to established policies for environmental protection, led by the likes of James Watt and Anne Gorsuch, but those assaults were met by strong opposition that forced the assailants to retreat with little lasting change in the policy framework. Neither the first Bush administration nor the two Clinton administrations achieved a great deal of change in the national environmental agenda one way or the other, though there were, of course, some achievements on the record. When environmentalists pushed for stronger action, industrial interests pushed back; when industry demanded regulatory relief, environmentalists

and their allies resisted. The result has been a sort of rough equilibrium, with little sustained movement in any direction.

Indicative of the stabilization that took place after the initial ambitious burst of political energy is the fact that many of the goals set forth in those early laws still remained unfulfilled twenty-five years or thirty years later. At the start of the twenty-first century large parts of the country, particularly the urbanized parts along the east and west coasts, the Gulf, and the older industrial areas, still had air quality that failed to meet air-quality standards established in 1970. A large fraction of the nation's inland waters, a third of the rivers, and half of the lakes and estuaries remained impaired and unsuitable for swimming and fishing. Many parts of the nation dependent on groundwater still had unsafe drinking water supplies. Most of the pesticides in use when FIFRA was passed still had not been tested for health and safety and re-registered. Thousands of sites contaminated with toxic substances remained to be cleaned up. Most of the species identified as threatened or endangered were not on a recovery path and many more that were truly threatened had yet to be listed under the Endangered Species Act.

The contests that have led to this standoff or stalemate or equilibrium have been fought across many fronts. In the court of public opinion, environmental causes seem to have won people's support but not strongly enough to change their buying behaviors or their votes. Ideologically, the environment has been pitted against the economy and free enterprise. Scientifically, experts in the business and environmentalist camps have impugned each other's methodologies and findings. In the advocacy world, conservative and "green" groups have pushed forward their conflicting analyses and recommendations. In dealing with the government, the interest frustrated by a regulatory decision routinely takes the issue to the courts, and the interest frustrated by a court ruling routinely goes to Congress for relief. Battles lost on the legislative front are renewed in the drafting of implementing regulations and, if lost there, are taken up again in the course of enforcement and compliance. Every tactic devised by one side has been countered by the other.

The same pattern of prolonged stalemate interrupted once in a great while by abrupt bursts of policy innovation has been seen in the history of particular environmental and resource issues. This illustrates an invariance with respect to scale in this policy behavior: the same pattern can be found at the scale of individual issues as is displayed by the aggregate movement of environmental policy, although the timing differs. Three chapters later in this volume examine such experiences in widely different policy issues: the harvesting of old-growth

timber in the national forests, the allocation of scarce California water among competing uses, and the introduction of market mechanisms in managing ocean fisheries. All three are marked by extended periods of policy equilibrium punctuated by episodes of sudden, discontinuous change.

Other examples can easily be found. In 1974 scientists identified an imminent threat to the earth's life-preserving stratospheric ozone layer. For the next thirteen years, industry and many governments resisted restrictions on the production or use of CFCs and other ozone-depleting chemicals while conferences, studies, and negotiations went on. Finally, in 1987, after the shocking discovery of an "ozone hole" over the Antarctic with an area greater than Brazil's, nations agreed to the pathbreaking Montreal Protocol phasing out those chemicals. In the ensuing decade, however, although phasedown did occur, the parties to the treaty continued to struggle with issues of noncompliance and enforcement and some industries renewed their resistance to the elimination of remaining ozone-depleting substances, such as methyl bromide and hydro-fluorocarbons (Benedick 1998). After the 1997 breakthrough, a pattern of stability and incrementalism was quickly reestablished.

Indeed, the statistical analysis in Frank Baumgartner's chapter, following this introduction, demonstrates that across the entire range of federal environmental policy decisions, as in other policy domains, patterns of budgetary change follow a similar pattern of incrementalism broken very infrequently by abrupt changes. The norm is stability from year to year. The infrequent exception is major change.

What explains this phenomenon? The policy science textbooks describe an almost linear progression in policymaking from "problem identification" to "formulation of options" to "policy analysis" to "decision" to "implementation" but, clearly, that is not the way the process works. Environmental policy has not progressed in steady incremental fashion but by fits and starts. On many issues the policy apparatus seems to be locked or frozen for considerable periods until, rather suddenly, it jumps ahead—or occasionally into reverse. Why does policymaking jam up even while the environmental problem persists or worsens? What builds up pressure for change? What triggers a release of political energy and resolve?

These questions are important because many important environmental and resource issues have been stalemated for considerable periods and remain so today. As a result, many domestic environmental goals remain unfulfilled, and a suite of global environmental challenges, first identified at least two decades

ago, continue to worsen (Speth 2004). Whether one looks back twenty-two years to the U.S. Council of Environmental Quality's report, *Global 2000*, or thirty-two years to the Stockholm Conference on Environment and Development, one finds clear statements of urgent environmental challenges here in the United States and, globally, challenges that remain unmet.

- Tropical forests are still being cleared at an acre per second. Half these forests are now gone and developing countries are projected to lose another 15 percent of what's left by 2020.
- A fourth of bird species have gone extinct and another 12 percent are threatened. Also threatened are 24 percent of mammals, 25 percent of reptiles and amphibians, and 30 percent of fish species.
- Seventy percent of marine fisheries are now overfished, up from 5 percent in 1960, but most marine fisheries are still managed using approaches that have demonstrably failed.
- Perhaps most critical, greenhouse gas emissions and atmospheric concentrations continue to rise unabated. The basic physics underlying global warming has been understood for more than a century, and respectable scientific reports warning that the continued buildup of carbon dioxide and other greenhouse gases would inevitably alter the global climate have been appearing at short intervals for the past twenty-five years. Evidence of actual climate change has been accumulating: rising temperatures and sea levels; melting glaciers, permafrost, and sea ice; longer growing seasons, and other manifestations. Yet, the United States government position on steps to combat global warming is confined to research and voluntary actions by the private sector, essentially the same stance it took fifteen years ago. It has withdrawn from international negotiations on mitigation measures in the Kyoto Protocol.
- Although vehicular emissions account for a third of U.S. greenhouse gas emissions and a major share of urban air pollution, the United States government has maintained vehicle fuel efficiency standards virtually unchanged for twenty years despite the increasing percentage of trucks and sport utility vehicles in the fleet. This has led to declining overall vehicular fuel efficiency in the face of our increasing dependence on oil imports and the advances of automotive technology.
- An agricultural support policy that has persisted essentially unchanged since the 1930s results in overuse of chemical fertilizers and pesticides, overuse and deterioration of freshwater resources, and widespread soil deterioration.

Among the environmental consequences is an anoxic dead zone in the Gulf of Mexico at the mouth of the Mississippi River that is now the size of New Jersey.

What might break the domestic political deadlock? These first decades of this millennium are critical. Humans now impact hugely on natural cycles of carbon, nitrogen, sulfur, and water. There is little or no slack left in these natural systems. In order to avoid further decades of deadlock and delay in dealing with these long-standing and growing environmental challenges, new insights into the processes and levers of environmental policy change are needed. Invocations of “political will” are not enough. The underpinnings of these new approaches must be built on a deeper and more realistic understanding of policy change.

Grizzled veterans of the U.S. environmental movement puzzle over the reasons why progress seemed so easy back in the early 1970s but has been so grudging in later decades. They search for the sources of the spate of environmental legislation and regulation back then, hoping that that energy and consensus can somehow be recaptured. Surely, there were key antecedents to the events of the early 1970s, but none that seem decisive. Old-line organizations such as the Sierra Club, the National Audubon Society, and the National Wildlife Federation had been pushing a conservation ethic for many decades. The expanding and increasingly affluent middle classes were becoming less and less tolerant of the obvious pollution of their air and water. During the 1960s several path-breaking books warning of environmental threats were published, most notably Rachel Carson’s *Silent Spring* and Barry Commoner’s *The Closing Circle*. There were also dramatic milestone events that focused public attention on environmental issues, such as the ignition of the Cuyahoga River in Cleveland and the oil spill off the coast of Santa Barbara. Influential new environmental advocacy groups came into being in the period 1968–70 to pursue vigorous legislative, litigious, and populist tactics: the Natural Resources Defense Council, the Environmental Defense Fund, the League of Conservation Voters, and Greenpeace, among others. Do these developments provide a sufficient explanation?

America’s travails and turmoil during the 1960s must also have a unique explanatory role. It was a time of social mobilization and unrest unlike any other since the 1930s, especially among students and other young people. Tens of thousands took part in direct civil protest and disobedience in support of civil rights for African Americans, and many more tens of thousands were inspired by those campaigns. Radical feminists railed against the dominance of the male establishment. Protests against the Vietnamese War became increasingly wide-

spread, bitter, and violent as the decade went on, perhaps reaching a crisis of confrontation at the Democratic National Convention in Chicago in 1968, where the police rioted in full public view on national television. Youth organizations became increasingly radicalized as their demands remained unfulfilled and the Vietnam War escalated. Students for a Democratic Society gave way to the Student Non-violent Coordinating Committee, which was eclipsed by the Weathermen, the Black Panthers, and finally by the Symbionese Liberation Army. Riots in the inner cities were commonplace. By 1970 anti-establishment and revolutionary rhetoric pervaded the nation's campuses. Following the slaying of students by National Guardsmen at Kent State University in 1970, strikes took place at 30 percent of the country's colleges and universities, demonstrations at more than half of them, probably involving a million students. Thirty campus ROTC buildings were bombed or burned (Gitlin 1987).

The establishment was thoroughly discredited in the eyes of the most activist and vocal segments of the population. Both political parties were in disrepute for their pursuit of the war. Liberals in government were impugned not from the Right, as in the 1980s and 1990s, but from the Left. The corporate world, perhaps symbolized by Dow Chemical, a manufacturer of napalm, was under attack for its involvement in the military effort. Corporate prestige had already been undermined by public opposition to nuclear power and by the investigations unleashed by Ralph Nader's *Unsafe at Any Speed*. University administrators were denounced by their student bodies as collaborators in the Vietnam War and as sexist, racist pigs to boot. Those demanding peace, civil rights, equal rights, and protection of the earth were able to present themselves as the true defenders of American and universal values (Libby 1998).

Many of the activists from the civil rights, the feminist, and the antiwar movements signed on to the ecology movement, joining forces with the older conservation-oriented organizations and providing the new environmental organizations with aggressive, veteran tacticians. In this climate it is not difficult to see how Congress and the executive branch found it easier to give ground to popular demands on environmental issues than on the other pressing issues of the day. Passing environmental laws with ambitious goals to be achieved at future date uncertain, with implementing regulations yet to be written, with compliance deadlines well in the future and enforcement mechanisms still to be determined, was much easier for a national government under siege by many of its own citizens than ending the war in Vietnam, ending discrimination against women, or overcoming the racial prejudices of the South and of South Boston (Cahn 1995). Negotiating over these new environmental laws

and regulations with clean-cut Ivy League-trained young lawyers was more manageable for the Establishment than dealing with the radical groups in the streets and at the police barricades.

The experience of the 1970s illustrates the path-dependence of the political process. For better or worse, the 1960s will not come again. Social movements are not produced wholesale or on demand, though they do share strong family resemblances (Tarrow 1998). Despite efforts to construct road maps for those who would promote social change (Moyer 2001), success is never assured. Some efforts collapse or peter out; others end in reform or repression and sometimes both. The emergence and fate of social movements are strongly influenced by the political opportunities available to them (McAdam, McCarthy, and Zald 1996). Social mobilization implies the positive-feedback political dynamics analyzed by William Brock in this volume, which may or may not result in the successful challenge to an older political rationalization by a new framing of the issue and which may or may not accumulate enough public participation and media attention for success. Fortunately, however, the case studies in this volume show that broad social movements are not necessary for policy punctuations to occur. Narrower coalitions of governmental and nongovernmental organizations can effect change.

In describing the phenomenon of stability and occasional discontinuous change, political scientists have borrowed a term from evolutionary biology: *punctuated equilibrium*. The idea in biology is that evolution apparently has not progressed steadily through a constant stream of mutation winnowed by natural selection but similarly through prolonged periods of stability interrupted by occasional but dramatic bursts of change. In adopting this phrase, the political scientists who initially analyzed the political phenomenon, including Frank Baumgartner, whose contribution initiates this volume, sought to emphasize the need to encompass both phases within the same analytical framework (Baumgartner and Jones 1993). Others had analyzed social movements and other processes that led to rapid political change; still others had focused on the political subsystems, “iron triangles,” and political monopolies that promoted stability. Baumgartner and his colleagues sought a framework capable of explaining both. Such a framework might help explain why there is deadlock or modest incremental change in some arenas but sudden policy shifts in others. What forces provoke such shifts? Are they fortuitous or created by deliberate manipulation? When are policy arenas particularly unstable or susceptible to radical change? What are the bulwarks that lock in the status quo and how are they dismantled, if change occurs?

The punctuated equilibrium approach that has resulted recognizes the policy process as a complex dynamic system. Though developed in the physical and biological sciences, analyzing phenomena as complex dynamic systems has proven very productive in the social sciences as well. Within the past decade or so, there have been hundreds of applications in economics and finance, which have shed light on market-price fluctuations, oligopolistic behavior, business cycles, and other economic phenomena (Rosser 2000). Studies of business behavior and organizational change have also made considerable use of this analytical approach (Bryson et al. 1996; Euell and Kiel 1999; Gersick 1991). There are also many examples of punctuated equilibria in the policy realm. A country may hold to a system of fixed exchange rates for many years and rather suddenly abandon it or undergo a massive devaluation. A country may hold to one economic system, such as socialism or communism, for many years and yet undergo an abrupt transition to a quite different system. Decisions to regulate or to deregulate particular activities have typically come about rather suddenly, after many years of resistance.

Another key feature of such systems is that under certain conditions small disturbances can have large consequences, shifting the system into a quite different behavioral path. For this to happen, a system must be near a critical point, just as a raindrop falling at the Continental Divide might flow to the Atlantic or the Pacific, depending on which way the breeze is blowing. The intriguing possibility is that a complex dynamic policy system might be highly sensitive to a small action taken at just the right time, despite long resistance to change.

In order to exhibit such features, the determinants of policy change must be characterized by both positive and negative feedbacks. Negative feedbacks would ensure that when a given policy is disturbed or threatened with change, forces emerge that drive it back to its original position. Clearly, if such forces dominated, then policy change would rarely, if ever, occur. Positive feedbacks would ensure that when a policy position is disturbed, forces emerge that reinforce that change, driving it even further from its initial position. Multiple equilibria are possible and policy can shift, sometimes abruptly, among or between them (Agliardi 1998). When both positive and negative feedbacks are at play in the policy arena, it is possible to observe the “punctuated equilibria” that seem to typify many policy areas.

Political scientists have identified many sources of negative feedback in the American political system. Some are structural and institutional; others are more behavioral. Together, they tend to impart a status quo bias to the political process. Among the more notable are:

- The separation and diffusion of power among political institutions in the federal system and among (and within) institutions in the legislative, executive, and judicial branches, which provide opponents of an action many avenues to block it and make it more difficult for proponents to maintain an effective coalition (Herzberg 1986).
- The heavy weight of precedent in judicial decision-making.
- The multiple constraints on bureaucratic actions due to relatively open administrative processes and onerous administrative procedures, which provide opponents many channels with which to intervene and make any action more difficult than inaction.
- The tendency of a multitude of organized interest groups to mobilize to defend their interests when threatened, often in opposition to other interest groups (Lohmann 1996; Grossman and Helpman 2001).
- The formation of policy subsystems and iron triangles: coalitions formed around an issue by interest groups, public management agencies, and political representatives, which can reward each other with favorable decisions, larger budgets, and reelection support to create a self-reinforcing cycle of support for a particular policy and to exclude opposing interests (Browne 1995).

Some political scientists have likened the results of this interplay of opposing interests and “countervailing power,” operating through many political channels, to a political equilibrium, and, indeed, there is a great deal of stability in most policy areas. However, bad policies can persist as well as good policies and there is no implication that this interplay of forces operates, in any sense, to maximize the public welfare (Lowi 1969).

Since policies do change, often rather discontinuously, these negative feedbacks must be counterbalanced in the political realm with positive feedbacks, and several such processes have also been identified. Some have first been analyzed by economists in the context of market behavior but have close political analogues (Pierson 2000).

These include, among others,

- *Bandwagon effects*: Most politicians dislike being on the losing side of what appear to be popular issues and are more likely to support a policy, the more evidence there is of political support, creating a positive feedback.
- *Social contagion or social learning*: Many people, including politicians, form their opinions on an issue by consulting polls, other indications of popular opinion, or expert opinion; so, the more people hold a particular view, the

more convincing or compelling it will become to others, ultimate becoming “common knowledge” (Gavious and Mizrahi 2000).

- *Media mimicry*: Media outlets are more likely to “cover” a story that their competitors are covering. As a result, issues may either be largely ignored or afforded a great deal of media attention, at least temporarily.
- *Political entrepreneurship*: Politicians seeking to make a mark often seize on an issue that has gained media and popular attention, bringing to it new legitimacy, constituencies, and political initiatives. Combined with the preceding, political entrepreneurship reinforces a positive feedback (Mintrun and Vergari 1996).

A policy process characterized by positive and negative feedbacks such as these is capable of long periods of stability and abrupt, nonincremental changes. William Brock’s chapter analyzes how such positive feedback mechanisms can lead both to policy lock-in and to discontinuous change at critical “tipping points.” He shows how, at these critical points, policy is also potentially susceptible to relatively small influences. In addition, all policy processes are subject to outside events or “exogenous” disturbances that might create such a critical opportunity or tip the policy process in one direction or another (Frankel and Young 2000). Among such disturbances that have occurred in the past are:

- *New scientific information*, such as the discovery of the Antarctic ozone hole, which helped provoke an international agreement on control of ozone-depleting substances;
- *A shift in the underlying economic fundamentals*, such as the substantial rise in energy prices that prompted a shift in policy toward energy conservation and renewable energy sources;
- *A technological change*, such as the introduction of catalytic converters, which prompted a shift in policy toward vehicle emissions;
- *New information available to the public*, such as the Toxic Release Inventory or the publication of Rachel Carson’s *Silent Spring*;
- *A change in the “macro-political” environment*, such as the election of a president with strong pro- or anti- views in a policy area;
- *An act of God*, such as the Three Mile Island accident, which changed public perception of nuclear power plant safety.

Such perturbations are not per se the causes of change. Oftentimes, as with the climate issue, new information arises but policy remains unaffected (Euro-

pean Environment Agency 2001). Advocacy groups often try to bring new information to bear on policy issues, but with mixed results. Technological changes can be diverted to serve other non-environmental objectives, as has happened with automobile manufacturing in recent decades. A new president may find it impossible to challenge some entrenched interests successfully, as Presidents Carter, Reagan, and Clinton discovered. Nonetheless, disturbances brought about by such exogenous factors may represent moments of opportunity when other interventions might have an enhanced probability of bringing about significant change because the policy system has been driven to a critical point.

THE CONTENT OF THIS BOOK

There have been attempts to build formal conceptual models portraying the environmental policy process as a complex dynamic system capable of nonlinear behaviors, although with limited empirical content (Brown 1994; Kline 2001). There have also been attempts to use this conceptual framework to describe and illuminate the history of some past environmental policy changes (Cowan and Gunby 1996). These efforts have succeeded in showing that insights can be gained by thinking about environmental policy processes in terms of complex dynamic systems.

The challenge that the research underlying this book accepted was to use this framework in a forward-looking approach to analyze policy areas that seem deadlocked and stalemated. Applying complex dynamic systems analysis to the policy process in a forward-looking way necessitates understanding the forces and mechanisms that hold a policy in place, understanding the forces that work to destabilize it, understanding what effects there might be from changes in these supporting and opposing structures, and understanding the forces that from time to time might act as strong disturbances to an apparent equilibrium, making policies unusually susceptible to change. If successful, such an analysis would provide insights into the most effective forms and points of intervention as well as the most promising times and opportunities for intervention. Even if the results of such analyses do not produce reliable predictive models, which are rare in the social sciences, a contribution to systematic analysis of the elements impeding and promoting change and the way they interact can still be enormously useful for policy analysts, advocates, and policymakers.

The book contains three parts. In the first part, a political scientist and an economist contribute the foundation chapters that provide conceptual under-

pinnings for the empirical analyses that follow and focus attention on key variables and processes. These two mostly conceptual chapters find many applications in the empirical case studies that follow.

Frank Baumgartner, the political scientist, is one of the originators of punctuated equilibrium theory as applied to the policy process. His chapter lays out the basics of the analytical framework. It identifies critical elements that often form part of abrupt policy change, including an institutional shift that opens the previously constrained decision-making domain to other interests and participants and a “reframing” of the issue that undermines the previous policy justification. Baumgartner’s chapter also provides empirical support for the punctuated equilibrium theory. His analysis of data on year-to-year changes in federal budgetary appropriations for various environmental programs shows a frequency distribution that differs from a normal pattern: small year-to-year changes are more frequent but so are the rare large departures from previous spending patterns. Such “fat-tailed” distributions are consistent with an underlying punctuated equilibrium process. Baumgartner’s chapter also explains the usefulness of the empirical case studies that follow in comparing episodes of rapid change and periods of stalemate and stability. This comparative approach adopted in the case study chapters helps in identifying key differences in the conditions that make for stability and those that allow punctuated change.

William Brock, the economist, contributed a chapter that emphasizes the dynamics created by the interdependence of choices and social or economic pressures to conform. These dynamics tend to arise whenever the positive feedback mechanisms mentioned above are present: bandwagon effects, social learning, or contagion, media mimicry, and the like. Brock shows how such dynamics can easily lead to policy “lock-in,” even when the extant policy is recognized to be inferior by most decision makers. His chapter also shows how policy discontinuities and abrupt transitions can arise, especially when one participant’s actions or decisions are conditioned by her expectations about what others will do.

Brock’s chapter focuses attention on key variables, such as the costs to an individual of deviating from the norm, the amount of “noise” or experimentation in the policy domain that permits new approaches to intrude, and the way participants’ expectations are formed. He explains how even simple “models” can explain not only the punctuated equilibrium pattern of policy outcomes but other commonly observed political phenomena as well: the tendency of compact special-interest groups to prevail against the broader public interest, the tendency of political advocates to use propaganda and disinformation cam-

paigns to confuse voters on issues, and the ability of slowly changing conditions, such as the gradual accumulation of experience with a policy, to produce abrupt changes in support. The analytical framework developed in the Brock and Baumgartner chapters provides strong support for the empirical case studies that form the rest of the volume.

The second part of the book consists of three chapters that analyze important environmental or resource policy issues that have experienced the long periods of stability and the episodes of abrupt change that constitute punctuated equilibrium. These chapters were written by specialists who have followed those policy issues closely for many years but who are also familiar with the punctuated equilibrium approach to policy analysis. Each of these chapters explains the dynamics behind both the equilibrium phase and the discontinuous policy change, identifying key political and institutional mechanisms.

The first of this series, written by Helen Ingram and Leah Fraser, shows how a punctuated equilibrium framework helps in understanding the policy innovations introduced into long-standing California water management problems. For decades, urban and agricultural interests operated in a classic “iron triangle” to build and maintain a highly engineered infrastructure system to divert scarce water to themselves, co-opting or overwhelming environmental opponents. The authors describe the professional ideology, the path-dependency, and the political bartering used to sustain this system. They then analyze the events leading up to two remarkable innovations. The first was an institutional change that broke the previous policy oligopoly and admitted a broader range of stakeholder interests into policy and management. Accompanying this institutional change was a new commitment to an adaptive, learning-by-doing management approach. The second, even more innovative, was the introduction of a market mechanism, the Environmental Water Account, to ensure sufficient water for endangered fish species. This mechanism provided the Fish and Wildlife Service funding with which to purchase water rights for species protection, rather than continuing to challenge urban and agricultural allocations solely through legal or regulatory actions.

Examining the antecedents to these innovations, the authors identify two key developments that pushed the policymaking process to dramatic change. The first was a change in the policymaking venue to a multi-stakeholder group incorporating state and federal agencies, private interests, and public interest organizations. The second was the emergence of a shared perception among these stakeholders that business-as-usual was no longer feasible because of an imminent endangered species crisis (the “smelt-down”). This shift in shared ex-

pectations drove stakeholders along a decision path that generated its own momentum and led ultimately to a policy discontinuity, illustrating the positive feedback and interdependence mechanisms analyzed in the Brock chapter.

The second chapter in this sequence, by Robert Repetto and Richard Allen, investigates punctuated equilibrium in the approach to managing the nation's marine fisheries. For decades, even while resource conditions in most fisheries deteriorated and fishermen's incomes suffered, fisheries managers adhered to a management approach based mainly on input controls, ignoring more successful experience in other countries that limited the catch to sustainable levels through transferable harvest quotas—known as Individual Transferable Quotas (ITQs). After management councils in a few fisheries adopted the latter approach, a coalition of opposed interests secured a congressional legislative moratorium on any further development of such systems. This moratorium was renewed and sustained for six years, forestalling any further policy experimentation or innovation. Then, in 2002, without much significant change from the conditions prevailing in most fisheries when the moratorium was adopted, the moratorium was allowed to lapse. Two years later, ITQ approaches were embraced as government policy.

These fits and starts in fisheries policy demonstrate the importance of the “social trap” mechanisms at the heart of Brock's analysis. Fishermen, who play the decisive role in Management Council decisions, are typically conservative and risk-averse with respect to fundamental changes in the way their fisheries operate. They also constitute fraternities with the ability to exert social pressure on each other. Without concrete evidence that a new management approach would improve their own individual outcomes, fishermen are hesitant to change. However, unless some fisheries are willing to experiment with management innovation, such evidence cannot arise, “locking in” the traditional approach. The function of the national moratorium secured by ITQ opponents was to reinforce this impasse, preventing any further policy innovation. Erosion of support for the moratorium stemmed in large part from “policy learning” over a period of years from the remarkably successful experience with the ITQ system adopted before the moratorium in the Alaskan halibut fishery, which transformed a disastrous fishing situation into a highly successful one and demonstrated that many of the hypothetical drawbacks to transferable harvest quotas were avoidable. This policy learning altered the perceptions of significant numbers of fishermen, fisheries managers, and other key policymakers, undermining the policy dominance of the opposing coalition.

The third chapter in this section of the book, by Benjamin Cashore and

William Howlett, tests the punctuated equilibrium framework by examining changes in timber management and harvesting in old-growth forests of the Pacific Northwest. Their description of the abrupt drop in the timber harvest from national forests in the region in the early 1990s shows several strong parallels with that of water policy innovations further south in California. For decades, the Forest Service had been able to maintain a policy subsystem based on the ideology of scientific management, the professionalization of forest management, and a strong rent-seeking bond with the timber industry and congressional allies. It was able to use the discretion implicit in its multiple-use management mandate to give primacy to “getting out the cut” at the expense of ecological and economic considerations, just as the California water subsystem had been able to continue for decades its engineering approach to water diversion and supply. Also, as in California, the policy “punctuation” was precipitated by a change in venue and the “reframing” of the issue from one of commodity supply to endangered species protection. Environmental groups, bringing suit to force the Forest Service to protect the endangered northern spotted owl, were able to draw the federal courts into an active oversight role in harvesting decisions. The result was a dramatic reduction in the harvest from the national forests and a shift toward “ecosystem management” by the Forest Service.

Cashore and Howlett introduce a new element into the analysis, however, by comparing the response to the endangered species challenge on private lands in the Pacific Northwest, regulated by state governments, with the response in the national forests. On private lands, the response was at most incremental and led to no great reduction in timber supply. This comparison underscores the importance of differential policy opportunities created by different institutional settings. On federal lands, environmental laws created greater opportunities for interventions by public interest groups, and the Endangered Species Act and other laws governing Forest Service action imposed more stringent requirements on the federal agencies. On private lands, by contrast, there were fewer opportunities for intervention by environmental groups, stronger protections for private property rights, fewer requirements on private landowners for endangered species protection, and a regulatory apparatus more sympathetic to the timber industry. This comparison emphasizes the potential importance of institutional features in conditioning policy dynamics either to facilitate dramatic policy changes or to sustain a policy equilibrium.

The final section of the book contains three chapters analyzing issues that remain in policy equilibrium and have not yet experienced discontinuous change

or punctuation. They assess the climate issue and two other deadlocked national environmental policy problems: the debate over vehicular fuel economy standards and the subsidization of environmentally damaging extractive users of the nation's public lands. These chapters analyze the sources of deadlock, the forces maintaining the status quo, and assess possible "triggers" that might lead to rapid change.

In the first of these chapters, Lee Lane examines the possibility that the United States will adopt domestic controls reducing greenhouse gas emissions and cooperate with other nations in constructing an effective international climate protection regime. As he points out, the obstacles are formidable. The economic costs of reducing emissions by enough to stabilize atmospheric greenhouse gas concentrations would be high in the absence of sufficiently cheap and plentiful renewable energy substitutes. By contrast, the damages that the United States would suffer from a changing climate are not evident even to experts, let alone to the average person, and in any case would be suffered decades into the future. This configuration of uncertain benefits and high costs is markedly different from those that supported decisions to reduce emissions of more conventional pollutants. Moreover, Lane points out, there is concentrated opposition to mandatory emissions reductions from well-organized and extremely influential energy industries. Finally, domestic U.S. action would be ineffectual without an international regime that constrained emissions from other countries as well, including especially the large rapidly growing countries in the developing world that put a very high priority on economic growth.

Lane's chapter is frankly pessimistic about the prospects for a breakthrough in U.S. climate policy, absent some dramatic manifestation of the risks of climate change, significant technological breakthroughs, a significant political realignment, or some combination of all these. He discounts the potential efficacy in triggering policy change of a new oil crisis, a widespread shift from coal to natural gas or state-level policy initiatives like those adopted in California and elsewhere. Instead, he sees hope in a more gradual approach to emissions reduction brought about by cost-effective market mechanisms, such as energy tax increases that could be politically justified partly as environmental measures and partly as revenue measures to address the serious federal budget deficits looming into the future. Should other industrialized countries move in that direction through a re-negotiated Kyoto Protocol or other international agreement, diplomatic pressures might help induce the U.S. government into a more cooperative policy stance.

In the next chapter James Dunn, Jr., takes up the related issue of vehicular

fuel economy standards. When Corporate Average Fuel Efficiency (CAFE) standards were enacted in 1975, the automobile industry was the target of a punctuation in regulatory policy. In the mid-1960s, when Nader's *Unsafe at Any Speed* was published, the U.S. automobile industry was essentially unregulated. In the years that followed a cascade of technology-forcing regulations was enacted, addressing safety (seatbelts), emissions (catalytic converters), and fuel economy (CAFE standards). This burst of activity was fed by the more general enthusiasm for environmental legislation that arose in the early 1970s but was also enabled by conditions specific to the industry at that time. The sharp rise in oil prices in the early 1970s, which was then expected to persist, combined with the rapid market penetration by Japanese-made small sedans, persuaded car companies and their unions that consumers would accept more fuel-efficient cars and could offset any price increases with savings in fuel purchases.

Since then, there have been minor upward and downward adjustments to CAFE standards, carmakers have learned to live with them, and those who would strengthen them and those who would abolish them are essentially deadlocked. Political leaders have expended little political capital on the issue, preferring largely symbolic long-term research partnerships with industry. Meanwhile, the American car market has changed drastically. Faced with huge pension and health care liabilities and losing market share to imports, Detroit has become increasingly dependent financially on sales of high-margin SUVs and light trucks, which face much lower CAFE standards, if any. Technological advances have been ploughed into increased vehicle power and weight, maintaining fuel economy largely unchanged. Significant increases in CAFE standards that would imperil sales of these mega-vehicles or further increase the competitive advantage of the Japanese companies in the market for smaller cars would put Detroit in financial peril. The well-organized industry, the unions, and their congressional supporters in both parties would oppose such measures strenuously. Dunn sees hope for significant policy change only if driven by or at least consistent with altered market forces: significantly higher fuel prices produced by world supply constraints or the enactment of broader climate-related policies, or rapid penetration of hybrids into the U.S. market. Even then, in his view, a policy initiative with chances of success would have to combine higher fuel efficiency standards with financial incentives for the industry to produce and sell such vehicles. A specific example would be a gasoline tax with revenues dedicated to tax credits for purchases of acceptably fuel-efficient vehicles in all segments.

The final chapter in this section, by Charles Davis, assesses the prospects for significant change in policies governing livestock grazing on public lands in the West. He finds that the prospects are dim. Policies were developed as early as 1934 in the Taylor Grazing Act to ensure that ranchers' interests were well protected in the administration of the public lands by the Bureau of Land Management. Since then, the livestock industry, western governors, and legislators and the Bureau have been able to maintain an effective policy subsystem, repeatedly and successfully resisting efforts to eliminate grazing subsidies or the priority afforded to grazing and other extractive uses in management priorities. Attempts by environmentalists and others to construct a new policy image ("welfare ranching"), to push through legislative or administrative reforms, or to shift the policymaking venue to the courts have met with only limited success.

Despite the vast area administered by the Bureau of Land Management, Davis points out that nationally this is a low-stakes issue. The aggregate subsidy provided to livestock operators on public lands is a tiny fraction of the federal budget. Most of the semi-arid land in question is remote and of little value for grazing or anything else. Known as the "lands nobody wanted," they can readily be seen to be in generally poor condition. What is more difficult to imagine is that they could ever have been in good condition. Under these circumstances it has proven difficult to generate much national public, media, or legislative concern with which to overcome the entrenched defenses of regional interests. Davis sees the likeliest prospect for a policy punctuation to stem from the effects of a slow-acting variable: the changing demographics of the western states. Urban, white-collar households with recreational and environmental interests in the land are increasingly outnumbering households with traditional ties to commodity production on the land. The composition of elective bodies is shifting correspondingly. At some point the weight of regional interests may shift, fracturing that coalition and producing a national political configuration less deferential to ranching, mining, and logging interests.

LESSONS LEARNED

The data presented in Frank Baumgartner's chapter and elsewhere in this book show that the dynamics of environmental policy behave as the punctuated equilibrium model predicts. Stability and incremental adjustment are the norm. Abrupt policy innovations and reversals do occur, but rarely. This pattern appears across many environmental and resource policy issues.