THE CENTER FOR ENVIRONMENTAL INITIATIVES
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The Dead Hand of Environmental Regulation

THE CAUSES AND IMPLICATIONS OF REGULATORY RIGIDITY; AND THE BENEFITS AND REQUIREMENTS OF GREATER ADAPTABILITY

OR, WHY REGULATIONS CANNOT ADAPT TO NEW SCIENCE, NEW TECHNOLOGY, NEW ECONOMIC CONDITIONS OR CHANGING POLICY PRIORITIES

James Lloyd Foster
Center for International Studies
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Executive Summary

Our analysis of measures to improve the environmental policy-making process strongly suggests that obtaining meaningful changes in regulatory outcomes demands far greater systemic change than is contemplated either by current "reinvention" programs or by the proposals of critics of current regulatory approaches. We argue that current proposals for changing regulatory policy-making process are not only too narrow and piecemeal but also directed at a definition of the policy problem that is fundamentally flawed. Most proposals for change are addressed to one or another of the widely recognized limitations of a policy process that emerged without an overarching rationale: the process is largely the end-result of a long sequence of uncoordinated legislation, judicial rulings and responses to emergent political demands having no particular policy theme -- it simply happened. Therefore, we find that making piecemeal adjustments -- as prescribed by critics of current environmental policy -- is not only unlikely to succeed, but may well produce unanticipated, perverse outcomes.

The focus of critical attention in the environmental policy debate has been on the "front-end" of the policy process. The concerns have been primarily directed to changing the procedures for initiating new standards and rules, including: the role and methods of risk assessment and cost-benefit analysis; procedures for participation of stakeholders; employment of "integrated policy analysis" and associated regulations dealing with cross-media and multiple-source environmental impacts; and the delegation of enforcement authority (e.g., "federalism"). By contrast, the purpose here is to examine measures for improving performance in the "back-end" of the regulatory process. While improving "front-end" decision-making is clearly desirable, there has been surprisingly little attention paid to the potential benefits of, or the requirements for, improved policy evaluation and the adaptation of regulation to new information and changing circumstances. Most importantly, in the context of high scientific uncertainty, improvements to the front-end cannot ensure more effective or efficient regulations. In many, if not most, cases, "only time will tell" whether chosen regulatory instruments are reducing environmental risks adequately and at acceptable social costs. Therefore, changing front-end procedures without corresponding and closely linked improvements to back-end, policy evaluation procedures and capabilities may produce few benefits.

Though many statutes authorizing regulatory action demand routine policy reassessments, a clear shortcoming of the current regulatory system is the weakness of evaluation systems. Furthermore, history finds few major environmental regulations that have been modified significantly as a result of systematic policy evaluation processes – demonstrating the "Dead Hand Effect" of regulatory rigidity. The historical record documents clearly the difficulties confronted by past efforts to modify existing environmental regulations. Resistance to such change appears to operate in spite of new scientific information undercutting extant policy, clear evidence of diminishing returns to current policy, new technology offering more cost-effective policy alternatives, and even the appearance of regulatory alternatives clearly beneficial to some key stakeholders. Occasionally changes do occur, but more likely as the result of immediate health scares, trade disputes, or as the result of effective political action on the part of a special interest group.

An avowed purpose of those seeking procedural changes in the front-end of the policy process is to get "better science" into the process by such means as improved risk assessments. This is a noble goal, but, in fact, there may be greater opportunities for, and greater benefits accruing from, getting

"better science" into the back-end processes of policy evaluation and reassessment. If systematic evaluation procedures followed initial rulemaking, then time and experience -- the *natural scientific experiments* of regulatory trials -- can reveal new technical opportunities, new definitions of the regulatory problem, and new regulatory approaches. In this light, for example, if regulatory actions are taken on the basis of the "precautionary principle" in the face of high uncertainty, then it is crucial that the resulting regulations be subject to continuing and careful evaluation and be open to revision in the face of new information. However, regulations undertaken on what would effectively be a "trial-and-error" basis are quite antithetical to current practice, current expectations of the process, and current perceptions of the interests of many stakeholders.

In truth, regulations are often formulated before highly credible supporting scientific evidence is available. And uncertainties may be increasing relative to the past, if for no other reason than the very success of science. Many, if not most, of the "easy" environmental problems have been successfully addressed, leaving the more difficult to current consideration. In addition, the continuing, rapid advances in science and technology present new definitions of old environmental problems as well as new solutions to those problems. Furthermore, improved environmental science has identified new and more complex potential problems, with just one dramatic example being the issue of endocrine system disruptors.

In a world where environmental issues are becoming more complex, both scientifically and politically, the policy-making implications go well beyond the magnitude of the scientific uncertainties and how they should be treated. One burden of greater complexity is that the costs of regulations tends to increase; and efficiency concerns may begin to undermine political support for environmental programs as well as impacting more heavily public budgets and corporate balance sheets. Possibly more compelling is the fact the risks of "being wrong" in designing regulatory responses may be greater in a world of greater complexity. The risks may go well beyond a possible failure to mitigate the environmental problem of concern, and include the risks of serious and unintended side effects – especially the risk of exacerbating another environmental problem. This has been the case, for example, with respect to the use of MTBE as a gasoline additive. Originally endorsed – and with limited prior scientific assessment of its effects – as a means of reducing auto emissions, it came to pose new and significant water pollution risks. Yet, after many years of critical attack, and with little support from stakeholders apart from producers of the product and of its substitutes, the removal of MTBE from gasoline has been agonizingly slow and tortured.

Another policy-making burden arising from increased complexity and the successful application of science is the emerging problem of markedly diminishing returns to further action by current regulatory instruments – posing the apparently unanticipated issue of "how much is enough?" Given the "maturity" of many regulatory regimes – some of which have been in place for nearly thirty years – it would be natural to expect that at least some regulations have passed their time of usefulness or are in need of fundamental change. Though critics of environmental policies grant that policy successes have been realized, they do not address the implications of the success. Success can pose its own set of new policy and analytic problems. What information is sufficient to conclude that an existing regulation is no longer relevant or can be relaxed? When do diminishing returns set in and what should be done to reallocate resources?

Ex ante determinations of how much is enough is virtually impossible, given the large uncertainties inherent in the calculations of the health effects, the potential pollution mitigation effects of particular technologies, or the relative costs and benefits of alternative regulatory instruments. However, *ex post* evaluations and reassessments of regulations, once they have established a track

record, offer the opportunity to assess marginal costs and benefits in terms of "real world" data and experience. One area currently ripe for such reassessment, for example, is that of automobile emission regulations. A record of great success in reducing these emissions has narrowed the range of potential further gains to very small amounts. Not only are there rapidly diminishing returns to current regulations in this area, but further improvements may only serve to raise the price of cars to the point where fleet turnover is adversely impacted – and older cars are a disproportionate source of total auto emissions.

All of the above considerations address a larger question: What are the opportunity costs of failing to pursue more adaptive regulatory approaches? Basic logic suggests many potential efficiencies foregone due to the Dead Hand Effect. What, then, are the constraints to more effective policy evaluation and adaptation? In particular, what are the stakeholder incentives favoring regulatory rigidity versus adaptability; and how might the *expectation* of more aggressive policy evaluation and adaptation change the behavior of stakeholders in the front-end policy-making process?

Efforts to exploit the potential benefits of a more "conditional" and adaptive approach to regulation confront a range of fundamental constraints. The tradeoffs between fixed and adaptive regulatory policies are especially clear in assessing how the expectation of adaptive change affects the policy preferences of various interest groups. For example, there is an important tradeoff for industry and regulatory organizations in accepting conditional regulations. Most important is the fact that initiating regulations with an intent to adapt the policy in light of new information, effectively *moves the burden of uncertainty from the regulator to the regulated*, and it is this burden that industry wants to avoid. Currently, the burden of uncertainty reduction is on EPA in front-end assessment of regulatory requirements. Fixed regulations at least eliminate one major uncertainty for industry in making their long-term product-market and investment decisions. Industry has consistently shown a preference for the certainty of even very stringent regulation to the uncertainty of "flexible" regulation. Promotion or acceptance of policy change in light of information developed through policy evaluation is a highly uncertain path to take in a political system where there are so many points of opportunistic entry by many competing interest groups. Industry often expresses positions that would appear on surface to favor greater policy flexibility and adaptability, but most often takes actions favoring the reliability afforded by regulatory stability. Once regulations are established, whatever the attitudes by industry prior to decision, industry adapts to the regulation, establishes advantages within the changed context, and finds it unattractive to change again. Industry prefers consistency, not sporadic change, and often is the strongest advocate of maintaining regulations.

A second fundamental constraint on adaptive regulatory strategies arises from the very fact that greater dependence on adaptive regulatory approaches is necessarily premised on recognition of irreducible uncertainty in the ax ante context. However, to justify policies on formal recognition of scientific uncertainty raises fundamental issues of the *political legitimacy* of regulations**.** "Sound science" as the basis of policy has been a necessary claim for policy action. Assertions of scientific uncertainty, on the other hand, have been the instrument of political opposition used by those adversely affected by new regulations. Is it possible to promote regulatory policies intended to *resolve* scientific uncertainties, as opposed to policies at least carrying the claim of *established* scientific consensus, if not certainty?

A third fundamental constraint on adaptability may be the binding constraint. For its part, EPA has generally been loath to reopen basic regulatory programs in light of the protracted and expensive process required for setting new regulations. It now takes from five to seven years to complete the

process for establishing a new rule. To reopen that process once finally complete suggests an enormous task when taken in light of the full menu of environmental regulations. It also suggests that modifying existing rules may be too burdensome in both time and human resources to contemplate except in extreme cases. The agency has pursued many alternatives to formal rule making in order to speed the process and reduce the problem of litigation – with negotiated regulations a particular favorite. To the extent that negotiated regulations are the basis of rulemaking, the demands of having to construct new political coalitions in favor of a particular rule change may pose a prohibitive challenge. In any case, though some successes have followed these efforts at innovative rule making procedures, we find that they ultimately pose special problems for policy enforcement, evaluation and adaptation efforts.

A final source of constraints on adaptability arises from the fact that regulators find a virtue in many aspects of the current regulatory system – especially in technology-based regulations – because of its conceptual and enforcement simplicity. Many Process, technology, and design standards generally are easier to articulate and implement than the alternatives. They are certainly easy to monitor. Regulators at the local level know what they are looking for; the criteria are met or they are not. Because monitoring and evaluation systems have been a notable weakness within existing regulatory regimes, the added demands of more adaptive regulations place a new and particularly demanding requirement on EPA and state capabilities. Adaptive regulatory regimes pose new and particularly demanding requirements on capabilities for program monitoring, data collection and evaluation. A central issue in moving from the existing system approach to an alternative one is the need for different kinds of information to measure environmental performance and verify that facilities are performing acceptably.

While recognizing these constraints, we argue that there are measures that could increase both the incentives and capabilities for improved policy evaluation and corresponding adaptation of regulatory policies. Several "experiments" with mandated regulatory reassessments have been in operation for some time such as the NAAQS five-year reviews and the National Toxicology Program's periodic review of the official list of carcinogens. Unfortunately, in spite of much effort, these processes have produced few policy changes over time. It may well be that large scale routinized high-level reevaluation processes are not at all effective procedures for generating truly adaptive policy behavior. These examples do illuminate several attributes of an evaluation system that could be more effective.

We also consider a number of *ad hoc* cases of partially successful regulatory reassessments suggesting quite different attributes of the desired process. Those efforts typically began with a clear commitment from the top-levels of the agency to reassess carefully selected issues. They involved establishment of informal processes, outside the routine administrative channels and policy channels but with top-level protection. When new science supported change and the benefits to industry could be demonstrated, adaptation tended to follow. Especially important to the outcome was the demonstration of new and innovative opportunities for industry and other stakeholders arising from regulatory change. One such case was the Montreal Protocol agreement to restrict production of CFCs as an ozone depleting substance. Critical to the outcome was the recognition by DuPont – the dominant producer of CFCs – that it had market advantage in the production of CFC substitutes.

> The power to become habituated to his surroundings is a marked characteristic of mankind. . . . We assume some of the most peculiar and temporary of our late advantages as natural, permanent, and to be depended on.
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> **KEYNES**
> The Economic Consequences of the Peace

Introduction:

The Only Change to Fear is Change Itself

It is the problem of regulatory change -- or more accurately, the problem of resistance to change and constraints on policy adaptation and innovation -- that is the object of our analysis. Criticism of environmental policymaking has led to many proposals for altering the policy process, especially demands for "better" risk assessments and greater emphasis to cost-benefit analyses in determining new regulations. However, there is little apparent demand for, or interest in, changing existing regulations -- the shortcomings of which are the very object of the criticism. Resistance to or avoidance of regulatory change appears to operate in spite of: new scientific information redefining environmental problem: mounting evidence of ineffectiveness or undesirable side effects of existing regulations; clear evidence of diminishing returns to current policy; new technology offering more cost-effective policy alternatives; and even the appearance of regulatory alternatives clearly beneficial to key stakeholders. Indeed, the historical record reveals few successful efforts to modify major regulations, and documents clearly the difficulties in changing environmental regulations once established. Why is environmental regulation so resistant to change, in spite of changing science, changing technology, new policy priorities and changing corporate interests? What are the costs and wider implications of regulatory rigidity? What must change in the political process or in policymaking procedures in order to promote greater adaptability in regulation?

We will label as the “Dead Hand Effect” this apparent inability or unwillingness to subject existing regulations to critical evaluation and, on that basis, to assess the merits of modifying, adapting or even eliminating regulations. In addressing this issue, our concern is not to argue for or against particular environmental programs. Instead, our purposes are, first, to determine the causes , the costs and the benefits of regulatory rigidity; and second to identify mechanisms that might encourage greater regulatory adaptability along with an assessment of their potential costs and benefits to various stakeholders. Of particular interest to our analysis are five issues:

- Identifying the institutional, political or other factors determining the capacity (or incapacity) of regulatory processes to recognize and adapt to new scientific, economic and technical information bearing on the merits of current regulatory standards, instruments and strategies;

- Analysis of the opportunity costs of failing to evaluate and adapt regulations in more timely fashion;

- Assessing the adequacy of evaluation systems -- basic systems for data collection, environmental monitoring, and evaluation of changing scientific understanding of the environmental problems addressed by existing regulations;

- Explaining the inability or unwillingness of stakeholders to demand or promote more effective policy evaluation and adaptation – including the substitution of non-governmental evaluation systems;

- Identifying alternative regulatory structures and procedures that might better address policy evaluation and adaptation requirements and opportunities.

We find that the basic dynamic of resistance to regulatory change and the failure to adapt, over time, to new information and policy alternatives does not simply reflect the dominance of bureaucratic inertia, or political gridlock, or the distribution of political power among interest groups. All of these factors may play a role, but successful cases of adaptation show clearly that, when there is strong political demand for change or a strong commitment from the political leadership, none of those factors is sufficient to resist change. More significant is the simple fact that policy change is a highly uncertain path for any stakeholder to pursue within a political system having so many points of opportunistic entry by the many interest groups competing for policy influence. Preferring the "devil you know" to the "devil you don't know" can be rational -- even though often a profoundly inefficient -- political strategy in a political system characterized by slow, unpredictable processes involving many interest groups with sharply conflicting views.

In this context, for example, industry claims to favor greater efficiency and adaptability, but often reveals a preference for the predictability and reliability afforded by regulatory stability -- even if more cost-effective or even more self-serving policy alternatives emerge. Once regulations are established, whatever the attitudes by industry prior to decision, industry adapts to the regulation, makes the necessary investments, and establishes advantages within the new regulatory context, and finds it unattractive to change again. The private sector likes consistency, not sporadic change, and often becomes the strongest advocate of maintaining existing regulations. Indeed, there are a number of notable cases where industry has voluntary chosen more stringent regulations -- when less onerous alternatives were offered -- rather than retreat from existing and known circumstances.

The Dead Hand and Policy Adaptability

The dead hand effect arises from one of two basic courses of policy action. One course leads from an initial decision point where a wide variety of regulatory policy options is available, and the expectation of all stakeholders is that the range of technological and other opportunities will only increase over time. That is, the often large uncertainties regarding the effects of initial decisions are underlined by the even larger uncertainties about possible future decisions. If the opportunities for possible policy change are large, then uncertainties would loom especially large for current regulation-induced investments and their potential payoff. Uncertainty about what the content and requirements of future regulations might be less compelling than uncertainty about when change

might occur and what might induce such change. It is, after all, the issue of timing that particularly influences the calculation of investment pay-offs. This policymaking pattern produces *intended* restrictions on longer-term policy adaptation: the very purpose of stakeholders in this policy pattern is "intentional lock-in." Intentional lock-in of policy is driven by the dominant concern of key stakeholders who perceive their interests as better served by uncertainty reduction (by maintaining the status quo) than by pursuing the always highly uncertain path of change. Even if more self-serving regulations is a possible outcome of change, the ability to achieve and sustain that preferred outcome is extremely uncertain in a political system where there are so many points of opportunistic entry by any one of many competing interest groups.

In short, the first policy course arises from mounting political resistance to the possibility of change -- and the stranded investments such change would produce -- in the face of a potentially large number of available (and possibly more efficient) alternatives. The second, and quite contrary, course of policy action that encourages the dead hand phenomenon is a sequence of decisions whose outcomes effectively eliminate policy options. This pattern of policymaking emerges from a sequence of restrictive decisions, which have the *unintended* consequence of eliminating future policy options and thereby producing a dead hand. In the first policy pattern, the dead hand is a conscious and intended outcome of policymaking, while in the second pattern the dead hand is an unintended consequence of policymaking that doesn't account for the long term implications of regulations. For example, pesticides regulation has often restricted or eliminated virtually all substitutes for regulated products (such as special use pesticides). This pattern has been critical, for instance, in the effort to regulate methyl bromide (a crop fumigant) because of its ozone depletion properties. Unfortunately, prior bans on other crop fumigants has left the marketplace without effective substitutes now for methyl bromide.

This unintended reduction of the potential for policy change is a form of "sequential lock-in": the result of piece-meal decisions, of unintended consequences in which the dead hand effect emerges from the fact that policy becomes restricted to one basic policy alternative. This lock-in effect typically results from one of three causes. First, it can result from a failure to analyze fully the long-term or the wider economic effects of each of a sequence of decisions. Second, restricting or eliminating substitutes for a product or process can emerge full-blown, for example, from regulations based on technology standards. Given the investment implications for industry, once a technology standard is set, it becomes long lasting. A third and not at all appreciated form of lock-in involves the increasingly important role of scientific forecasting models used in regulatory rule making. The model is a representation of the “real world” but is not, of course, a true representation. Increasingly, as in the recent cases of rules on reformulated gasoline and the SO2 emission reduction program, the focus of the policy dispute becomes the model. Not only to protect one’s interests but also to “fix” the resulting regulatory standards to the extent possible, the fight becomes one of what version of the model with what assumptions will be the current and future basis of regulation.

Whether or not there is strong political will for change, the resistance to such change generally comes from a variety of stakeholders with seemingly opposed interests. Furthermore, all of

these stakeholders may, in the policy debate, present similar criticisms of existing regulatory regimes, especially of existing command-control regulations. Nonetheless they all may defend the status quo. Defending the status quo reflects the fact that their *perceived* interests are best served by that outcome rather than by facing the incalculable uncertainties of entertaining change. And the dominant uncertainties are *not scientific uncertainties.* For all the talk about the role of scientific uncertainty in regulatory decisions, it is not scientific uncertainty that dominates reconsideration of regulations: The dominant uncertainties are political and come down to a question of whether stakeholders believe or have high confidence in: the ability of the federal government to make credible commitments that agreements to establish modified regulations will be successfully defended against opportunistic political actions of opponents to the agreement. The most credible commitment is specific legislative authorization, but time has undermined the credibility of this avenue for at least two reasons:

- either opportunistic actions by disadvantaged groups undermines the agreement over time through amendments to the legislation,

- or the legislation is so thorough and sustaining that the legislation itself becomes the major barrier to further adaptive change – adaptive change that is desired by an overwhelming majority of stakeholders

Why Worry About Policy Adaptation?

The focus of critical attention in the environmental policy debate has been on the "front end" of standard setting and rule making. The literature has emphasized issues in the initiation of regulatory policies: methods of risk assessment and cost-benefit analysis; the participation of stakeholders; the choice of policy instruments; and the delegation of enforcement authority (e.g. greater state autonomy). This focus addresses the special interests and concerns of entities directly affected by *new* regulations as well as the more general interests of those wanting to rationalize the policy process. By contrast, little attention has been paid to the potential benefits of adapting existing regulations to exploit new scientific and technical information or to account for changed economic or other circumstances. This paper examines the "back end" of the regulatory process for two reasons outlined below.

The benefits of adaptation include efficiencies that follow from the incorporation of new scientific knowledge and technical information into policy review. Critics of the current regulatory process emphasize the need to get "better science" into the process at the front end by means of improved risk assessments. In truth, regulations are often formulated before highly credible supporting scientific evidence is available. Time and experience -- the natural scientific experiments of regulatory trials -- can reveal new technical opportunities, new definitions of the regulatory problem, and new regulatory approaches.

The benefits of a more adaptive approach to regulation go directly to issues of political legitimacy**.** In a world where environmental problems are becoming more complex, both scientifically and politically, uncertainties may be greater than in the past. If actions will be taken on the basis of the "precautionary principle" in the face of high uncertainty, then regulations should be open to revision in the face of new information. Regulations on a "trial-and-error" basis will be

politically feasible and justifiable only if an effective policy reassessment system is in place and is expected and accepted by key stakeholders in decisions.

The tradeoffs between fixed and adaptive regulatory policies are especially clear in assessing how the expectation of adaptive change affects the policy preferences of various interest groups. For example, there is an important tradeoff for industry and regulatory organizations in accepting conditional regulations. Fixed regulations at least eliminate one major uncertainty for industry in making their long-term product-market and investment decisions. Industry has consistently shown a preference for the certainty of even very stringent regulation to the uncertainty of "flexible" regulation. Initiating regulations with intent to adapt the policy in light of new information, effectively moves the burden of uncertainty from the regulator to the regulated, and it is this burden that industry wants to avoid. For its part, EPA has generally been loath to reopen basic regulatory programs in light of the protracted and expensive process required for setting new regulations. The agency has pursued many alternatives to formal rule making in order to speed the process and reduce the problem of litigation. Though successes have followed these efforts, we find that they ultimately pose special problems for policy enforcement, evaluation and adaptation efforts. Both industry and regulators may develop strong interests in stability.

Given the prospective benefits of adaptive policy strategies, what structures, processes and procedures are required to implement such strategies? The paper examines several past experiments and current proposals for changing regulatory policy making process and suggests that these are not only too narrow and piecemeal but also directed at a definition of the policy problem that is fundamentally flawed.

The paper examines experiments with mandated regulatory reassessments that have been in operation for some time such as the NAAQS five-year reviews and the National Toxicology Program's periodic review of the official list of carcinogens. In spite of much effort, these processes have produced few policy changes over time. It may well be that large scale, routinized high-level reevaluation processes are not at all effective procedures for generating truly adaptive policy behavior.

Consideration is also given to cases of partially successful regulatory reassessments suggesting quite different attributes of the desired process. Beginning with a clear commitment from the top-levels of the agency to reassess carefully selected issues, an informal process was undertaken, outside of normal administrative channels. When new science supported change and the benefits to industry could be demonstrated, adaptation tended to follow relatively quickly. Particularly instructive in this regard are cases of policy reassessment of lead in gasoline in 1982 and 1984. Not only were the above principles observed, but the policies presented offered innovative opportunities for industry to respond to new regulations that gained crucial industry support for the regulations and offered clear efficiencies for industry compliance efforts.

The paper also examines current proposals to correct what are widely perceived to be the "mistakes" and "failings" in environmental regulations as well as in the process for determining. Though critics grant the fact that policy successes have been realized, they do not address the implications of the success. Success can pose its own set of new policy and analytic problems. What information is sufficient to conclude that an existing regulation is no longer relevant or can be relaxed? When do diminishing returns set in and what should be done to reallocate resources? When might it be better to bring back a banned product or process to substitute for a currently used but even more dangerous product or process?

To address these heretofore generally overlooked questions pose new and particularly demanding requirements on capabilities for program monitoring, data collection and evaluation. A central issue in moving from the existing system approach to an alternative one is the need for different kinds of information to measure environmental performance and verify that facilities are performing acceptably. Many regulators find a virtue of the current system is its conceptual simplicity. Process, technology, and design standards generally are easier to articulate and implement than the alternatives. They are certainly easy to monitor. Regulators at the local level know what they are looking for; the criteria are met or they are not. Because monitoring and evaluation systems have been a notable weakness within existing regulatory regimes, the added demands of more adaptive regulations place a new and particularly demanding requirement on EPA and state capabilities.

The overriding conclusion of our analysis is that meaningful changes in regulatory policy require systemic changes in the process by which that policy is made. Efforts to improve risk assessments or to employ different policy instruments, such as voluntary enforcement or market incentive regulatory programs will not yield adaptation. Most proposals for change are addressed to one or another of the widely recognized limitations of a policy process that emerged without an overarching rationale; the process is simply the end-result of a long sequence of uncoordinated legislation, judicial rulings and responses to emergent political demands having no particular policy theme: it simply happened. Therefore we find that making piecemeal adjustments -- as prescribed by most critics of environmental policy -- is not only unlikely to succeed but may well produce perverse and undesirable outcomes.

Bringing the "Back End" Up Front:

The Policy Evaluation and Adaptation Problems

A 1993 Carnegie Commission study notes in the conclusions (but not in the analytic sections): "Agencies also seem increasingly reluctant to revisit rules when the factual or policy predicates underlying them have changed."[1] This comment would suggest that the problem of adaptive change is of more recent vintage, one that is "increasingly" apparent. If so, why has the problem grown in a period when policy change is the main focus of the policy debate? In any case, The only explanation offered for this characteristic of policy is: "Federal agencies are slow to make major changes in regulatory priorities largely because of bureaucratic inertia…"[2] Though bureaucratic inertia may play a role, there simply are too many stakeholders, with far too much at the mercy of regulation, to conclude easily that mere bureaucratic inertia could deny concerted political action by those stakeholders.

Interestingly, it was also in 1993 that the National Academy of Science published the only analysis (or at least the only one we have been able to find) that raised the problem of adaptive change as the principal issue for analysis. Quite properly, the issue was raised in the context that "the policy and regulatory process does not incorporate new scientific information very well or in a timely manner."[3] Placing the role of science within the context of policy adaptation, as opposed to the process of initiating new regulations, sets this analysis apart. That is, a constant refrain of the critics of environmental policy is the need to get "more and better" science into the process. However, those critics focus their concerns about incorporating science into environmental regulations on the problems of initiating regulatory programs, and especially the methods and procedures of risk assessment as the basis of initiation decisions.

Yet, it is in the process of policy evaluation, review and adaptive change of existing regulation where there is greatest opportunity and potential rewards from effective incorporation of new scientific knowledge and technical information. Initiating regulations is most often compelled before highly confident, supporting scientific evidence is available. Time and experience (the "natural" scientific experiments of regulatory trials) can reveal new technical opportunities, new definitions of the regulatory problem, and new regulatory approaches. The problem, however, is in compelling the regulatory process to recognize the new information and to adapt regulatory behavior in light of that new evidence.

In any case, apart from this National Academy study, the debate over the use of science in regulatory policy has ignored systematic treatment of the context of adaptive change to existing regulations. Unfortunately, the National Academy study is far better at raising issues than in

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[1] Carnegie Commission, **Risk and the Environment: Improving Regulatory Decision Making,** June 1993, p. 107

[2] Ibid, p. 97

[3] Richard Morgenstern, *Science, Engineering, and Regulation* in Myron Uman, ed., **Keeping Pace with Science and Engineering: Case Studies on Environmental Regulation**, National Academy Press, Washington, DC, 1993, p. 243

offering in-depth analysis or in offering operational insights. It notes "the Agency (EPA) does not have a strong record for meeting deadlines for the reevaluation of regulatory decisions."[4] And the analysts observe that "we should be concerned that the regulatory system is sufficiently flexible to be able to adapt," but does not define flexibility or the requirements of adaptation.[5]

Because this last statement refers both to the terms "flexible" and "adapt" in the same context, it is important here to define and distinguish these terms as they are used in our analysis. Flexibility is, of course, a favored term of virtually all advocates in the policy debate to describe the most desired quality for the environmental policy-making process. It is all things to all people. In this light, it is essential that our analysis not be seen as another statement of the need for greater regulatory flexibility as a solution to regulatory rigidities. Flexibility has come to mean many things to different advocacy groups, but the attributes of regulatory policy covered by the flexibility concept do not address the types of regulatory policy rigidities with which we are concerned.

As used in the environmental policy literature, flexibility refers alternately to: the need for less precise, "one-size-fits-all" regulations; granting greater discretion to state regulators or to industry in choosing the particular methods of pollution mitigation; or greater discretion in determining local enforcement priorities and resource allocations. The call for greater regulatory policy flexibility is important in its own right; however, we find significant the distinction between policy flexibility and policy adaptability. Our conception of adaptability focuses on an approach that is quite the opposite of flexibility: we are attempting to identify policy approaches whose very purpose is to create *change*, and which can and will continually adapt to changes in scientific information as well as changes in environmental and related conditions. Flexibility, on the contrary, is concerned with *differences in the relevance of regulations across regulated entities at any moment in time;* it is concerned with differences in circumstances across media, across pollution sources and across locales. A flexible policy is one that takes account of those differences by adjusting regulatory enforcement policies to the particulars of local conditions. Adaptability is concerned with how those circumstances (the local differences) might change over time, and how regulations and enforcement methods must change accordingly.

What Must Be Changed in the Policy Process?

Over the past decade, a remarkable degree of agreement has emerged within a relatively broad cross-section of the political spectrum that it is possible and necessary to improve both environmental regulations and the process by which those regulations are determined. The policy debate has come to be dominated by almost tediously repeated themes, calling for fundamental changes, in both regulations and in the methods and procedures for determining those regulations. The broadly accepted themes of the policy debate emphasize the weaknesses of the traditional command-control, "one-size-fits-all," single-medium focus of environmental regulations: the practice of highly centralized, federally-directed, regulatory rules and standards that are characterized as too rigid, too bedeviled by unintended policy consequences, overly restrictive in specifying compliance actions, and too focused on rules that fail to account for differences among industrial sectors, among individual companies and across separate regions of the country. In addition to these indictments of commonly employed policy instruments, criticism is directed at the over-all policy-making process which is widely described as too insensitive to new scientific

[4] Ibid, p. 246
[5] Ibid, p. 243

information, too committed to low priority problems, too slow to take actions, too inflexible, and too inefficient.

The depth of the criticism, even from those sympathetic to environmental regulation, is illustrated by a recent, overall evaluation of environmental regulations by Resources for the Future. That evaluation concludes:

> . . . the pollution control regulatory system has deep and fundamental flaws. There is a massive dearth of scientific knowledge and data. The system's priorities are wrong, it is ineffective in dealing with many current problems, and it is inefficient and excessively intrusive." [6]

Having reached this conclusion, the authors go on to point out that "most of the participants in the system are aware of these defects."[7] In short, the authors suggest there is general agreement among those familiar with the environmental policy process regarding its fundamental shortcomings -- and those shortcomings have long been evident. Yet, if there is, in fact, broad agreement among policy analysts and political leaders about the major shortcomings in environmental regulation, it raises evident questions: Why has so little changed; or, if change has occurred, why is it so unsatisfying to the critics?

Among the reasons for the lack of successful change is the overly narrow conception of the policy-making problem inherent (but usually only implicit) in most proposals for change. The upshot is proposals suggesting piecemeal change. In particular, the focus of the debate is on the "front end" of the process of regulatory standard setting and rule making. The concern is focused on affecting how initial decisions are made and on the policy instruments to be employed. As important, the related proposals for changing the regulatory system are presented as "solutions" to specific problems attributed to past regulatory policies. Yet, by ignoring the crucial importance of the "back end" of the regulatory process -- monitoring, evaluation, reassessment and adaptation of regulations -- the proposals are far less than systemic. And our review of a broad cross-section of historical cases of environmental regulation suggests that it is this "back end" of the process where weaknesses are greatest and the potential benefits of change may be greatest. In any case, how is it possible to determine whether current regulations are necessary and effective or whether new alternatives will be more effective without a satisfactory capability for evaluating performance?

One implication of this apparent lack of interest in the issues of the back end of the process is the corresponding lack of interest in revisiting past regulatory decisions. Proposals for change rarely address the potential benefits of changing existing regulations, even though the shortcomings of existing regulations are the reasons why change is desired in the first place. Proposals for change are directed at new policy issues, not correcting old policies. The peculiar problems posed by the process of adaptive change to existing regulations -- and the apparent lack of a constituency for change, who will gain and who will lose and so on? -- has seldom been explicitly raised in the many critiques of environmental policies. In one of the few explicit references to this issue, a 1993 Carnegie Commission study, chaired by former EPA administrator Douglas Costle, observed --

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[6] J. Clarence Davies and Jan Mazurek, **Pollution Control in the United States: Evaluating the System**, Resources for the Future, 1998, p. 287

[7] Ibid, p. 287

without elaboration -- that "rules once promulgated tend to remain 'frozen in place,' immune to change that advances in scientific knowledge would warrant…"[8]

On the other hand, change does occur in regulation -- however infrequently -- with careful examination of those cases potentially offering important insight into the requirements for change as well as the constraints to change. Indeed, our analysis includes, as an essential task, a comparative analysis of cases of "successful" change as well as cases where change failed in spite of new science, new technical opportunities or other essential considerations appeared to offer beneficial alternatives to existing regulation. That comparative analysis reveals, for example, that the lack of constituencies for changing existing regulations is a function of the fact that the benefits of greater adaptability are easier to conceive in principle than in reality. Many who might viscerally leap to the defense of any potential change in regulatory policy that at least suggests the possibility of greater leniency, may discover that the assumed benefits often become less "self evident" as the implications are brought into closer focus. As our review of the historical record reveals, it is seldom all that clear up-front whose interests are ultimately served by potentially greater adaptability -- if there are any interests served at all as they are currently perceived. Past cases of regulatory change reveal that the interests of many key stakeholders are simply not clearly defined or appreciated, or their perceived interests change significantly over time as the full implications of regulatory adaptation become more transparent. Indeed, an essential role for regulators and others favoring adaptability is to divine strategies by which a broad coalition of stakeholders come to see their interests served by adaptive change to regulations.

The historical record reveals that business interests, for example, are often a strong, even dominant force favoring policy *stability* rather than adaptability. Whether change would be toward greater laxity or toward stringency, the record shows that business interests would often be ill served by significant policy change. This fact is in no small part an explanation of policy rigidity. On the other hand, as notable are two other aspects of the historical record. First, industry, or even a relatively narrowly defined sector of an industry, often reveals its interests as derivative of anything but a single-minded view of regulatory change. Advocates of adaptive change, in seeking a decisive coalition for change, have been well-served by identifying those industry divisions and nurturing business entities who can be convinced their interests are served by change. Second, industry can become a leading advocate for adaptive change, if regulators can provide effective political leadership as well as credible commitments ensuring that proposed changes will be both completed and sustained in the form that they were proposed.

If adaptive policy change is to be a characteristic of environmental policy-making, current proposals for changing regulatory policy-making process are not only too narrow (and piecemeal) but also directed at a definition of the policy problem that is fundamentally flawed. For instance, too much of the emphasis in the policy debate is focused on the "mistakes" and "failings" in environmental regulations, as though the problem needing solution is essentially the problem of correcting policy errors. After thirty years of aggressive environmental protection regulation, we might well expect to find that policy success poses at least as many evaluation issues as policy failures. There are, after all, many examples of policy success in the areas of air quality, solid waste disposal, hazardous waste treatment, and especially in such specific areas as blood lead level reductions, automobile emissions, and denial of open burning of urban waste. Have these indications of success led to any reductions or terminations of further regulatory demands?

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[8] Carnegie Commission, **Risk and the Environment: Improving Regulatory Decision Making**, June 1993, p. 108

Success raises questions of when does the inevitable trend to diminishing returns set in; what data and assessment methods are needed to identify conditions of diminishing returns; and what are the alternative policy responses to diminishing returns? Even more directly, when and how can success in environmental regulation be translated into a declaration of victory and the termination of regulation? Dealing with these issues will require at least that the expressed objectives of regulatory policies be translated into explicit performance criteria by which to judge policy effectiveness -- a rule which is not generally observed at present -- and effective monitoring capabilities put in place by which to determine when "it is clean enough."

Our analysis suggest the potential value, as well as the requirements, of new approach to environmental policy-making, different from what has been practiced in the past but differs also from what has been proposed in the current policy debate. That approach does not presume either a particular problem focus, or preferred policy instruments. Instead, it is an approach based on the expectation of and preparation for mid-course corrections -- or even reversals -- in regulatory policies. Change is expected as time and experience reveals the true dimensions of the environmental risk, the effectiveness of initial corrective measures, including their possibly undesirable side effects, and allows exploitation of new technologies and new scientific knowledge.

The underlying assumptions of this approach begin with the recognition of extraordinarily large and irreducible uncertainties surrounding key environmental issues. While most advocates in the policy debate emphasize those uncertainties to support their position, they are not apparently prepared to accept the implications of uncertainty as it impacts the likely effectiveness of their proposed change to the policy process. That is, environmental advocates are wont to support more stringent regulations on the basis of needed precautionary hedges against uncertainty. Opponents of regulation, on the other hand, stress uncertainty as posing policy risks of potentially unnecessary and excessively costly regulation. What neither side directly addresses, however, are the fundamental issues determining the justifications of regulation or change in regulation: What would constitute effective change in environmental regulations or in the rule-making policy process? What does it mean to "improve environmental regulation" or to "improve the rule-making process?" What are the appropriate criteria for determining "better" policy processes or regulatory outcomes?

The point is that uncertainties are too great to resolve these issues in detail. For many, if not most, issues, the determination of what is "necessary," or "better," or "efficient" will only be revealed by experience with regulation. The current search for "solutions" to the problems posed by environmental policy will necessarily founder on the shoals of growing scientific, economic and political uncertainty. In this light our approach is not to discover or defend a solution but, rather, to propose a methodology for addressing environmental issues that explicitly deals with the constraints posed by uncertainty. Given the uncertainty problem, the methodology we propose for directing policy-making accepts that a highly confident definition of the environmental "problem" demanding regulation is no more possible than is a highly confident prediction of the specific kinds and levels of health effects that will accrue over specific time periods and at predictable costs for a particular regulatory rule. Therefore, in contemplating the initiation of new regulations, the dominant concern -- the factor that should always be central -- is not the determination of an optimal policy. Rather, the dominant concern should be the identification of a regulatory *strategy*, not a policy or a problem "solution." The essential concerns -- and these are concerns that should receive far greater attention at EPA than they have -- are: to avoid "policy lock-in" that may be the result of bureaucratic, technical or financial constraints to subsequent change; to avoid potentially large stranded investment; to focus on data collection and analysis that may refute the accepted health effects and

economic scenario underlying the policy; and to emphasize scientific research to provide more options if and when adaptive policy change is required.

However large the scientific and other policy uncertainties affecting environmental policy may have been in the 1970s and 1980s, the problems are now more complex, the scientific uncertainties are greater, and the costs of mitigation are rising. In the earlier period, the nature of pollution problems were dramatically apparent, and, efficiency issues aside, almost any measures directed at the most evident air and water pollution cases could have some meaningful effect. The problems were simply defined and generally conceived as local in origin and in resolution, and the policies employed were generally rather "blunt" instruments. Today, it might be said that the "easiest" problems have been addressed, and the "cheapest" and "easiest" solutions have been largely exhausted. Now, the problems are regional, national and even global in their extent. These issues have a much greater scope, pose significantly more complex scientific questions, and confront policy-makers with a much higher degree of uncertainty than prior issues, say, of solid waste disposal or individual industrial plant effluents to waterways. Those uncertainties are magnified in the issues of concern today: ozone depletion, global warming, reduction of ambient particulate matter in the air, and so on.

As important, the complexity of individual environmental issues is magnified by the policy-making complexity of having to confront an enormously large number of compelling policy issues: comprehending the interactions among these issues; setting priorities among them; and directing an enforcement program dealing with the resulting wide range of regulatory policies. Complexity of the issues is further increased in the policy making process by the political tradeoffs that policy-makers are now compelled to make. This includes the assessment of such (uncertain) implications as: the effect on small businesses; "environmental justice" effects, such as, impacts on social and economic disadvantaged groups; "paperwork" impacts on business employment and other local economic effects, and; cost-benefit justifications. There are also increasingly demanding trade implications and international environmental agreements of which policy must take account.

This approach clearly appreciates the fact that large uncertainties make calculations of an optimal balance of costs and benefits not only unreliable but potentially quite misleading. That is, locking policy into a particular but highly uncertain future not only surrenders policy to fate but also risks the squandering of time and resources. Selection of a projected "best" cost-benefit policy option must be based on intentionally refutable predictions about the future. In anticipation of the need to adapt policies to new information, the initial policy selection criterion is "robustness" -- a policy which can be effective across a broad range of the uncertainty in the driving scenario. In addition, the most effective business policy-makers define "contingent" policies and make preparations to resort to them if and when necessary.

At its best, such an approach begins with clear objectives and a scenario (or scenarios) depicting what is believed to be the most likely future. But then the emphasis is placed on a set of fundamental questions, which is the purpose of an evaluation system to provide "answers" on a continuing basis. That evaluation system is not focused on issues of the business' market performance but, rather, on market conditions that give early warning that the strategic plan is wrong -- its presumed future is increasingly less likely to appear.

The questions, which are quite relevant to the regulatory issues of the EPA, include:

- How might the fundamental assumptions of policy of the underlying scenario fail?

- When and how will this failure be discovered?
- What can be done to hedge against this failure?
- How and when will the necessity for policy change be known?
- How sensitive is policy to small but unreliably monitored changes in scenario variables?

Addressing these difficult questions on a continuing and effective basis requires continual attention to a number of derivative issues. First, what are the political and economic limits to adaptive policy, and what can increase or diminish the adaptability of policy over time? Second, in evaluating policy, how reliably can the relevant factors be measured and are the right factors being measured? Third, how will unanticipated side effects and events be recognized and what confidence can be placed in the ability to recognize them?

Constraints on Adaptability

In any case, though not offering any specific evidence to support their case, the authors of the National Academy study suggest at least three causes of rigidity in regulations in addition to the presumption of "bureaucratic inertia" offered by the Carnegie study mentioned earlier. First, technology-based standards tend to become locked-in to those technologies, if for no other reason than industry has a stranded investment in the case of a changed standard. Second, budget constraints and the demands of dealing with yet unregulated problems deny the allocation of major resources to policy evaluation and adaptive change. Finally, the heavy time and political capital-consuming requirements of establishing regulatory standards and rules creates strong disincentives to reopen decisions previously set.

The historical record documents all too clearly the difficulties in effectively and consistently evaluating and reassessing regulatory policies. That record offers no end of examples of ignoring the implications of new scientific information contrary to current policy, clear evidence of diminishing returns to current policy, new technology offering more cost-effective policy alternatives, and the realization of unanticipated and clearly undesirable side effects of current policy. If the historical record clearly reveals the lack of adaptive change in regulatory policies, less obvious from that record are the reasons for the lack of adaptation and, especially, the measures that could be taken to encourage such policy change.

Yet, the record also makes clear that establishing adaptable policy systems and effectively undertaking adaptation is far from impossible. A classic example of effective adaptive policy change is found in the case of the Montreal Protocol, first drafted in 1987. That international agreement effectively eliminated CFCs and established the basis for reducing or eliminating other ozone depleting substances. In that case, the initial protocol agreement included specific terms for incorporating new scientific information and changing policy in light of that information. Based on the development of new evidence demonstrating a serious ozone depletion problem, the initial agreement to a 50 percent reduction in CFCs was transformed just three years later into a phaseout by the year 2000. Then, only two years thereafter, in 1992, the phaseout date was moved up to 1994 and several additional chemicals were added to the agreement.

Of course, all cases have their unique aspects. Nonetheless something useful can be learned from all cases of both success and failure in regulatory adaptation. In the Montreal Protocol instance, it was an international agreement driven in no small part by scientific entrepreneurs supported by a substantial international scientific community aggressively developing new scientific data. And that scientific community was not shy in their efforts to influence public opinion, as news

media worldwide gave considerable attention to what seemed an arcane scientific issue. There was the fact that key industrial producers of ozone depleting substances came to see their interests promoted by the agreement, but that too was part of the process of building a coalition by influencing the perception of interests by key interest groups. As we will see in many other cases, the potential has existed for similarly influencing industrial interests but the policy entrepreneurs have not stepped forward as aggressively.

A classic case of this fact is found in efforts to resurrect from the grave of regulatory banishment the use of food irradiation to combat the rising tide of food poisoning incidence. Here the uncertainties in the science are much less commanding than in many other instances of health and safety regulation and the potential benefits are clear. Whatever one might think of the costs of preventing, for example, instances of bronchial reactions to smog in Cleveland that might number in the thousands of incidents, the record of hundreds of thousands of very serious food poisoning incidents in the US per year should make the tradeoff clear. And irradiation is not economically challenging. Yet, as the government attempts gradually to deregulate irradiation, the problem has become the reluctance of food processors to use irradiation in light of public antipathy to the process. Is the public education effort of science entrepreneurs needed here; and what are the costs and benefits that might motivate such entrepreneurs as compared, for example, to the case of ozone depletion? Is it the attractiveness of high science over low science?

In any case, the Montreal Protocol as an international agreement producing dramatic regulatory change is a potential harbinger of the future. In the years to come, the pressure of international agreements -- especially trade agreements -- will be an "uncontrollable" factor demanding greater reassessment and adaptation of environmental regulations than is likely to have occurred otherwise. Possibly as important, exploiting the threat of trade complaints as a rationale by interest groups favoring policy change is likely to become much more common. In lieu of more certain science or more convincing cost-benefit analyses favoring policy change, the justification for adapting existing regulations to conform to the terms, for example, of GATT and NAFTA can be quite effective. This political strategy was clear, for instance, in the recent case of the passage of the Food Quality Protection Act. As we will see in the detailed treatment of this in Part III, though no formal trade complaint had been brought against US pesticide regulations as they affected food imports, the threat of such a complaint was aggressively exploited by proponents of this law to justify its near "revolutionary" effects on pesticide regulations. That law finally, after forty years, repealed the anachronistic Delaney Clause and established a process whereby the twenty-five year-old effort to reregister pesticides could effectively proceed.

The so-called Delaney Clause is a classic example of science getting ahead of regulation, but without the promotion of policy and science entrepreneurs to promote change, nothing happened for decades. The Clause prohibited food additives or pesticide residues on food of substances that had proven carcinogenic in animal tests. Whatever its merits at the time of its passage in the late 1960s, by the late 1990s the advances of science had made it obsolete at best. In the 1960s, substances might be measured in parts per hundreds or thousands; by the 1990s, substance residues could be measured in the parts per quadrillion. How could scientifically reliable assessments be made of the health effects of such tiny doses?

In a number of the above cases, it should be emphasized, scientific uncertainty was not the dominant constraint affecting the ability to adapt existing regulations. The major barriers to change were public sentiment and political considerations. In no small number of cases it has been these factors, and not scientific considerations, that has driven regulatory policy down paths where

scientific and economic uncertainty are far greater than the available alternatives. And those public and political factors have also served in many cases to abort efforts to adapt the resulting policies to new scientific and other information contrary to existing regulations. The important point is that it is often not the failure of regulators to recognize the benefits of alternative policies, or the failure of science to provide clear insight to those alternatives. But the commanding point is that, having been driven to regulations subject to more uncertainty, the requirement of adaptability is made even greater.

These points have generally not only been overlooked in the policy debate, but the debate has effectively denied their importance. This is illustrated, for example, by the arguments of a recent Carnegie Commission study of environmental policy-making. "Many of the most obvious opportunities for reducing risks from hazardous substances and problems have already been pursued," the study argued; and "the risks that remain tend to be harder to characterize precisely and to reduce."[9] The study concluded this argument with the comment:

> Great new demands would eventually be placed on science. At first, however, dramatic progress could be made without testing science's ability to deliver. EPA's first Administrator, for instance, directed the agency's efforts at reducing emissions of gross pollutant that posed acknowledged risks to public health and the environment. Little technical insight was required disease and odor and increase fishability and swimmability. One did not have to understand chemistry to know that filtering the thick black smoke pouring out of a smokestack allowed persons living nearby to breathe easier and cough less.[10]

On first glance, these points seem to be intuitively satisfying; but on closer examination, they appear to be constraining assumptions whose acceptance serves to focus the debate on the wrong problems. First, the claim that the easiest problems have been addressed and now the issues are much more complex, requiring more and better science, while generally true, ignores the fact that there are many cases in which the environmental problem and its cost-effective solution is reasonably clear but the "cheap," easy and high confidence solutions are denied as a function of political choices. There are many fundamental pollution problems still with us that are neither difficult to understand scientifically nor are available solutions subject to much scientific uncertainty. For example, indoor pollution is often characterized by environmental experts as far more important, as well as far more tractable, than many forms of regulated outdoor pollution. The same is true of non-point water pollution, solutions to which are prevented by the strength of the farm lobby. And the fastest, most significant reductions in auto emissions could be achieved by buying up old, junk cars and demanding more rigorous testing of emissions from autos on the road. None of these problems are complex, particularly expensive to redress nor subject to much uncertainty. However, given little political will to take on the public and the farmers directly, compelling them to put their own time and money into environmental protection, the regulatory focus is necessarily left to address more indirect, more complex and more expensive methods of trying to produce the same outcome.

There is no doubt, on the other hand, that the requirements to justify regulations today is much greater than in the past, not only in terms of scientific evidence, but also in terms of the effects on small business, paperwork burden effects, "environmental justice" impact, and overall economic

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[9] Carnegie Commission, **Risk and the Environment: Improving Regulatory Decision Making**, June 1993, p. 27

[10] Ibid, p.33

impacts. First of all, the fundamental difference between policy-making in 1970 and in 1998 at EPA is the degree of political freedom of choice EPA enjoyed in the earlier period, however constrained it may have been. Standards were set relatively quickly, the courts did not demand such extensive scientific supporting evidence, and the legal demands for protracted and extensive public hearings and comments were not yet so demanding.[11] An example of how those demands had increased by the late 1980s is offered by the case of EPA's proposed ban in 1989 on nearly all new products containing asbestos. This proposed rule was the outcome of a ten year analytic effort, one of the most extensive rulemaking procedures in the agency's history.[12] However, the court overturned the restriction on the grounds that the agency did not explicitly consider less burdensome alternatives, and for not giving a full and balanced assessment of asbestos substitutes.

Today, the process for reaching a final rule on any issue is extraordinarily long -- if a conclusion can indeed ever be achieved through "routine" processes. Indeed, the same Carnegie Commission noted that by the early 1990's "the rule-making process appears to have 'ossified,' becoming so time-consuming and expensive that agencies increasingly turn to perfunctory vehicles for promulgating policy, like policy statements, manuals, and regulatory letters."[13] By the late 1990's, EPA was not only seeking any possible route around formal rule-making procedures--with many unhappy consequences as we will see below.

This more demanding formal process for reaching decisions and the resort to informal, less structured policy-making alternatives has important implications for the evaluation and reassessment process. To the extent that the formal process is required for purposes of adaptive change in regulations, there is every reason for the regulators to be uninterested in reopening rules that have taken many years to establish and will take many more to reestablish. As we will see later in the case of reformulated gasoline, the growing evidence of the negative health effects of current standards has not moved EPA away from its ardent support of those standards. And this position is held in spite of growing opposition from states, from the Congress, from environmental groups, and even from significant elements of the oil refining industry. In this case, EPA is fully aware of the problems with current regulations but makes equally clear its unwillingness to reopen the arduous process of establishing new standards.

If the prospect of protracted and costly rule-making preliminaries is a clear constraint on the willingness to entertain adaptive policy change, a more direct constraint arises from the increasingly detailed, highly prescriptive authorizing legislation handed down by the Congress.
For example, Representative Henry A. Waxman (D-Cal.) has attacked the role of the Congress whose legislation, he argues, reinforces the rigidity and lack of flexibility in the command-and-control orientation in current policy: "The acid rain program in Title IV of the 1990 [Clean Air Act] Amendments is so detailed it actually specifies in the statute the level of emissions permitted at each power plant in the nation." [14] In short, the Congress was guilty of "over-regulating," of usurping the role of the regulatory agency, and of dictating command-control regulations.

One clear reason for increasingly detailed and prescriptive environmental legislation has been the sequential interplay of the Congress, the courts and EPA in defining the degrees of

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[11] Brickman et. al. **Controlling Chemicals**, passim
[12] Carnegie Commission, p, 57
[13] Ibid, p.23
[14] Henry A. Waxman, *An Overview of the Clean Air Act Amendments of 1990*, 21 **Environmental Law**. (1991) p. 1743

discretion allowed to EPA. Until the mid-1980s, the courts tended to emphasize legislative histories in determining the intent of the Congress in granting authority to EPA. However, among other decisions, the Supreme Court's 1984 decision in *Chevron v. Natural Resources Defense Council* moved in the direction of somewhat redefining the basis of EPA's interpretation of its authority. Where statutory language might be ambiguous, *Chevron* established a standard of review that granted greater deference to the agency interpretation of its discretion, placing less emphasis on legislative histories or other accounts of congressional intent, unless the court found EPA's interpretation of its discretion "unreasonable."

Any relief that EPA officials might have felt in reaction to this decision must have been short lived. It was not long before the Congress responded to the courts' decisions by resorting to the strategy of writing increasingly detailed legislation such that its intent would be less subject to discretionary interpretation. But the more detailed the legislation, the less ability EPA has to adjust policy to new information and changing circumstances. This problem has not been ignored; it simply hasn't changed significantly. In 1993 Congress asked the National Academy of Public Administration (NAPA) to determine how the Environmental Protection Agency (EPA) set its policy agenda and priorities, and to recommend how it could use its resources more efficiently. In addition to priority-setting criticisms, the NAPA report emphasized the inflexibility of "command-control" regulations stipulated by Congress: "EPA has relied heavily on highly detailed regulations that specify either the equipment to be used to reduce pollution or the precise performance requirements that, in practice, depend on particular equipment or processes."[15]

Evaluation and Reassessment Requirements

Early on in the development of the current environmental regulation systems the requirements of establishing coherent and routine policy evaluation and reassessment capabilities appears to have been well recognized. However, legislative efforts to compel development of policy evaluation and reassessment capabilities have a long history, but a short list of successes. Indeed, the US Congress, as early as the 1970 Clean Air Act (CAA) and repeatedly thereafter, demanded routine, periodic assessments of regulatory rules and standards. The CAA required the EPA to ensure that National Ambient Air Quality Standards (NAAQS)[16] reflect the "latest scientific information" and that both the criteria and the standards be reviewed periodically and be amended as new science might dictate.

Soon enough, both the White House and the Congress were taking steps to improve the policy evaluation capabilities of EPA. First, to assist in the effort to incorporate the latest scientific information, a Science Advisory Board (SAB) was created for EPA by executive order in 1974. Then, only a few years after the CAA was passed, the Congress, too, apparently realized that there was a problem in the realm of policy review and reassessment. As a consequence, legislation authorizing environmental regulations across a variety of transport media began to include ever more demanding provisions and requirements for policy review and adjustment in light of new information. For example, the Toxic Substances Control Act (TSCA) of 1976 set particularly demanding requirements, not only for determining regulated uses of new chemicals, but also for reassessments of all previously registered chemicals. And the 1977 CAA Amendments set an

[15] National Academy of Public Administration, **Setting Priorities, Getting Results: A New Direction for the Environmental Protection Agency** (1995), pp. 97-98

[16] The so-called NAAQS "criteria pollutants" include carbon monoxide, lead, nitrogen oxides, ozone, particulates, and sulfur oxides.

absolute requirement of the NAAQS standards being reviewed, and reapproved or changed accordingly, at least every five years.

All of this effort to require policy evaluation and adaptation apparently at least served to convince observers and analysts *outside* the US government that a serious and important system was in place and was operating effectively. For example, a noted comparative study of toxic chemicals regulation in the US and in Europe, undertaken in the mid-1980s, argued that, in comparing the US to Europe: "US regulations are more often amended, altered, or suspended than comparable policy measures in Europe."[17] By comparison to the US, it was argued: "Reappraisals are often perfunctory in European countries." [18] The basic evidence used to support these conclusions was the fact that legislation-making reassessments compulsory were in effect in the US and not in Europe. A more careful examination of actual behavior would not have found so much difference between Europe and the US.

What has been the result of mandating highly structured, routine policy reassessment systems? Such structured, routinized systems have been established, for example, at EPA for its NAAQS reviews and by the National Toxicology Program (NTP) for its periodic reassessments of the list of human carcinogens. For these two programs the review requirements have led to the creation of a substantial administrative structure. There are at EPA, in addition to the Agency's principal Science Advisory Board, a variety of scientific groups dedicated to the review of the CAA and to special issues involved in the evaluation of existing as well as proposed regulations. For its part, the carcinogen list is routinely reviewed in detail by a three-tiered hierarchy of science advisory committees before moving on to the political decision-makers. We are now in the ninth version of the carcinogen list. Yet, no substance has ever been taken off the list -- and we will consider later the recent review of the saccharin case, in which the new scientific evidence appeared to argue strongly for removal. With respect to the NAAQS, in spite of much effort, not much has happened over thirty years – at least not until the 1997 rulings on fine particulates.

These examples pose the question of what structures, processes and procedures are necessary and sufficient for effective adaptation in regulatory policy? It may well be that this large scale, highly routinized, high-level, reevaluation process is not at all the desirable process for generating truly adaptive policy behavior. Unfortunately, the alternative to large-scale, highly formalized evaluation processes that become like religious rites is to have no evaluation process whatsoever. At least that is the experience of EPA. In any case, it is a central issue of our analysis to determine the role that policy evaluation can play, what the requirements are for an evaluation system that is most likely to promote timely and effective policy evaluations.

In highly structured, formalized and routinized review processes -- like the National Toxicology Program on carcinogens or the EPA NAAQS reviews -- little changes over time in spite of great effort. The problem in all of these cases is that the more structured and routinized the process for initiating regulations, the more the reassessment process comes to resemble the process for initiating new regulations. And the initiation process, with all of demands for public comment and participation, intra-governmental reviews of agency reviews, probable court challenges and so on, becomes a process of survival. There are so may opportunities for entry into the process to challenge, impede and disrupt what is in any case a protracted process, that many years is required to achieve a final rule -- if a rule can be achieved at all. Even in the cases (such as the National

[17] Ibid, p.49
[18] Ibid, p. 37

Toxicology Program) where outside scientists dominate the review process, there are many tiers of committees and the committees themselves are composed of representatives of man interest groups. We find in all these cases the outcome is typically a protracted, often unsuccessful effort to revise policy. And this is even true in cases where both industry groups and environmental groups can at least agree that change is justified.

An alternative approach is suggested by, for example, the 1984 review of the program to phase-out lead form gasoline that will be described in Part III. Beginning with a clear commitment from the top-levels of EPA, an informal process was undertaken by a select team of analysts outside normal bureaucratic channels. New science was exploited to support a more rapid and decisive phase-out schedule and the evaluation process was relatively quickly and ably completed and decisions taken. This example suggests what might be obvious to those who have been involved directly in government service. Effective action not only requires top-level attention and commitment, but it is also a function of being selective, not exhaustive. There are too many environmental regulations for many of them to be subjected to systematic reassessment on a routine basis. And there is little reason to assume that new science justifying broad reassessments will appear on a continuing basis. There is so much criticism of the failure of EPA to set priorities, but the emphasis is generally on priorities among prospective as opposed to existing regulations. Yet, whatever may be the constraints on comprehensive priority-setting efforts, EPA administrators could make the truly important priority decisions of selecting those few regulatory areas in each year for which in-depth reassessment will occur.

The potential benefits of policy adaptability seem intuitively obvious. Who can be opposed to making policy "smarter" and "rational" in the practice of adapting policy to new information and changing circumstances? Yet there are costs and tradeoffs with everything. As Paul Portney of Resources for the Future has pointed out, the federal government has been proposing something on the order of 2,400 regulations each year, and a significant fraction of these are environmental regulations. [19] Obviously, this number of new regulations poses an enormous potential burden if they are all to be subject to persistent reevaluation; and that burden would further limit the resources available for meeting the demands of promulgating new regulations. On the other hand, is there any reason for emphasizing policy adaptability other than to correct "errors" of the past? Obviously mistakes can and will be made in setting regulations; but given limits on time and resources and the demanding issues that haven't been addressed, should more time and money be placed on reevaluations of past policy? Can more be gained from altering old regulations than by dealing with problems not yet addressed?

Portney, who has argued long and often about the need to subject environmental regulations to rigorous cost-benefit tests, goes on to point out that the data necessary for such assessments are not available in any case, that uncertainties about costs of compliance are, in fact, overwhelmed by the data limitations and resulting uncertainties regarding benefits. Portney notes that, since about 1986, environmental compliance costs are believed to have increased substantially. Those substantial cost increases are due primarily to the 1986 amendments to Superfund and the 1984 amendments to the Resource Conservation and Recovery Act, but significant cost increases have also resulted from the Safe Drinking Water Act and the 1990 amendments to the Clean Air Act. Portney cautions that we have very little reliable data on past and current regulatory compliance costs by which to quantify that belief. Rising costs should make policy more sensitive to the requirement for justifying such costs. But, if we cannot reliably assess the costs and benefits of

[19] Prepared Testimony of Dr.. Paul R. Portney, Senate Committee on Governmental Affairs, February 8, 1995

existing regulations, then on what basis are these programs justified in their continuation -- especially in light of estimates of total social costs of environmental regulations annually in the range of $150 to $200 billion?

These enormous expenditure levels alone should lead to a demand for clear and defensible capabilities for evaluating existing regulations. However, current proposals for changing the policy process do not address the issues of policy evaluation and adaptation. Indeed, there is little attention paid to the potential benefits to be realized by adapting existing regulations to new scientific and technical information. And in the context of high and rising social costs of environmental protection, and in the face of new and potentially very costly problems (e.g., reduction of fine, airborne particulates or global warming), the correction of inefficient regulations currently in place can be crucial. If there are not significant efficiencies to be found in existing regulations, then the deep criticism of current regulatory policies must be grossly misplaced.

On the other hand, it can well be argued that too much emphasis in the policy debate is focused on regulatory "failures," as though the problem needing correction is limited to avoiding repetition of past failures. But, after thirty years and many billions of dollars in environmental cleanup, the "Problem of Success" may be as important as problems of failure. Successful environmental clean up poses the issues, for example, of when is it "clean enough?" Alternatively, even a program that can be justified on cost-benefit grounds may well be subject to the opportunity to exploit new technologies that increase the net benefits of regulation. In addition, avoiding systematic review of past decisions denies the efficiencies that can be gained from resetting policy priorities over time (and priorities are not necessarily a function of success or failure). Furthermore, such oversight prevents exploitation of the opportunities inherent in the new scientific evidence that reveals altogether new approaches or new targets against which to direct regulatory efforts to reduce the health and safety risks currently addressed by now outdated conceptions of the source or the pathways producing the risk.

Rather than addressing systemic problems, most proposals for changing the regulatory system are addressed to one or another of the widely recognized limitations of a policy process that emerged without an overarching rationale; the process is simply the end-result of a long sequence of piecemeal, uncoordinated legislation, judicial rulings and responses to emergent political demands having no particular policy theme: It simply happened. Therefore, making piecemeal adjustments -- as prescribed by most critics of environmental policy -- to a process that itself emerged from piecemeal responses to a range of policy problems is not an approach likely to produce particularly effective, long-term policy improvements. The overriding conclusion of our analysis is that meaningful changes in regulatory performance over time require fundamental changes in the over-all policy-making process.

It is in the failure to recognize this fundamental requirement, we believe, that current proposals for modifying the regulatory policy process, miss the main point. The inherent limitations in these proposed "improvements" to environmental regulations as a basis of "reform" are revealed in the programs of the Clinton administration to "reinvent regulatory policies." The administration has employed a virtual "shotgun" approach in which essentially all the prominent proposals in the policy debate are being tried. The shortcomings that have been found in these programs arise, we believe, from the basic failure to recognize the need for more fundamental, systematic change.

In their "reinvention" efforts, the Clinton administration has attempted to "graft" a set of innovative programs on top of the existing regulatory process. But those innovative programs

required equally innovative enforcement personnel and programs at the local level, unique monitoring and evaluation procedures, and adaptive responses by EPA managers to issues that had not previously been confronted. In other words, the reinvention programs, as usual, focused on the Front End of the policy process and ignored the requirements of the Back End. The upshot, according to the assessments by GAO and by Resources for the Future has been confusion within the enforcement process, claims of unfairness from regulated entities, and disputes between federal and state regulators. In effect, EPA was attempting to run at least two different regulatory systems when most critics wanted reform because EPA had been unsuccessful at running one system. Failing to address the weaknesses in the Back End of the policy process, has meant that innovative approaches to deal with perceived Front End cannot be effectively evaluated and, if nothing else, the prospective benefits to various stakeholders interests cannot readily be recognized.

The Clinton administration's reinvention efforts incorporate many of the proposals that have been offered by environmental as well as by business interests for modifying the regulatory policy process. Those proposals range from specific methodological recommendations (e.g., improved methods of risk assessment) to more systemic recommendations regarding decentralizing a greater part of policy-making to the states, relying more on voluntary or "self-regulating" measures, or employing market-based, incentive systems to a greater extent.[20] In a very broad-based program to incorporate many of these proposals, in March 1995, EPA unveiled 25 high-priority actions and 14 other significant actions - among which include The Common Sense Initiative, Project XL, the Brownfields Initiative and refocusing hazardous waste regulation on high-risk wastes - to allow industry and states more flexibility and "common sense" in setting standards and rules and in achieving compliance.

In spite of -- or maybe because of -- all these new initiatives, there appears to have been little improvement in any policy area. Indeed, all of these programs have come under critical fire. Resources for the Future, for example, has concluded from a broad-based evaluation of these programs: "Federal programs that rely on incentives to improve the environmental performance of businesses are doing little to improve the environment or regulatory system." [21] And the sources of this failure are considered to be wide and deep, but reflective of the problems experienced in existing regulatory programs: "factors that have hampered the success of many of the voluntary programs: the lack of a statutory basis; poor management by EPA; and mistrust amongst the parties involved. . . ."[22]

An assessment by the General Accounting Office (GAO) of these programs suggested that their failings were little different from the failings of more traditional regulatory programs.[23] GAO observed that there were too many initiatives, the administrative capacity of EPA was over burdened, priorities were not established and the purposes of the programs were not made clear to local agents or to business.

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[20] Particularly good summaries of the various proposals for reforming environmental policy-making can be found, for example, in: Margaret Kriz, *A New Shade of Green*, 27 **National Journal**, (1995); and Daniel J. Fiorino, *Toward a New System of Environmental Regulation: the Case for an Industry Sector Approach*, **Environmental Law**, June 22, 1996

[21] Michael Tebo, **Summary of Findings: Industry Incentives for Environmental Improvement: Evaluation of US Federal Initiatives**, Resources for the Future, November 12, 1996

[22] Ibid

[23] *GAO: EPA Must Prioritize, Clarify Environmental Reinvention Efforts* **Hazardous Waste News** August 18, 1997

In a separate analysis of the programs GAO noted that regional EPA officials argue that they struggle to prioritize the numerous initiatives to efficiently use resources. More importantly, "The problem is further compounded by confusion both within EPA and among other stake-holders over the primary purpose of some of the agency's most important initiatives." [24] Because of this confusion about the intended purposes, "stakeholders have delayed reinvention efforts as they tried to figure out what EPA wanted or would accept."[25] An additional problem was that EPA realized considerable strain on senior management resources because of the need to pass judgment on the open-ended, unanticipated policy implications of voluntary and market incentivized programs lacking clear (or any) evaluation criteria.

Yet another analysis of these innovative, "new initiatives" by EPA was no less critical of both their results and their limited potential for the future. That analysis pointed out that, on the one hand, "The agency seemed uncertain about what it wanted to accomplish or how it planned to execute the programs," but, on the other hand, "There is a distinct possibility that the only incentives powerful enough to change business behavior are outside the legal authority of executive branch agencies…"[26]

These problems in the efforts of the Clinton administration to "reinvent regulatory policies" arise, we believe, because they are directed at the wrong problem; they miss the principal requirement for effective policy change. The overriding conclusion of our analysis is that meaningful changes in regulatory policy require systemic changes in the process by which that policy is made -- not simply efforts, for example, to improve risk assessments, or to employ different policy instruments, such as voluntary enforcement or market incentive regulatory programs. Rather than addressing systemic problems, most proposals for change are addressed to one or another of the widely recognized limitations of a policy process that emerged without an overarching rationale; the process is simply the end-result of a long sequence of piecemeal, uncoordinated legislation, judicial rulings and responses to emergent political demands having no particular policy theme: it simply happened. Therefore, making piecemeal adjustments -- as prescribed by most critics of environmental policy -- to a process that itself emerged from piecemeal responses to a range of policy problems is not an approach likely to produce particularly effective, long-term policy improvements.

For all the commentary in the environmental policy debate regarding the need to get more and better science into the regulatory process, and to "rationalize" the policy process, it is surprising how little the public debate addresses the weaknesses in the EPA evaluation capabilities. What are the purposes and attributes of an effective evaluation system? The answer to this question, of course, depends on what we perceive to be the dominant constraints to change in the environmental regulation system.

According to a recent assessment of EPA's regulatory evaluation system by Resources for the Future, EPA "is largely devoid of any capability or desire to evaluate the programs it administers. Its internal information systems for allocating workload and measuring accomplishments are weak or nonexistent."[27] And according to an analysis by the National

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[24] *GAO: Challenges Facing EPA's Efforts to Reinvent Environmental Regulations*

[25] Ibid

[26] J. Clarence Davies and Jan Mazurek, **Industry Incentives for Environmental Improvement: Evaluation of US Federal Initiatives**, Resources for the Future, 1996

[27] J. Clarence Davies and Jan Mazurek, **Pollution Control in the United States: Evaluating the System**,

Academy of Public Administration at least in theory and in terms of organizational charts, the EPA had a program evaluation division, "but it essentially functioned as a management consulting group for the EPA programs, performing almost no real program evaluation."[28] If there is no evaluation system, how is one to determine when and how regulations should be modified, terminated or replaced?

In a quite recent report on EPA's enforcement and evaluation system, the Government Accounting Office (GAO) has summarized and updated its long series of critiques of EPA's shortcomings in these areas. The GAO noted its hopeful view of the possible effects on EPA's efforts arising from the requirements of the new Government Performance and Results Act that requires EPA to define explicitly its long term objectives and measures for evaluating performance of regulatory programs. Unfortunately, the GAO assessment found that little has changed in EPA evaluation efforts or in methods for evaluation. The EPA performance and results plan for 1995-1999 reflect past similar efforts in that proposed performance measures by EPA are "overwhelmingly weighed toward numerical targets for inspections, enforcement actions, and other outputs." For example, the "Performance Plan" proposes for 1999 that the Agency "will conduct 15,000 inspections and undertake 2,600 enforcement actions and will make 60,300 state pesticides inspections."[29] There is a stark lack of environmental outcome measures of performance. The GAO is clear in its assessment that unless there are clear improvements in monitoring and evaluation capabilities, then various proposals -- such as delegating greater enforcement responsibilities to states -- cannot be confidently embraced.

Policy Evaluation: Does EPA Have a Special Problem?

To the extent that EPA's record reflects a lack of emphasis on policy evaluation and consequent policy adaptation, it is not at all clear that it is unique in this regard. Typically, policy evaluation has been given short shrift by the bureaucracy; and, furthermore, it has not received substantial attention from academic or from policy analysts. Serious Congressional concern with evaluation of non-defense programs began with the Great Society programs of the late 1960s. Initially the Congress had no choice but to rely, in the absence of its own evaluation capability, upon the findings and reports of the executive branch as it had in the past. However, the Congress turned more and more to the U.S. General Accounting Office (GAO) to provide independent assessments of the effects of these large investments in social programs.[30] This role for the GAO seems to have begun with the Prouty Amendment to the Economic Opportunity Act of 1967, which required the GAO to assess the effectiveness of the "Great Society" poverty programs.[31] By 1980, congressional demands on the GAO for evaluation studies was so great an Institute for Program Evaluation was created. This followed shortly after the Office of Management and Budget (OMB) issued Circular No. A-117, in 1979, entitled "Management Improvement and the Use of Evaluation in the Executive Branch." This circular, which constituted formal policy for the executive branch, stated:

Resources for the Future, Washington, D.C., 1998, p.10.

[28] NAPA (National Academy of Public Administration), **Setting Priorities, Getting Results: A New Direction for EPA**. Washington, D.C.: NAPA., 1995, Pp. 168-169

[29] GAO**: Environmental Protection: EPA's and States' Efforts to Focus State Enforcement Programs on Results,** GAO/RECD-98-113, May 1998, p.9

[30] See Ray C. Rist, *The Organization and Function of Evaluation in the United States: A Federal Overview*, *in* Ray C. Rist, ed., **Program Evaluation and the Management of Government** (New Brunswick: Transaction) 1990, pp. 72-76

[31] See F.G. Mosher, **A Tale of Two Agencies** (Baton Rouge: Louisiana State U. Press) 1984

> All agencies of the Executive Branch of the Federal Government will assess the effectiveness of their programs and the efficiency with which they are conducted and seek improvement on a continuing basis so that Federal management will reflect the most progressive practices of both public and business management and result in service to the public. [32]

But just as at least some formalized interest in policy evaluation was blooming, the Reagan administration's budget cutting and lack of interest, especially in regulatory policy, led to serious declines in the resources allocated to policy evaluation. For example, in 1987 the GAO reported to Congress on the resources allocated to evaluation for the period 1980-84. The GAO report revealed that:

> With regard to fiscal resources OMB figures show an increase of 4 percent (roughly $17 billion in 1980-constant dollars) in total budget outlays (excluding net interest) between 1984 for the non defense departments and selected agencies declined form $177.4 million in 1980 ot 110.9 million in 1984 (in 1980 constant dollars). Thus while the overall budget in the non defense cabinet departments and independent agencies increased by 4 percent, outlays for evaluation activities decreased by 37 percent.[33]

The GAO report went on to point out that, of the resources allocated to evaluation, almost 80% of the budget went to evaluation studies costing less than $100,000 -- hardly enough for serious evaluations of major programs.[34]

The Policy Evaluation Problem at EPA.

This history is particularly relevant to the case of EPA because the GAO has been the primary government organization performing evaluation studies on EPA programs. In fact, since 1991 the GAO has published an unrelenting series of critiques of EPA's generation and use of scientific information.[35] Particularly troubling is evidence that EPA is limited in its ability to recognize new scientific evidence as a basis for reevaluating previously established regulations. For example, with respect to assessments of risks and benefits of already registered pesticides that new evidence suggests may pose an unacceptable risk, GAO found that quantitative estimates of pesticides' benefits are generally imprecise because some of the data on which they are based "are frequently of poor quality or missing altogether." It was not able to find at EPA "sources of reliable data on the

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[32] cited in Rist, op. Cit. P.74

[33] cited in Rist, op.cit., p. 75

[34] "With regard to evaluation costs, about 80 percent of all evaluations underway in 1984 cost $100,000 or less; 15 percent cost between $100,000 and $499,000; and 5%, above $500,000. Compared to 1980, there was a shift toward conducting more evaluations that cost under $100,000." (Rist, p .77) And the report went on to argue: "Considering only those units reporting evaluation activities in fiscal years 1980 and 1984, there was a 23% reduction in the number of evaluation products [2,114 in 1980 versus 1,619 in 1984]." (Rist, p. 81)

[35] A partial list includes: **Pesticides: EPA's Information Systems Provide Inadequate Support for Reregistration** (GAO/T-IMTEC-92-3, Oct. 30, 1991); **Toxic Substances Control Act: Legislative Changes Could Make the Act More Effective** (GAO/RCED-94-103, Sept. 26, 1994**); Environmental Protection: EPA's Plans to Improve Long-standing Information Resources Management Problems** (GAO/AIMD-93-8, Sept. 16, 1993**); Environmental Protection: EPA Faces Formidable Challenges Managing Water Quality Data** (GAO/T-AIMD-93-2, Aug. 5, 1993); **Toxic Substances: EPA Needs More Reliable Source Reduction Data and Progress Measures** (GAO/RCED-94-93, Sep. 23, 1994); **Waste Minimization: Major Problems of Data Reliability and Validity** Identified (GAO/PEMD-92-16, mar. 23, 1992); **Pesticides: Information Systems Improvements Essential for EPA's Reregistration Efforts** (GAO/IMTEC-93-5, Nov. 23, 1992).

quantity of pesticides used on food crops and on the effect that various pesticide alternatives would have on crop yields."[36] And these scientific data problems are described as endemic throughout EPA:

> Many of EPA's scientific data sets are either incomplete, obsolete, or missing altogether, a problem that extends across all media areas. These problems have made it difficult for the agency to conduct scientifically based risk assessments and to measure the results of environmental programs…Until recently, EPA has not had adequate peer review procedures needed to ensure the scientific quality of the agency's technical and scientific products…[37]

At least partly because of these data problems, EPA has only registered a few pesticide products after decades of review. Through fiscal year 1992, the agency had reregistered 31 pesticide products and completed the reassessment of active ingredients in pesticide products for about 2,370 more products. However, about 20,000 pesticide products, containing 642 active ingredients, needed to be reregistered, but, in the absence of EPA action, most of these products continue to be sold and distributed even though knowledge of their health and environmental effects is incomplete.[38]

GAO was particularly critical of EPA's water programs and toxic substances control programs:

> EPA's water quality program illustrated the kind of data quality problems that have complicated the agency's and the states' efforts to set defensible limitations on facilities' discharges into the environment.… the agency has long relied on outdated scientific information to support ambient water quality criteria for pollutants designated as priority under the Clean Water Act. Most of the existing criteria are supported by scientific studies and other technical documents that are more than 14 years old, and no new criteria for pollutants have been established over the last 5 years.
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> Finally, in our work on the Toxic Substances Control Act (TSCA), we have observed that EPA has made little progress in reviewing the risks of existing chemicals, in part because the agency's information on chemical effects and exposures is often scarce, incomplete, or outdated. [39]

The GAO found support for its criticisms, for example, from EPA's Expert Panel on the Role of Science at EPA, and from a 1995 analysis undertaken by the National Academy of Public Administration (NAPA) reviewing EPA policymaking procedures at the request of EPA. The Expert Panel is described as "an independent advisory committee created under the Federal Advisory Committee Act to evaluate how EPA can best meet the goal of using sound science as the foundation of agency decision-making." That panel is said to have been particularly critical of "the uneven quality of the agency's science and deficiencies in the peer review process." [40]

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[36] **Pesticide: Better Data Can Improve the Usefulness of EPA's Benefit Assessments** (GAO/RCED-92-32)
[37] Statement for the Record by Peter F. Guerrero, May 12, 1995, op.cit., p. 1
[38] See Government Accounting Office, **Pesticides: Pesticide Reregistration May Not Be Completed Until 2006** (GAO/RCED-93-94, May 21, 1993); **Pesticides: EPA's Information Systems Provide Inadequate Support for Reregistration** (GAO/T-IMTEC-92-3, Oct. 30, 1991) and **Pesticides: EPA Lack assurance That All Adverse Effects Data have Been Reviewed** (GAO/T-RCED-92-16, Oct. 30 1991) all of which are updated and reaffirmed in 1995 per the testimony of Peter F. Guerrero, op.cit., [p. 4]
[39] Statement for the Record by Peter F. Guerrero, May 12, 1995, op.cit., pages 3 and 5
[40] Statement for the Record by Peter F. Guerrero, May 12, 1995, op.cit., p. 2

On the other hand, NAPA's report concluded that, though significant progress has been made in reducing pollution from the biggest and most obvious resources, "the rate of progress will slacken considerably unless profound changes are made in the legal foundation and management structure of EPA."

> EPA has not been able to target its resources as efficiently as possible to the nation's highest environmental priorities… Furthermore, the agency has not established coordinated systems for planning, budgeting, and evaluating that would help it allocate its resources… EPA should refine and expand its use of risk and cost-benefit analysis and begin work on a reorganization plan that would break down the internal walls between the agency's media program offices…[41]

The problems of internal management and coordination of policy at EPA are described as affecting not only the proper use of scientific information at the federal level but possibly more important, at the state and local level. The NAPA analysis used as evidence for its argument the case of Wisconsin drinking water monitoring that we previously mentioned. In that case, the state was compelled to monitor for radionuclides, even though Wisconsin monitoring data show that these elements do not exist in the state's drinking water.[42]

These evaluations present important issues. Whether or not the particular policy problems identified by the GAO and NAPA are correctly described, the assertion that EPA's basic data collection, aggregation and assessment capabilities are grossly inadequate pose fundamental constraints on policy evaluation in any case.

Policy Evaluation: The US versus Europe.

A noted comparative study of toxic chemicals regulation in the US and in Europe argued that, in comparing the US to Europe, "US regulations are more often amended, altered, or suspended than comparable policy measures in Europe."[43] In fact, European environmental protection legislation quite clearly minimizes the issue of reevaluation of regulations. For instance, the French law on toxic substances control, codified in 1977 and left basically unchanged into the 1990s, placed the requirement for determining whether reevaluation is necessary on industry, which was instructed to "notify" the government if a new danger becomes apparent. Very similar legislation was in force in Germany and Britain. The British went farthest in ignoring the potential problem of old regulations by not even requiring renewals of product licenses for pesticides. And these circumstances have not significantly changed in the new political context of the European Union and the European Commission. In fact, European Community's Sixth Amendment on environmental issues makes no reference to existing chemicals in the marketplace.

In a recent review of European environmental policies, it is argued that the EU has taken a much more assertive, central role in environmental policy to redirect the policies of member states:

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[41] Statement of Peter F. Guerrero, Director, Environmental Protection Issues, Resources, Community, and Economic Development Division, GAO, **Current Environmental Challenges Require New Approaches,** Testimony Before the Subcommittee on VA, HUD and Independent Agencies, Committee on Appropriations, U.S. Senate, Wednesday, May 17, 1995, p.1

[42] **Ibid**, p. 7

[43] Ibid, p.49

certainly for the less economically advanced countries (e.g., Spain, Portugal and Greece) but also for the leading states. For example, David Vogel, in his recent and stimulating book, *Trading Up*, argues persuasively that very dramatic changes in environmental policies have occurred and continue to occur as a result of trade policy harmonization required by the Single Europe Act. Whether or not individual European states were active in evaluating environmental regulations (and most were not), Vogel presents a range of cases in which the emergence of the European Union and the requirement of a single market has resulted in fundamental redirection of environmental policies in most, if not all, European states. That is, the motivation for policy evaluation and adaptation was the result of multinational negotiations over trade policy -- negotiations undertaken within the formalized structure of the European Union.[44] Another recent, comparative assessment of US and European environmental policies also stresses the importance of the emergence of the European Union structure and the consequent decline in the "corporatist" policymaking process typical of the past in Europe:

> …..the EU plays another important "bridging" role between the international and domestic levels, namely an agenda-setting role……..it is unlikely that the United Kingdom or Belgium would have enacted legislation on emissions from large combustion plants or bathing-water quality in the absence of EU policy. Likewise, most member states did not have environmental impact assessment procedures prior to the adoption of the relevant EC directive.[45]

These observations suggest that the "consensual," corporatist European policymaking approach may no longer be dominant. The last citation suggests that possible improvement in European willingness to reconsider established policies is more a matter of "New Politics" – the assertion of policy direction from the European Union – than of a recognition of new scientific evidence or the recognition of new environmental problems, either of which should inspire reevaluations.

These treatments of European policies leave us with two questions. First, was the US ever more active than European states in undertaking policy evaluation and adaptation, as argued in the comparative study of chemical regulations? Second, given the more changes in European policymaking structures, is Europe now more active than the US in policy evaluation? The historical record demonstrates that US environmental regulations are and have been highly resistant to change. This is true in spite of direct Congressional requirements for routine reevaluations, repeated court rulings to enforce the sense of the Congress, and continuing political pressure from both environmental and industry groups for policy change. To address these questions we turn to a comparison of policies in the arena of pesticide reregistration.

US versus Europe: Pesticide Re-registration.

Did the US, in fact, reassess and modify regulations – whether with regard to chemicals or any other substances – to an extent significantly greater than realized in Europe, either before or after 1985? Did the policies change either in Europe or the US after 1985, and, if so, what explains the change? In the event, the combination of the "greening of European politics," and the rising role of the European Union in setting the environmental agenda, led in 1993 to a Council of Minister's

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[44] David Vogel, **Trading Up**, Harvard Press, 1995

[45] Angela Liberatore, *The European Union: Bridging Domestic and International Environmental Policy-Making*, in Miranda Scheurs and Elizabeth Economy, eds., **The Internationalization of Environmental Protection**, Cambridge U Press, 1997, pp. 197-99

Regulation 793/93 requiring a Europe-wide assessment and monitoring of "risks posed by existing substances." However, as late as the end of 1997 still found the Dutch, German and Danish representatives to the Council of Ministers expressing "concern about the major delays experienced in the last two years in the drive to implement Council Regulation 793/93 on assessing and monitoring the risks involved in these types of substances." [46] The delay was explained in the Council's report as being due to the inadequate resources available to the European Office in charge of surveying chemical substances, to overly rigid procedures, and to the fact that the Regulation had limited coercive effect.

In Europe, the "policy" had changed but there was little change in actual regulatory behavior. On the hand, in the US neither policy nor regulatory behavior changed. And, in fact, there was relatively little difference between US and European regulations of chemicals before or after 1985. Throughout the 1970s EPA had been directed by Congress to reregister those chemicals that had been registered before EPA's inception, including pesticides. By 1980 the Government Accounting Office (GAO) noted that all that had happened was that an "inventory" of chemicals had been completed but no new rules or registrations. [47] Some fifteen years later, the GAO was offering ever sharper criticism of EPA's failure to reregister chemicals and especially pesticides. In 1995, the GAO noted that EPA had reviewed the risks of only about 2 percent of the 62,000 chemicals that were already in commerce when the agency began to review new chemicals in 1979. Moreover, as of 1994, EPA had issued regulations to control only nine chemicals in almost 18 years.[48] In short, up to the mid-1990s, not much had been done to regulate potentially hazardous chemicals on either side of the ocean.

A central issue in moving from the existing command-and-control approach to an alternative one is the need for different kinds of information to measure environmental performance and verify that facilities are performing acceptably. In the minds of many regulators, one virtue of the current system is its conceptual simplicity. Process, technology, and design standards generally are easier to articulate and implement than are performance standards. Regulators at the local level know what they are looking for, those things are tangible and generally physical, operating criteria apply and can be readily assessed. The criteria are met or they are not; the regulators need not analyze whether the actions satisfy some ambiguous policy goal.

The Dead Hand of Regulation:

The Problem and the Policy Issues

The "dead hand" metaphor conjures a strong image: a hard, frozen grip, unconsciously driven, and very difficult to remove whatever is in its grasp. The term was first coined by

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[46] *Environment Council: Auto-Oil Consensus, Biodiversity, Waste and Water Debates*, **European Report**, December 20, 1997

[47] Government Accounting Office, **EPA is Slow to Carry Out Its Responsibilities to Control Harmful Chemicals**, October 28, 1980

[48] Statement for the Record by Peter F. Guerrero, Director, Environmental Protection Issues, Resources, Community, and Economic Development Division, GAO, **EPA's Problems with Collection and Management of Scientific Data and Its Efforts to Address Them,** Before the Subcommittee on VA, HUD and Independent Agencies, Committee on Appropriations, U.S. Senate, May 12, 1995, [p.5]

economists in reference to virtually any market regulation, given the presumed effects of regulation on the "invisible hand" of efficient, free markets. The term was popularly employed in the period when economist's primary focus was on price-entry regulations of monopolies. The last significant reference to the term appears to be in the title of a 1971 article by James Q. Wilson, *The Dead Hand of Regulation.*[49] It is of more than passing interest that this article appeared just as the "revolution" in social regulation -- including especially environmental regulation -- was beginning. That is, the Dead Hand concept was apparently deemed relevant to the period in which regulation was focused primarily on essentially economic as opposed to social regulation.

The thrust of Wilson's argument was that economists had misconstrued the problem of regulation; in particular, the concept of the "capture" of regulatory entities by business, he argued, was not supported by the historical record. Wilson raises an argument that proved to be particularly relevant to the subsequent period of social regulation – whatever may have been its accuracy in explaining the prior period of emphasis on economic regulation:

> Certain firms will be helped by some of the specific regulatory decisions making up this climate, others will be hurt. But the industry as a whole will adjust to the climate and decide that the costs of shifting from the known hazards of regulation to the unknown ones of competition are too great, it thus will come to defend the system. The agencies themselves will become preoccupied with the details of regulation. [50]

Wilson's intent in making this statement was to counter the argument of economists, particularly that of George Stigler, that economic regulation exists essentially to provide privilege and economic rents to particular business entities who are able to capture the regulatory process. Stigler's argument from his classic article on the theory of regulation, was concisely summarized in the following statement: ". . . As a rule, regulation is acquired by the industry and is designed and operated primarily for its benefit."[51]

The Dynamics of Change and the New Dead Hand

Stigler's argument does not include an explanation of regulatory change but does not preclude significant change in regulations over time, including a move to deregulation: given that business is presumed to have a dominant influence over regulatory policies, a change in business' interests would logically lead to a change in regulations in the direction of those interests. Though also not explicitly concerned with the problem of change, Wilson's argument, on the other hand, presents a *prima facie* case for the dominant expectation of stagnation in regulations once they have been established. In effect, in disputing the issue of whether business controls regulators, Stigler offers an explanation about why regulations are initiated and comprise particular qualities, and Wilson offers an explanation about why regulations reveal a peculiar rigidity over time that defies simple explanation in terms of the imputed interests of any entity or group.

Wilson went on to suggest that the fundamental problem involving government regulation stemmed from the effort to make bureaucracy do something that is inherently not able to do well: "Indeed, one of the ironies of economic regulation is that it has generally existed with respect to

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[49] James Q. Wilson, *The Dead Hand of Regulation*, **The Public Interest**, (Fall, 1971)
[50] Ibid, p. 47
[51] George Stigler, The Theory of Economic Regulation, **Bell Journal of Economics and Management Science**, (Spring,1971),p.1

those tasks it can do only poorly (such as setting rates and prices and controlling market entry) and has not existed, or has been indifferently managed, with respect to those tasks it could do well."[52] And Wilson went on to suggest that one task that regulatory bureaucracy might do well is to regulate environmental pollution -- to *prevent* business from doing something, rather than to set prices by which business is *allowed* to market privileged products and services.

Though many have come to doubt whether government provides social regulation more effectively or efficiently than it does economic regulations, the concept of the Dead Hand has nonetheless disappeared from the regulatory literature. This might be explained as a function of the fact that, at least in principle, economic theory justifies regulation of externalities of business activity; or it may simply be explained by the desire of analysts to be politically correct on social issues. In any case, time and experience has produced a growing acceptance of regulation (at least in the context of demonstrated market failures) as a necessary part of acceptable economic performance.

On the other hand, there is an important dimension of environmental regulation to which an altered concept of the Dead Hand metaphor seems quite appropriate: the difficulty in significantly changing or terminating regulations once they are in place. The historical record documents all too clearly the resistance to significant modification in existing environmental regulations. Resistance to changing existing regulations appears to operate in spite of new scientific information contrary to current policy, clear evidence of diminishing returns to current policy, new technology offering more cost-effective policy alternatives, and unanticipated and undesirable side effects of current policy.

Less obvious from that record are the reasons for this resistance and, especially, the measures that could be taken to mitigate it. The historical record also makes clear that this is not a problem unique to the United States government; at least in the environmental policy area, it apparently is endemic to governments worldwide. Does the lack of significant change in regulations over time reflect the fact that at least the majority of regulations are effective and continue without need for adaptation to new information, new scene or new circumstances? Or does the lack of change reflect more fundamental shortcomings in the regulatory policymaking process that prevents adaptive responses to new opportunities, new problems and new information?

Policy Evaluation and Regulatory Adaptability

Though there are many case studies, as well as more general analyses, of the environmental policymaking process, the primary focus in virtually all of those studies is on the *initiation* of regulation, or on the typical pattern of a continuing process leading to ever *greater stringency* of regulation. Environmental policy is typified by phase-ins of regulations and phase-outs of pollutants and hazardous processes, substances or products. The typical "history" of a regulatory policy is one characterized, first, by a slow-paced initiation of regulation, in which the conflict of competing interests is most intense, leading on to a gradually strengthening of environmental standards, wherein the disputes tend to be limited to the pace and degree of stringency of regulation – not its basic legitimacy. The result is policy pattern reflecting a "ratchet effect" of ever more restrictive regulation. The logic for this pattern is often compelling. It encompasses the desire to avoid economic dislocation, to allow regulated entities time to undertake investments and make other adjustments, while providing for "fairness" in imposing regulations. However, the "ratchet" process

[52] Ibid, p.58

generates powerful resistance to change in the direction of policy -- even when new information or new technologies strongly suggest the availability of more cost-effective alternatives.

Regulatory policy often seems impervious to changing circumstances or changing scientific information, or any other factors that might seem relevant to a disinterested observer. In spite of the apparent significance of this pattern, the issues involved in policy evaluation, and the consequent potential for beneficial adaptation or termination of existing regulations, have received very little attention.[53] One reason for this apparent oversight may be the fact that there have been so few examples of active reevaluation of environmental regulations leading to significant adaptation or termination of regulation. This fact of history, to which we will have occasion to return several times in the analysis that follows, raises many fundamental questions.

Does the limited number of historical cases of active policy adaptation suggest that policy has generally been correct -- meaning effective and efficient -- and, therefore, has required no major revision; or does it suggest a failure to actively pursue program evaluation, to collect the appropriate data for assessing alternatives, and to address the needs of policy adaptation based on that information? Given the emphasis on analysis of policy initiation decisions, are we to assume that the consequent policy-making principles appropriately and adequately reflect the requirements of policy evaluation and policy adaptation? We would hope that new scientific information would be a fundamental policy driver in any policy-making contexts; but are there significant differences in the requirements for information collection and assessment and use of such information in the context of initiating as opposed to adapting regulations?

In spite of all the criticism of environmental policy-making -- criticism coming from advocates as well as from opponents of such regulation -- the problem of failing to adapt policy to new information and to new circumstances has been almost entirely overlooked. Moreover, there has been little critical examination of the regulatory policy evaluation system – and effective policy adaptation presumes an effective evaluation process. However, such an evaluation system neither exists nor seems to be missed by regulators, by environmental activists, or even by those adversely affected by regulation. There is no apparent political or public demand for a greater emphasis on evaluation of regulations and little effort to provide such evaluation -- whether to justify or to critique policy.

A recent study by Resources for the Future (RFF) portrays itself in its summary as "the first full-scale systematic evaluation of U.S. pollution control efforts."[54] The parent study makes an even more dramatic claim: "The present report is the most comprehensive evaluation of the pollution control regulatory system ever conducted. In fact, it is one of the broadest attempts at program evaluation for any program area."[55] And this conclusion, suggesting that effective evaluations have not yet been conducted at EPA is reached after nearly 30 years of EPA's existence. Given that the lead author was a long-time, member at the Environmental Protection Agency (EPA) we can assume he knows the limitations of the policy process at that agency. Scattered throughout the summary of this study are a series of damning statements about the state of EPA's evaluation capability:

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[53] One of the few studies to address these issues directly is George Gray and John Graham, *Regulating Pesticides*, In John Graham and Jonathan Weiner, eds., **Risks versus Risk, Tradeoffs in Protecting Health and the Environment**, Harvard Press, 1995

[54] J. Clarence Davies and Jan Mazurek, **Regulating Pollution: Does the U.S. System Work?** Resources for the Future, Washington DC, 1997, p.1.

[55] J. Clarence Davies and Jan Mazurek, **Pollution Control in the United States: Evaluating the System**, Resources for the Future, Washington, D.C., 1998, p.2.

> It [EPA] is largely devoid of any capability or desire to evaluate the programs it administers. Its internal information systems for allocating workload and measuring accomplishments are weak or nonexistent.[56]
>
> It is very difficult to evaluate either the costs or the benefits of environmental programs and regulations.[57]
>
> There is a massive dearth of scientific knowledge and data . . . . The current system is focused largely on how to control pollution rather than on whether pollution is actually being controlled.[58]

At least in theory and in terms of organizational charts, the EPA had a program evaluation division, "but it essentially functioned as a management consulting group for the EPA programs, performing almost no real program evaluation."[59] Finally, apparently to remove the misleading sense that EPA was in fact performing evaluation, the division was finally abolished in 1994 by the new Clinton administration. The new administrator, Carol Browner, also abolished the STARS ( ) system which passed as an evaluation system. However, STARS had long been criticized, both within EPA and by external critics, as essentially measuring and compiling quantifiable program *inputs* as opposed to assessing program *outputs* -- the actual environmental outcomes of policy.[60]

While the RFF criticisms of EPA's evaluation system may be warranted, the RFF's report does not itself represent a true evaluation analysis. Most importantly, the analysis fails to deal directly, let alone systematically, with policy implementation, enforcement and monitoring at the state level, where "the action is." Of a report totaling 289 pages, the treatment of state level actually takes up all of nine pages.[61] The report does note that "enforcement is conducted mostly by state and local agencies" and that "most monitoring of pollution levels is done by state and local agencies."[62] However, the remainder of the brief treatment of (role of?) the states is focused on the issue of federal-state relationships, and especially the problem posed by the fact that "the *support* that state pollution control agencies traditionally have given EPA has turned to opposition."[63]

If an evaluation of state-level programs is omitted, what is being evaluated? The report offers many pages of summary data on changes in environmental conditions, but virtually all of this data is drawn from already available studies many of which are quite dated. More importantly, the RFF authors have carefully noted that all such data are suspect and that EPA has little if any reliable data on which to base analysis.

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[56] Ibid, p.10
[57] Ibid, p.30
[58] Ibid, p.48
[59] NAPA (National Academy of Public Administration). 1995. **Setting Priorities, Getting Results: A New Direction for EPA**. Washington, D.C.: NAPA. Pp. 168-169 and J. Clarence Davies and Jan Mazurek, **Pollution Control in the United States: Evaluating the System**, Resources for the Future, Washington, D.C., 1998, p.1.
[60] J. Clarence Davies and Jan Mazurek, **Pollution Conrol in the United States: Evaluating the System**, Resources for the future, Washington, D.C., pp.35-36.
[61] Ibid, pp. 39-48.
[62] Davies and Mazurek, **Regulating Pollution . . .**, p.9.
[63] Ibid, p.9.

One of the few independent assessments actually performed by RFF for this study is not only based on highly suspect EPA data, but employs extremely questionable analytic techniques. The Three-City Air Study involved an analysis of the question: Does regulation matter? It examined the determinants of changing air quality in the Pittsburgh, Cleveland and Baltimore areas, areas that were once, but no longer, heavily industrialized regions. Did improvements in air quality derive from de-industrialization or from environmental regulation?

The analysis was based on data from ambient air monitoring sites over the period from the early 1970s to the early 1990s. However, not only is this data generally suspect, but this study restricted itself to analysis only of the days showing the highest pollutant concentrations in each area for a given year. As the study itself notes, this data "is not indicative of typical ambient air quality levels."[64] Furthermore, the study looked only at data for particulates and ozone -- both of which represent data that changed in definition and collection methods over the period. This restriction of the data base led to the total number of observations or data points of 106 for all three areas combined for the twenty year period 1972-92.[65] That would lead to a average of little more than one observation per city per year -- meaning some years would probably have no observations for a given year. In any case, this would seem to be an analytically highly questionable total of observations.

How it is possible to reach significant conclusions about the causes of changes in environmental conditions from so few observations of admittedly questionable data remains open to question. Nonetheless, this study proceeds to use rather elaborate statistical methods on these limited data and reach surprisingly clear and precise conclusions: De-industrialization and other non-regulatory factors explain a large percentage of the air quality improvement and regulation a much smaller but statistically significant percentage of the improvement. In reaching for a supportable conclusion, the study concludes: "the failure of local factors (e.g., the level of local manufacturing activity and local pollution control investments) to account for a majority of the variation in local air quality underscores the importance of regional or national factors (both regulatory and non-regulatory) in determining local air quality."[66] In other words, using questionable data within an extremely simplistic model, it was discovered that the majority of the local variation could not be explained by the model; but the data are limited to a handful of data points of peak pollution periods which are likely to show a peculiar and biased measure of variation. This result was, then, used as an argument that national air regulations matter a great deal.

Our point here is not to belittle the efforts of RFF. They have made some of the only serious and important efforts to advance recognition of the policy evaluation problem at EPA. Rather, the points to be made are that: 1) all efforts at policy evaluation and adaptation are limited by the quality or lack of data available from EPA or any other source; and, 2) even if data were available, effective evaluation and adaptation procedures require a better understanding of why, how and by whom evaluation should be conducted, and a far clearer understanding of the purposes of evaluation. Those purposes have to be focused on policy adaptation but we currently lack a clear conception of the system and process requirements of such adaptation.

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[64] Mark Powell, **Three-City Air Study**, Discussion Paper 97-29, Resources For the Future, March 1997, p.3.
[65] Ibid, p.4
[66] Ibid, p.15

I. What is the nature of the "dead hand problem": what are its characteristics, costs and consequences?

We have previously described the policy "ratchet effect" that typically characterizes the evolution of environmental regulations. There are, however, four alternative patterns to the ratchet effect of policy that bear directly on the Dead Hand issue. One alternative is the immediate and outright ban of a product, process or substance -- usually as the outcome of a public health scare. There are relatively few cases that fit this category, but they are cases that have proven especially resistant to change. It is interesting that in a meaningful number of cases of bans, serious reevaluation efforts have subsequently been undertaken. Though often instituted as "crisis-driven" measures that have often been denied the benefit of considered review of all information, the subsequent emergence of new information appearing to invalidate the ban has seldom -- as we shall see -- proven sufficient to lift the ban. Why have bans been particularly resistant to policy adaptation?

A classic example of this pattern is revealed in the case of the so-called Delaney Clause. Passed into law in 1958 as an amendment to the Federal Food, Drug and Cosmetic Act, the Delaney Clause outlawed the use of any food additive that had been demonstrated by animal tests, or was otherwise suspected, to be a carcinogen. Somewhat oddly, such processes as food irradiation to sterilize food products were defined by the clause as a "food additive."

When made into law, the impact of the Delaney Clause was circumscribed by the available scientific capability to discover chemical residues. At that time the science of measuring chemical residues was limited to doses on the order of one part in a thousand, and it might well be argued that doses measurable in those quantities of potentially hazardous substances should have been restricted even by so "blunt" an instrument as the Delaney Clause. Soon enough, the "science got ahead of the regulation" and now doses as small as one part in a quadrillion can be measured. At this level the Delaney Clause, strictly interpreted and enforced, required the denial of exposure of raw food during production, transportation and distribution to almost anything hazardous. The law had clearly become overly restrictive, yet, it persisted for nearly forty years.

The second alternative to the ratchet effect pattern of regulatory policy evolution is adaptive policy *reversal* of an on-going, programmatic movement toward ever-greater regulatory stringency. That is, in a world in which effective policy evaluation and adaptation occurred as a routine of policy-making, the possibility of reversals of the effected ratchet effect appear. In fact there have been such reversals of policy in the past. Therefore, an object of our analysis is to identify those cases, determine whether and how policy evaluation procedures and resulting new information affected the reversal decision, and attempt to show inferences from these cases regarding the requirements for effective policy adaptation.

A third alternative to the ratchet effect is the reversal of regulations by which certain processes, products or substances -- known to have potential health or other risks associated with them -- have been specifically approved for particular purposes or in particular controlled circumstances. A reversal of such regulatory approvals would represent, of course, a move toward stringency. An example would be the treatment of regulated agricultural pesticides. A long-term problem for EPA has been the re-registration of pesticides and the problem of determining tolerance levels for food residues of pesticides registered before 1980. The extraordinarily protracted and largely unsuccessful (until present passage of the Food Quality Protection Act) quality of these efforts suggest how difficult reversing prior approvals can be.

The fourth alternative to the ratchet effect pattern is the termination of an existing regulatory program, or the termination of planned programs of imposing greater stringency of regulations. When and why should a policy be terminated? The reasons may vary from the finding of significantly diminishing returns, to findings of unexpected and unacceptable side effects of policy, or to findings of simple irrelevance and unnecessary expenses of a regulation. An example is found in a case of water regulation enforcement in the state of Wisconsin. The GAO has reported the extreme frustration of environmental officials in that state regarding the costs and diversion of scarce resources to an EPA-required program for monitoring of radionuclides in drinking water. There had never been a discovery of radionuclides in the states drinking water, while there are a significant number of agriculture-related water contamination issues that fail to get enough attention. Wisconsin officials had unsuccessfully proposed spending the money assigned to radionuclide monitoring to more cost-effective sanitary surveys and well head protection programs.[67] Unfortunately, they were not allowed to alter their monitoring program.

In light of these alternative regulatory scenarios, the cases of concern to us as representing adaptive denials of the power of the Dead Hand of Regulation include:

(1) the reduction of restrictions or granting of greater leniency, on production processes and emissions, or on the production or use of particular substances or products currently subject to regulatory restraints;
(2) the termination of regulatory restrictions -- including the elimination of bans -- on those same processes, products or substances; or
(3) for hazardous substances or products that had previously been explicitly approved for production and use, the withdrawal of production or use privileges previously approved.

There are, in addition, a number of special cases to consider in examining the problems posed by the needs of policy evaluation. One particularly important category of cases arises from the fact that a significant number of environmental legislative authorizations require routine policy evaluation. One example is the Clean Air Act (CAA) that requires regular and formal reviews of National Ambient Air Quality Standards (NAAQS) and related regulations. Why, in the case of CAA and other legislation posing similar evaluation requirements, has it not been possible for these reviews to be completed as required or for clearly justified alterations in regulations to occur? Does a formalized process actually inhibit as opposed to encourage policy evaluation?

An additional, crucial consideration in examining the problem of evaluation in each of the scenarios above, must be the role of industry. What are the preferences of industry in confronting the inflexibility of the Dead Hand; and how would more ready reconsideration of regulations affect the interests of industry? What are the implications of static regulations -- their costs and benefits? Does the role of industry vary across our four regulatory pattern scenarios? Is the argument of J. Q. Wilson mentioned at the beginning of this paper an adequate explanation of the role and interests of industry: Does industry simply accommodate to regulation and come to prefer regulation to the prospect of a return to open competition? But does environmental regulation protect industry from competition, especially foreign competition? Does environmental regulation get used effectively as

[67]Statement of Peter F. Guerrero, Director, Environmental Protection Issues, Resources, Community, and Economic Development Division, GAO, **Current Environmental Challenges Require New Approaches**, Testimony Before the Subcommittee on VA, HUD and Independent Agencies, Committee on Appropriations, U.S. Senate, Wednesday, May 17, 1995, p.1.

a non-trade barrier?

A final set of questions relates to how the Dead Hand, or its absence, affects initial regulatory policymaking. That is, does the expectation of the Dead Hand effect make initial agreement on or acceptance of regulation more or less likely? How does the prospect of inflexible regulations, as opposed to regulations subject to (unpredictable) change in the future, affect: (1) the nature of the bargaining positions taken by interest groups and the difficulty in reaching initial agreement on establishing regulations; (2) the structure, role and conduct of enforcement, monitoring and evaluation systems; (3) the incentives not only for faithful compliance but also for "over-compliance;" and (4) the incentives for investment and innovation by industry?

II. Why is the Dead Hand and policy adaptation an important issue and has its importance changed over time?

Why should we be particularly concerned about the problem of policy evaluation and adaptation; what are the costs and consequences of failing to adapt policy? What motivations drive the evaluation process and what criteria should guide policy reassessment? Does the increasing complexity of environmental problems -- especially global and transnational problems-- make incremental "trial and error" policies, and therefore the risk of the Dead Hand, more important, more relevant, more likely? Is it more important now than before? Does the "success" of past policies present a unique problem of diminishing returns, or of diminishing relative returns, or of diminishing political priorities?

Increasing Complexity and the Dead Hand. In the 1960s and 1970s, the nature of pollution problems were dramatically apparent, and, efficiency issues aside, almost any measures directed at the most evident air and water pollution cases could have some meaningful effect. The problems were rather simply defined, were generally conceived as local in origin and in resolution, and the policies employed were generally rather blunt instruments. Today, it might be said that the "easiest" problems have been addressed, and the "cheapest" and easiest solutions have been largely exhausted.

Now, the problems are regional, national and even global in their extent. Those issues have much greater scope, pose significantly more complex scientific questions, and confront policy-makers with a much higher degree of uncertainty than prior issues, say, of solid waste disposal or individual industrial plant effluents to waterways. However large the scientific and other policy uncertainties may have been in the past, those uncertainties are magnified in the issues of concern today: ozone depletion, global warming, reduction of fine, ambient air particulate matter, and so on.

The increasing complexity of environmental issues, and the concomitant increase in scientific uncertainty, only serves to undermine further the hope and belief on the part of many environmental advocates that, properly developed and utilized, science can afford "certainty" and thereby remove the problem of political choice:

> A continuing sand trap for environmental policy is the longing for scientific certainty – an exact, numerically elegant determination of what effect on the environment particular human actions will have. Yet neither the EPA nor any environmental analyst has ever been able to prove exactly what levels of emissions are bad…."[68]

[68] Gregg Easterbrook, **A Moment on the Earth**, Penguin, New York, 1995, p. 188

If scientific uncertainty is finally going to be explicitly recognized as inherent to environmental policy-making -- especially given the increasing complexity of the policy problems then regulations may be, of necessity, a trial-and-error proposition whose justification must rest on a willingness and ability to adapt or reverse policy as new information is received. A prominent case in point is the recently passed Food Quality Protection Act (FQPA) which dramatically changed the requirements for regulating pesticide residues on food, requirements established as the outcome of trade complaints. Because of the necessity for rapid response, the EPA refers to rules made pursuant to FQPA as "interim regulations." That is, there is every expectation that as time provides collection of information and more thorough analysis, these regulations will be modified.

The presumption of an adaptive policy capability is especially prominent in the many cases where the so-called "precautionary principle" is employed in the face of significant uncertainty about the underlying science. If policy is instituted "just in case," then that precautionary policy should be carefully linked to efforts to use the experience gained in implementing regulations to resolve uncertainty. This, of course, requires continuous, close monitoring and evaluation capabilities put in place at the time policy is initiated, there must be established a mandate to alter policy when and as that uncertainty is resolved.

Shifting the Uncertainty Burden. In an important sense, initiating regulations with an intent to adapt the policy in light of new information, effectively moves the burden of uncertainty from the regulator to the regulated. Industry might, for example, embrace the idea of adaptability in the expectation that relief might summon from demonstrations of excessive costs or limited benefits. Yet, there is a serious tradeoff for industry in accepting conditional regulations. Fixed regulations at least eliminate one major uncertainty for industry in making their long-term product-market and investment decisions. As we will find, industry has consistently opposed open-ended regulation, preferring the certainty of even very stringent regulation to the uncertainty of "flexible" regulation. Indeed, a significant constraint to regulatory adaptability has been industrial and general business resistance to change.

The issues raised by the "threat" to business of change in regulation is suggested are exemplified in the Montreal Protocol case on ozone depleting substances. First, with respect to CFCs, the producers of CFCs were initially quite opposed to efforts to restrict production and use of those chemicals. It was not until the major industrial actors, particularly DuPont as the largest producer, came to understand that regulation of CFCs was in their interest, that a breakthrough in the Montreal negotiations became possible and for DuPont to "discover" its self interest took no little time. It is widely reported that DuPont's change of mind, if not of heart, came with the revelation that it had potential rent generating, proprietary technology for producing substitutes for CFCs. However, DuPont had long been aware of this potential; its restraint was the uncertainty it faced in competing effectively with those substitutes -- especially given their higher cost -- if any other CFC producers in any other country were still allowed to produce CFCs. In the event, DuPont was quite willing to support an international agreement, if (1) it removed the market uncertainty for its substitute products, (2) it could be rigidly enforced, and (3) it was not subject to opportunistic change by competitive CFC producers or opponents of its substitute products. Given that the Montreal Protocol proscribed CFC production by all producers, DuPont effectively used the agreement to establish an advantaged market position. Having established that position, it is not surprising that DuPont had became not only a strong advocate of the Protocol, but also an unbending opponent of any effort to modify the Protocol in any way that places its new products in jeopardy.

The Montreal Protocol also, unfortunately, reveals how uncertainty can prevent business willingness to change its regulatory environment. In this case, methyl bromide has also been deemed a serious ozone depleting substance but, after many years, it has not been possible to reach an agreement on its elimination from production and use. It is not the power of producers that can make or unmake an agreement but the power of users of the product -- the politically powerful farm lobbies of a broad range of countries. The problem amounts to great uncertainty about the availability and effectiveness of substitutes for the broad range of uses of methyl bromide as a farm pesticide, structural fumigant, and quarantine pesticide. For the users of this pesticide, the uncertainty surrounding substitutes is too great to accept. The users are unwilling to let the burden of uncertainty be shifted onto them exclusively; and no one appears willing to consider measures for compensating in one of a number of possible ways for accepting that burden.

But, like all generalizations in the arena of politics, there are many cases in which industrial interests logically seek revision of regulations, and not necessarily to the detriment of the environment. For example, in 1993 the Environmental Protection Agency (EPA) reported on a study sponsored jointly with Amoco Oil Company that evaluated the costs of existing oil refinery regulations as compared to alternative measures that would have the same environmental benefits. That study examined air and water emissions of Amoco's 53,000 barrels per day Yorktown, Virginia refinery. It concluded that 97% of the emissions reductions required at the refinery, could be achieved with alternatives to prescribed programs at 25% of current costs.[69] Present regulations cost the refinery an average of $2,400 per ton of reduced emissions of volatile organic compounds and hazardous wastes. The study concluded that alternative methods could reduce emissions of these substances at a cost of $500 per ton. The savings could occur, the study said, if a facility-wide release reduction target existed, if statutes and regulations didn't prescribe emission-reduction methods, and if facility operators could determine ways to meet the target. It is to EPA's credit that it sponsored this analysis. Its relevance cut across the entire refinery industry. But, were significant changes in existing regulatory policies, in fact, undertaken? Unfortunately, this analysis was only meant to be an instructive "model" to demonstrate the lack of flexibility in legislative authorizations of environmental regulations. It is even more unfortunate that this experience was not viewed as a more general "model" of the benefits as well as the methods of policy evaluation more generally

In considering the issue of the motivation for evaluation, it is crucial that the problems to be addressed are not limited to cases of apparent policy failure or, as in the Delaney Clause, to cases where the continued relevance of a particular regulation is in doubt. After thirty years of aggressive environmental protection regulation, we might well expect to find that policy "success" poses at least as many evaluation issues as policy failures.

Success raises questions of when does the inevitable trend to diminishing returns set in; what data and assessment methods are needed to identify conditions of diminishing returns; and what are the alternative policy responses to diminishing returns? Even more directly, when and how can success in environmental regulation be translated into a declaration of victory and the termination of regulation? Dealing with these issues will require at least that the expressed objectives of regulatory policies be translated into explicit performance criteria by which to judge policy effectiveness -- a rule which is not generally observed at present -- and effective monitoring capabilities put in place by which to determine when "it is clean enough."

In considering such issues, there is a question of whether policy failure can be defined with

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[69] *Flexible Regulation Gets Nod From EPA*, **The Oil and Gas Journal**, February 28, 1994, p. 15

any more precision than policy success. What, in fact, is the meaning of policy success –- of successful policy outcomes -- and of the policy implications of success. Given the risk tradeoffs in so many instances of environmental regulation and the oft-discovered, unintended consequences of regulation, success is often an ambiguous term. Was the banning of DDT a success in light of the consequent rise in malaria deaths worldwide? Is it a success to ban pesticides deemed to pose a relatively small risk of cancer, if the elimination of the pesticides reduces the supply and increases the costs of fruits and vegetables, the consumption of which is considered fundamental to minimizing cancer risks?

There are also potentially significant, but generally overlooked, policy implications of "success," as defined in the simplest sense of the term as a regulatory restriction meeting its intended objective, whether "right" or "wrong" in the long-term. Most environmental policy analyses focus on questions of whether regulations are necessary or should be made more stringent; but, at least equally important in the current policy context, after thirty years of significant regulatory activities, are such questions as: When is a local condition "clean enough?" When should policies be terminated? When do diminishing returns set in; how can that stage be effectively recognized; and what should be the policy response? Alternatively, what information is sufficient to conclude that a past restriction was either inappropriate or no longer relevant? That is, might it be preferred, as determined by risk tradeoff analyses, to "bring back" some product or process that may be a less threatening substitute for a currently used but even more dangerous product?

Neither the presumption of past policy error or current policy success is required to have a compelling rationale for aggressive policy reevaluations. First, new science can make past policies obsolete by changing hazard or exposure estimates, or by providing new means of protection from, or use of, the substance at issue. Second, even more certain to change over time is the definition of hazards and their priorities. New environmental problems will emerge and be recognized, just as, for example, the ozone depletion problem unexpectedly emerged and turned CFCs from a "benign" substance into a primary environmental threat.

Apart from outright success or failure or regulations to achieve specific environmental outcomes, there are a number of additional circumstances that could reasonably motivate policy adaptation. For example, the motivation for policy adaptation might arise from: recognition of such problems as the emergence of unintended and undesirable secondary effects of policy; the realization of unexpectedly high costs of compliance, including the indirect costs of economic and social dislocation; the perception of an "unfair" distribution of the costs and benefits of regulation; or the recognition of unanticipated problems in enforcement or regulation.

III. The Causes of the Dead Hand Effect and Incentives For its Continuation.

The problem of the Dead Hand appears to be well recognized within the political system, and legislative efforts to complete policy evaluation and reassessment have a long history, but a short list of successes. Indeed, the US Congress, as early as the 1970 Clean Air Act (CAA) and repeatedly thereafter, demanded routine, periodic assessments of regulatory rules and standards. The CAA required the EPA to ensure that National Ambient Air Quality Standards (NAAQS)[70]

[70] The so-called NAAQS "criteria pollutants" include carbon monoxide, lead, nitrogen oxides, ozone, particulates, and sulfur oxides.

reflect the "latest scientific information" and that both the criteria and the standards be reviewed periodically and be amended as new science might dictate.

Soon enough, both the White House and the Congress were taking steps to improve the policy evaluation capabilities of EPA. First, to assist in the effort to incorporate the latest scientific information, a Science Advisory Board (SAB) was created for EPA by executive order in 1974. Then, only a few years after the CAA was passed, the Congress, too, apparently realized that there was a problem in the realm of policy review and reassessment. As a consequence, legislation authorizing environmental regulations across a variety of transport media began to include ever more demanding provisions and requirements for policy review and adjustment in light of new information. For example, the Toxic Substances Control Act (TSCA) of 1976 set particularly demanding requirements, not only for determining regulated uses of new chemicals, but also for reassessments of all previously registered chemicals.

All of this effort to require policy evaluation and adaptation at least served to convince observers and analysts *outside* the US government that a serious and important system was in place and was operating effectively. For example, a noted comparative study of toxic chemicals regulation in the US and in Europe, undertaken in the mid-1980s, argued that, in comparing the US to Europe,

> there are striking differences in their concern with substances cleared for use in the past. The US has by far the most fully developed legal framework for discovering and controlling existing chemical hazards. TSCA (Toxic Substances Control Act), for example, establishes a framework for dealing with both new and existing industrial chemicals." [71]

It is further observed that in Europe "reappraisals" of existing regulations were often "perfunctory," with their emphasis on new chemicals rather than reconsidering previous regulations established for existing chemicals. [72] The US, on the other hand, is described as concerned as much with previously established regulations as with regulating new chemicals. As a consequence, it is argued, though without much supporting evidence, that in the US regulations were more frequently subjected to reassessment and amended or suspended than was the case in Europe.[73]

These comments suggest that the "dead hand" was, at least in an earlier period, considerably more apparent in Europe than in the US; that indeed the US policy process is significantly more aggressive in reevaluating regulation in light of, among other things, the development of new scientific information. In fact, the argument was that European environmental protection legislation quite clearly minimized the issue of reevaluation of regulations. What, in fact, did the record show on either side of the Atlantic?

In Europe, the Council of Ministers of the European Union finally agreed to a directive in 1993 requiring the review of existing chemicals authorized for sale within the Community. However, as late as the end of 1997 still found the Council of Ministers expressing "concern about the major delays experienced in the last two years in the drive to implement Council Regulation

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[71] Ronald Brickman, Sheila Jasanoff, Thomas Ilgen, **Controlling Chemicals: The Politics of Regulation in Europe and The United States**, Cornell U Press, 1985, p. 36

[72] Ibid, p. 37

[73] Ibid, p.49

793/93 on assessing and monitoring the risks involved in these types of substances (hazardous chemicals)." [74] In Europe, the "policy" had changed but there was little change in actual regulatory behavior.

On the other hand, in the US neither policy nor regulatory behavior changed. And, in fact, the actual regulatory record shows there was relatively little difference between US and European regulations of chemicals before or after 1985. Nearly fifteen years after the passage of TSCA and ten years after the amendments to FIFRA requiring reregistration of all pesticides, the Government Accounting Office (GAO) was offering ever sharper criticism of EPA's failure to reregister chemicals and, especially, pesticides. In 1995, the GAO noted that EPA had reviewed the risks of only about 2 percent of the 62,000 chemicals that were already in commerce when the agency began to review new chemicals in 1979. [75]

Causes of the Dead Hand Effect. What are the possible explanations for a failure of policy reassessments efforts, in spite of active political direction, and provision of necessary resources? What are the tradeoffs between legislated, routinized and highly structural evaluation systems, on the one hand, and more case specific, decentralized and "environmental" evaluation systems, on the other hand? What are the incentives for regulated entities -- both corporate and public -- to engage in adaptive change or to resist change? How might governmental policy exploit those incentives to gain greater adpatability of policy; or is the government, in fact, truly interested in reassessing policy?

There have been, of course, many critiques of environmental policy, from all sides of the debate, and as many proposals for changing the process, procedures and policy instruments employed by EPA. Environmental regulation has been accused of being too inflexible, too stringent, too expensive, too bedeviled by unintended consequences, and too inefficient. There is the implication in this criticism that, while there has been significant improvement in many areas of environmental protection, success itself has become a problem: success breeds slackness, reifies a commitment to problems of the past, not the present, produces unrecognized diminishing returns, and has resulted in a large and unwieldy bureaucratic organizational structure not capable of adapting to the demands of new problems.

This criticism of environmental policy has been met by a wide range of proposals for "improving" both policy-making procedures and policy instruments:

- Get "better" science and more rigorously take account of the uncertainties in the science; do more and better risk assessments and cost-benefit analyses; and, in particular, utilize "integrated" analysis of cross-media and cumulative exposure risk assessments of pollutants.
- Rely less on command-control regulations: rely more on negotiated or "self-enforced" regulations, or employ market incentive programs, or employ more flexible standards and enforcement strategies.

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[74] *Environment Council: Auto-Oil Consensus, Biodiversity, Waste and Water Debates*, **European Report**, December 20, 1997

[75] Statement for the Record by Peter F. Guerrero, Director, Environmental Protection Issues, Resources, Community, and Economic Development Division, GAO, **EPA's Problems with Collection and Management of Scientific Data and Its Efforts to Address Them,** Before the Subcommittee on VA, HUD and Independent Agencies, Committee on Appropriations, U.S. Senate, May 12, 1995, [p.5]

- Correct the overall "fragmentation" of policy that begins with the initial, narrow and overly prescriptive, Congressional authorizing legislation, and compartmentalizes operations down to the level of local enforcement.

These various definitions of the policy problem and necessary correctives raise at least two questions for our analysis: First, do the policymaking problems implicitly or explicity raised by these proposals also include the problems of evaluation and adaptation; and, second, does the effort to comply with these corrective proposals increase or decrease the capability for and the probability of effective policy evaluation and adaptation? We will address in order each of these three categories of policy-making change.

Policy Adaptation and The Role of Science. Nothing in the environmental policy arena is more fraught with dispute than the issues of what role science and scientists should play in policy-making, how "certain" the scientific evidence must be to justify regulations, and what represents credible scientific evidence. Indeed, this area of inquiry raises a nearly unmanageable array of difficult questions.

In what ways might "better" science or better use of science change regulatory outcomes? Is there a "failure of science" in providing the necessary basis regulatory adaptation; or is there a "failure of the policy-making process" in utilizing available scientific information? Does the role of science differ across nations and has that role changed over time; and what are the policy implications of those cross-national differences and changes over time -- indeed, does science "matter" in determining policy?

Have changes in the policy process and procedures over time affected the acquisition and use of scientific information; or has change in scientific knowledge produced the changes in policy-making procedures? How do both industrial and governmental organizations respond to new, scientific information? What factors increase their willingness and ability to adapt behavior to new information? What incentives effectively promote innovation -- the creation and diffusion of new technologies for environmental ends?

How is scientific information currently used and what are the strengths and weaknesses of alternative methods and procedures for incorporating scientific knowledge? What are the roles played by science and scientists, interest groups, electoral politics and parliamentary politics, the courts, international organizations, and trade disputes? In terms of policy evaluation, what are the implications of particular methods and procedures by which new knowledge is generated and integrated into the environmental regulation policy process?

How do both industrial and governmental organizations respond to new, scientific information? What factors increase their willingness and ability to adapt behavior to new information? What incentives effectively promote innovation -- the creation and diffusion of new technologies for environmental ends?

In addressing many of these questions, a conference held at the University of Texas in 1995 on the subject *The Identification, Assessment, and Management of Environmental Risks* concluded: "We have looked to science to provide certainty and discovered that it can't." The panelists, comprising five notable environmental policy scholars and policy makers, included two economists

and three scientists.[76] This conference was directed at the growing criticism of environmental policy-making flowing from a broad spectrum of advocacy groups; and inspired by the recent passage in the House of Representatives of that element of the Republican "Contract with America" dealing with regulatory reform: a proposal demanding more rigorous risk and cost-benefit assessments, and clearer scientific justification for regulation in the areas of health, safety and the environment.[77]

Adam M. Finkel, previously of EPA and then director of the Health Standards Programs at the Occupational Safety and Health Administration (OSHA) observed: "I've been frustrated for a long time about the fact that uncertainty is not acknowledged in economics or in risk analysis." That is, the policy "problem" in this view is not how to find certainty or to get "better" science into the policy process; the "problem," instead, is how to take account of uncertainty more explicitly in policy analysis. More critical was Richard Belzer, economist at the Office of Management and Budget (OMB), who has for many years been responsible for reviewing proposed environmental regulations and the analysis offered in justification for them. His assessment of the cost-benefit analyses, and associated scientific evidence, offered in justification of new environmental regulations was: "The problem has been that historically these documents are prepared very poorly for a variety of reasons. One is that it's often *inconsistent with the agency's interest in any given case to do it correctly*."[78] And, for Belzer, it is not just cost-benefit analyses that presents a problem; indeed, cost-benefit analyses cannot be significantly improved without improvements in risk assessments:

> …we have been hampered by inadequate information on the benefits side. About 15 years ago, we began struggling to obtain better information on the benefits side and discovered there was this whole other subject out there: a discipline called risk analysis.….as a lot of economists have gotten into this, our training being different, we found things that, in many cases, we found just appalling.[79]

It was left to Jerome R. Ravetz, a former professor of the history and philosophy of science at Leeds University, to bring the various technical and philosophical issues together. Responding to Belzer he noted: "who would argue against using the best available science?" Yet, we must admit that science doesn't provide clear-cut answers and, therefore, "we should focus on real uncertainties. But *agencies don't want to do that because they believe that to acknowledge any uncertainty opens*

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[76] *Roundtable: Rethinking Risk Regulation*. **Issues in Science and Technology**, June 22, 1995
Page 53 Panel Discussion on "The Identification, Assessment, and Management of Environmental Risks" was the theme for a panel discussion at the Center for the Study of Science and Society at the University of Texas at Dallas. Panelists included:

Richard B. Belzer, staff economist in the Office of Information and Regulatory Affairs at the Office of Management and Budget;

Adam M. Finkel, director of Health Standards Programs at the Occupational Safety and Health Administration of the Department of Labor;

Steven Lewis, a toxicologist and science policy advisor at Exxon Biomedical Sciences, Inc.;

James C. Murdoch, associate professor of economics and political economy at the University of Texas at Dallas; and

Jerome R. Ravetz, director of the Research Methods Consultancy Ltd. in London and a former professor of the history and philosophy of science at Leeds University.

[77] *Regulatory Reform Act of 1995*

[78] University of Texas roundtable, op. cit.

[79] Ibid

one up to a successful challenge in court." And admitting to scientific uncertainty merely opens the policy debate to political opportunism of conflicting interest groups. Not only is there irreducible uncertainty, but it is also impossible to remove policy judgment irrespective of uncertainty.

Whatever risk assessments may conclude, however rigorous their content, those assessments must be interpreted and translated into policies – that interpretation inevitably involves value conflicts. Scientific uncertainty only makes political resolution of value conflicts more difficult.

> This model of an uncertain science interacting with values is one that is very, very new to our culture. We are still groping to try to understand it….we are in a period of learning how to cope with uncertainty. We had looked to science to provide certainty and discovered that it can't. Then we find uncertainty being managed and manipulated by all the political players. We can't squeeze the uncertainty out of the science.[80]

Worse yet, having dashed the hope that science would remove the need for value judgments, we now have encouraged the hope that cost-benefit analysis will remove that need. Ravetz implies that the worst possible outcome would be replacing the hoped-for certainty of science as justification for regulation with the "certainty" of selecting regulatory policies on the basis of cost-benefit calculations: "For a long time, the dominant consensus was that science will find a number that tells us what is safe and what is dangerous. I'm now suddenly feeling that we're going for another magic number: namely, net benefit." [81]

This notion that science is a highly politicized commodity in the policy debate and something to avoid confronting if possible, is a popular theme of many other analysts of environmental policymaking. Sheila Jasanoff offers some arguments that suggest the "American Exceptionalism" of placing so much emphasis on scientific evidence is merely a useful "cover" for policymakers. That is, unlike in other countries, in the US much is spent on scientific research and the policy debate is caste in terms of competing scientific evidence. And, particularly noteworthy "in the public justification of American regulatory decisions," has been the reliance on quantitative representations of risk in a manner that seemed to make the scientific basis of policy explicit.[82]

Why is it necessary to cloak regulatory policy in scientific dress? Jasanoff argues that, because US policy must "be made in public," it is not surprising that "officials may find the appearance of methodological rigor especially appealing" because it suggests "policy decisions are being made in a rational, nonarbitrary manner."[83] Furthermore, she describes a basic ambivalence in the treatment of scientific knowledge. First, because the fundamental uncertainties in the basic science allow for differences of opinion among scientists, the fact of "scientific pluralism" within the US science community ensures lack of consensus. As a consequence, the prescription to "consult the experts and 'do as they say' has relatively little meaning in the context of American risk politics."[84] Furthermore, she contends that social and political elites refuse to accept "expert" knowledge as the basis for their "own political acknowledgment of risk." [85]

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[80] Ibid

[81] Ibid.

[82] Sheila Jasanoff, , *American Exceptionalism and the Political Acknowledgment of Risk*, **Daedalus,** Fall 1990, Vol. 119, no. 4, p.29

[83] Sheila Jasanoff, , American Exceptionalism and Political Acknowledgment of Risk, **Daedalus,** Fall 1990, Vol. 119, no. 4, p. 30

[84] "But equally important to the politics of risk in America is the relatively nonhierarchical organization of science as well as politics…….differences in the societal responses to risk between the United States and other

Even more direct arguments have been offered contending that all the emphasis on science in the US policy context may have little significance beyond its role in offering political justification and legitimacy:

> Lacking sufficient stature to take a binding action that would be accepted by all interests, US officials must seek another basis of action and defense. One of their few alternatives is to find refuge in objective scientific analysis and professional consensus… [86]

Thus, we have a series of arguments that science is useful only in promoting certain political and bureaucratic interests, but, if it does not serve those interests, it is to be ignored or is ignored. When we turn to the historical case studies we will examine several additional, and complementary, hypotheses. One is that not only is scientific evidence ignored, there is a conscious and clear effort *not* to collect new scientific evidence for purposes of policy evaluation. And this bureaucratic policy is encouraged and supported by industry.

Don't Ask, Don't Tell. To the extent that EPA wants to examine the environmental risks, for example, of potentially hazardous substances, the agency has broad powers for acquiring the necessary information from producers and users of such substances. However, in large part, because of resource limitations, EPA is not only dependent upon industry to provide the data for assessments, it is increasingly dependent on industry to identify hazardous risks.

Under the provisions of TSCA, producers of substances or products for which evidence is discovered suggesting hazardous risk must immediately report these findings to EPA. This would, of course, apply to any testing of products and substances. This, clearly, provides a disincentive for industry to test products are to take special care in dealing with potentially hazardous substances in a manner producing data which they would have to report to EPA.

The recently completed Presidential Commission on Risk Assessment reported with apparent surprise and alarm, testimony it received about this issue. It appeared that judicial decisions had limited EPA's ability to demand data not volunteered by industry:

> Lynn Goldman . . . informed the Commission that judicial interpretations in response to suits over the 20-year history of TSCA have severely limited the agency in issuing requirements for minimal data sets . . . . The Environmental Defense Fund (EDF) has been evaluating the extent to which information is available for quantitative risk assessments of the approximately 2,900 chemicals in the TSCA high-production inventory; apparently not more than a few percent have adequate data for such assessments.[87]

In response to this criticism, The Chemical Manufacturer's Association responded to the Commission that the data doesn't exist.

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nations result in part from the relatively low level of scientific pluralism in countries with a more homogeneous or centralized culture of knowledge." Ibid, pp. 75-76

[85] Ibid, pp. 71-72

[86] Ronald Brickman, Sheila Jasanoff, Thomas Ilgen, **Controlling Chemicals: The Politics of Regulation in Europe and The United States**, (Ithica: Cornell U Press, 1985), p. 23

[87] **Presidential Commission**, p.58

> There are disincentives for chemical manufacturers under TSCA Section 8(e) to conduct tests, particularly exploratory tests. Companies that do not test do not have to report anything striking in a substantial risk notice, while those that conduct testing run the risk that any adverse information will be given undue weight by the agency.[88]

The problem arises from the fact that section 8(e) of TSCA does not require companies to conduct tests, only to report risks that they do discover through their own testing programs. Therefore, there are disincentives to conducting tests, especially exploratory tests for those companies that do not test avoid reporting, while those that do extensive tests run the risk that any adverse data reported will be used against the reporting companies.

Whose Interests are Served by Adaptive Policy? What is the role and what are the preferences of industry in confronting the dead hand, inflexibility of policy; and how would more ready reconsideration of regulations affect the interests of industry? What are the implications of static regulations – their costs and benefits? Do major actors actually know what their interests are in confronting new environmental regulations or the prospect of change in those regulations?

Are alternative regulatory "strategies" -- e.g., command-control versus market incentives -- associated systematically with (a) differences in the generation and use of scientific information, (b) differences in the timeliness in setting and in complying with regulatory standards, (c) the degree of political satisfaction with or dissension over the standards, (d) the costs and effectiveness of implementing the standards for regulated entities, (e) the extent to which innovation is produced in private sector and (f) the ease or difficulty in monitoring and enforcing compliance on the part of regulators?

To understand how and why public or private organizations might pursue regulatory policy change or respond positively to such change, it is necessary to assess the interests that direct the activities of those organizations. In lieu of detailed analysis, it is common for analysts to assume that the current activities, products or markets of organizations determine their interests; their interests are to continue doing what they are doing. Given a definition of those interests, it is typically further assumed:

(1) that organizational interests, goals and behaviors are highly stable and routinized;
(2) that organizations clearly understand what their interests are;
(3) that regulated organizations recognize how proposed regulations will affect them;
(4) that organizations rationally pursue their clearly understood interests; and
(5) that, in pursuing their interests, organizations are not subject to significant uncertainty about the most effective means of achieving their objectives, or about the potential benefits of achieving those objectives.

In practice these assumptions lead to the conclusion that, for example, the interests of General Motors can be inferred from (or are assumed to be determined by) the fact of its position as a market share leader in a highly concentrated automobile industry, in which gasoline-powered, internal combustion engine automobiles defines the marketplace; and those interest so defined are highly resistant to change over time. But the same could have been said about the interests of, say, Monsanto in the late 1980s as a leader in the commodity chemicals and specialty chemical products industry. Yet, in response to increasingly stringent regulations on that industry, Monsanto

[88] Risk Commission Calls for Revamping of TSCA, **Pesticide & Toxic Chemical News**, March 24, 1997

transformed itself into the leading company in the new and burgeoning industry of agricultural biotechnology, having disposed of most of its chemical production lines. There was little about its prior position in the chemicals industry that would have suggested this outcome.

Do major actors have clear knowledge of what their interests are when engaging in the regulatory policy debate? What are the uncertainties they face in attempting to assess the costs and benefits of changes in the regulatory regime? Clearly, the market orientation and interests of firms and other types of organization can and do change over time, as new technologies appear, new markets open or the opportunity appears to gain advantage within an existing market or set of economic conditions. Yet, change comes at a price in virtually all circumstances. The questions are: When and how do organizations recognize the opportunities in changing circumstances or in their efforts to promote change? A necessary but apparently insufficient condition for such recognition is whether the benefits of change are calculated to outweigh the costs; but benefits cannot be appropriately assessed if one's interests, and their implications, are not well understood.

Given the intrinsic uncertainties involved in long term commitments to investment and product design and production techniques, business generally prefers the "certainty" of existing regulatory conditions and the prospect of as little change in "uncontrollable" factors as possible. However, the natural preference for as much certainty as possible often comes at the price of organizations failing to appreciate their "real" interests, and how those interests can best be served not only by innovation, but, more importantly, by change motivated by regulatory policy. That is, at least as important as the issue of uncertainty in guiding business preferences is the evident fact that businesses are often not clear about, or misinterpret, their own interests.

With respect to industrial entities, do they know how the value of their current products and technologies may change – whether to diminish or increase – given a choice among a range of possible regulatory options? Under conditions of substantial uncertainty, if regulation may provide or protect a competitive advantage, when and how and under what circumstances is that advantage clearly perceived and acted upon? Most importantly, how do the actions of Congress, regulatory agencies, foreign competitors, non-governmental organizations (NGOs), and other advocacy groups shape industry's understanding of its interests, of the business risks it faces, and of how it can and should act to influence regulatory outcomes?

In light of the potential uncertainties on the part of industry in confronting regulatory change, how certain can government entities be regarding the political and economic consequences of its choices among regulatory outcomes? Are there systematic behaviors on their part in dealing with significant uncertainty on these issues? Are there natural tendencies toward cost-minimizing versus benefit maximizing strategies on the part, especially, of elected officials?

IV. Successful Policy Adaptation and the Requirements of Change.

In what sense is policy adaptability an "improvement" in policy-making? Is it, in fact, not quite possible or even probable that significant changes in regulatory policies -- and the policy process modifications necessary for undertaking them -- themselves present potential problems, both for public policy and for regulated entities? Unfortunately, our ability to address such fundamental issues is limited by the near total lack of a theoretical framework or analytic structure by which to assess alternative approaches to social regulation. What, then, should guide our effort to determine what policy evaluation and adaptation procedures and outcomes actually constitute an "improvement" in environmental policy, viewed in aggregate and in the long term?

In particular we need guidance in understanding the following issues:

- Who is the constituency for change; how can political support for change be mobilized; what are the political costs and the regulatory tradeoffs of seeking political coalitions and developing compromise solutions?
- the compelling problems presented by the prospect of moving from the existing regulatory regime to something different, irrespective of its constituent elements.
- what are the necessary organizational structures, procedures and relationships with regulated entities to ensure effective regulatory program monitoring, information collection, evaluation and assessment;
- what would represent credible criteria for assessing and validating the effectiveness of changes actually undertaken?

In considering this process of change, our expectation is that the really significant constraints to change do *not* include a failure to perceive the existing problem, nor an inability to conceive of possible alternatives, nor that favorite boogeyman, "bureaucratic inertia." There are powerful extra-governmental, as well as governmental institutional forces, resistant to change in the current system. Once a regulatory regime and particular regulations are established, industry adapts to the regulations, establishes advantages within the changed context, and finds it unattractive to change direction again. In any case, given commitments to long-term capital investments and to product markets, industry likes consistency, and often becomes the strongest advocate of maintaining current regulations and regulatory approaches. In like fashion, environmental activist groups as well as state and local governments may oppose adaptive changes in regulations for a host of non-intuitive reasons.

Achieving a consensus for change will require convincing a wide range of constituencies that the new system will work, that it will protect the environment more efficiently and effectively, and will do so while also better serving each of their interests. Few constituencies are likely to abandon the existing legal and regulatory framework without assurances that their agendas will be protected.

In this regard, one of the few merits of the much-criticized command and control regulatory regime is that it is conceptually simple and relatively straightforward to measure compliance. Compliance is generally easier to define and verify in a process requirements system than in a system that relies on performance standards. Therefore, a central issue in moving from the existing command-and-control approach to an alternative one is the need for different kinds of information to measure environmental performance and verify that facilities are performing acceptably.

IV. Cases of Success and Failure in Policy Adaptation: Alternative Perspectives on Requirements and Consequences

Comparative and historical analysis suggests strongly that among the most important determinants of the influence of the dead hand of regulation are:

- the structure of the policy process -- especially how that structure may or may not involve formalized and systematic systems for policy evaluation;
- the strategies selected for enforcing, monitoring and evaluating regulatory policy instruments; and
- the procedures for the collection and incorporation of new information relevant to policy reassessment, and for using new scientific evidence about the policy problem in question

Finally, a major consideration in explaining constraints on policy adaptability is the issue of how policy legitimacy is established. In the case of the FQPA discussed above, it was relatively easy for the EPA to admit that its rules were subject to change at any time because the law had been justified by circumstances presumably beyond EPA's control --it had not been a product of EPA efforts. Rather, the FQPA was "sold" as a necessary response to external demands -- the demands of responding to a presumed trade complaint. There are few if any cases, apart from those produced by international agreements or raised as international trade complaints, in which a reversal of environmental regulations does not place in question the very legitimacy of policy. The legitimacy of environmental regulations, with very few exceptions, is based on the presumption of "scientific truth," not on normal calculations of political and economic interest. As a consequence, the need to justify a change in policy almost of necessity requires subverting what was previously established as scientific truth. But why would regulators fear criticism if a policy change was clearly based on the weight of scientific evidence? The only answer could be the near hyperbole by which so called scientific evidence is used to legitimize the original policy decision. The point here is that the very issue of legitimacy is a fundamental source of resistance to reversal of policies.

Does Science Matter in Policy Adaptation? The Case of Irradiation

The fundamental alternative to the ratchet effect of gradually increasing regulatory stringency is the case of outright bans on particular substances, or products. As in the case of saccharin, once banned, it is extremely difficulty to resurrect a substance or product. One evident reason for this inflexibility is that immediate and outright bans or prohibitions are not common, unless there is strong and vocal public demand for immediate regulation, as for example in the cases of the pesticides EDB in 1983 and Alar in 1989. In both cases, public scares over the cancer threat attributed to residues of these pesticides on food led to public demands for immediate bans. Fortunately, cases of public scares are relatively uncommon. But their effects tend to be permanent, for what politician is willing to lead a campaign to resurrect, say, a chemical that has gained a disastrously negative public image?

The unfortunate part of this story is that there are and have been in the past, a number of notable instances in which a banned substance or product could have been beneficial had it been possible to return it to public use. A current example of this forfeited benefit involved not a substance or product, but rather, a process - the process of food irradiation. The case of irradiation also reveals how difficult it is to reverse the Dead Hand even when there is little scientific uncertainty - indeed where there is virtual scientific consensus - about the safety of the process and about its potential benefits.

In the current context, the effective use of irradiation could be beneficial in dealing with a number of significant environmental issues. First, food irradiation could be an effective substitute for the use of methyl bromide as a food sterilizer and quarantine fumigant: methyl bromide representing a major continuing ozone depletion problem. Second, it represents one of the few very effective means for dealing with the growing number of food poisoning crises due to food-borne bacteria. Third, it represents one of the few effective alternatives for dealing with trade issues surrounding internationally acceptable food safety measures: pesticide residues arising from sterilization pesticides; and food preservation measures.

Food irradiation is also an interesting case in that it has realized not only an eventual reversal of its ban but that the reversal also has come as a series of steps, a sequence of relaxations in regulatory use restriction. And each of those steps has required a policy crisis to justify and initiate the step. In short, food irradiation raises the fundamental issue of the "legitimacy" of regulatory adaptation - especially when the "science" alone, however strong the evidence may seem to be, does not offer enough to generate the necessary public and political support.

The Cost of Public Ignorance of Science. In a number of cases of strong resistance to long-established health and safety regulations, the culprit is not Congress, nor the bureaucracy, nor industry, nor science – the culprit is public opposition to change. A classic case of this phenomenon involves the use of irradiation as a food sterilizer and preservative. This process is probably associated with the least scientific uncertainty and the greatest scientific consensus regarding the safety and benefits of the procedure of any in health related issues. Food irradiation has the blessings of the World Health Organization, the American Gastroenterological Association, and the United Nations' Food and Agricultural Organization, to name only a few of the organizations involved in health and safety programs who support wider use of irradiation. And few supporters of wider use have been as strong in advocating irradiation as the scientists at the FDA. Not only is the safety of irradiated food not in doubt but the safety of radiation facilities has been established. There have only been about a half dozen minor accidents - and no deaths - among the nearly 40 U.S. irradiation plants that have been operating for decades.

The popular fear in the U.S. of anything involving radiation was reflected in the inclusion of food irradiation within the preview of the Delaney Clause as a "food additive" associated with cancer causes. More than 40 other countries make irradiation a fully legal process in processing food, though few use this method extensively - in part because of cost considerations. Only France, among European countries, uses irradiation to any great extent. As with the case of pesticide re-registration (see next section, pp.___), it has taken periodic food-related health scares to allow extensions of the authorization of irradiation as a food sterilizer-preservative process. The cost to national health conditions has been significant. And now there is an even more compelling reason for adapting regulation of food irradiation: The phasing out of many pesticides - methyl bromide in particular - leaves very few effective food sterilization pesticides or other alternatives. Indeed, without an effective substitute for methyl bromide, the difficulties in phasing out this ozone depleting substance will be even more difficult than it has already proven to have been. FDA has approved several limited uses of food irradiation that were first used to help the Army preserve canned bacon in the early 1960s. But it rescinded the approval for this use after a few questions were raised in the late 1960s about irradiation's effect on laboratory animals. However, apart from meat, wheat and flour have been cleared for irradiation since 1963, and over the years spices, pork, fruits and vegetables and poultry have been added to the FDA list. Since then the FDA has slowly changed its view but has never gotten too far in front of public opinion. The agency approved the irradiation of spices, fruits and vegetables in 1986 to destroy insects and mold, and it authorized the

irradiation of chicken in 1990 to kill bacteria like salmonella or Campylobacter, which are the two biggest causes of food poisoning in the United States. There are now about 60 irradiation plants in the United States that sterilize a wide array of items, from nipples on baby bottles to tiny containers holding coffee cream. Most of these facilities are for the purpose of sterilizing medical equipment and supplies. The slow pace of change reflects, for example, the outcome of a CBS poll in August 1997 which found that only 12 percent of US citizens favored irradiation as part of food processing, whatever problems it might solve. France, where many chickens are irradiated, have made much use of it.[6]

Finally, in December 1997, the FDA amended its food additive regulations to provide for the use of irradiation to treat uncooked meat, meat byproducts and certain other food products "to control food borne pathogens and extend shelf-life."[7] Why did this change occur at this time. When federal researchers began a detailed review of food poisoning cases in 1996, they were surprised to discover that the most common causes of food-borne illness in the United States turned out to be a relatively obscure bacterium, Campylobacter is ubiquitous in the intestines of chicken, turkeys and other poultry. Based on the study of food poisoning cases in five states, federal health officials estimate that Campylobacter, which causes bloody diarrhea, fever and abdominal pain, is responsible nationwide for about 4 million infections annually. Deaths are relatively rare - between 200 and 1,000 deaths per year, mostly in the elderly or people whose immune systems are compromised, according to the federal Centers for Disease Control and Prevention (CDC). According to a spokesperson for the Center for Science in the Public Interest (CSPI), a Washington-based health advocacy group, "We knew that Campylobacter was important, but always thought that salmonella was going to be the big player."[8]

Though irradiation has been approved for use in poultry, very few poultry processing plants employ the technology, industry spokesmen said citing increased cost and possible resistance from consumers. And this testing reveals the real source of resistance to use of radiation: No food processor or retail food outlet wants to be identified with "food radiation."

Science, Diminishing Returns and the Dead Hand: The Case of Dioxin

The recently completed Presidential Commission on Risk Management placed particular emphasis on the issue of diminishing returns in a number of industries and with respect to a variety of pollutant emissions. One particular example where diminishing returns issue cuts several ways involves benzene. The Commission noted that benzene, formaldehyde, and acetaldehyde from motor vehicles were each estimated to cause no more than 30 additional cases of cancer nationwide per year -- out of a total of 500,000 new cancer cases per year.[89] This fact first raises the issue of whether recurring significant new costs in efforts to reduce these emissions -- and benzene in particular -- can be justified by the limited benefits. The Commission goes on to note that "The fact that air toxics from industries properly controlled under MACT standards are not likely to be the major sources of cancer risk will be an important context for EPA to consider when the residual

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[6] Gina Kolate with Christopher Drew *Technology in Waiting: A Special Report. Long Quest for Safer Food Revisits Radiation Method,* **The New York Times,** December 4, 1997.
[7] *Irradiation in the Production, Processing and Handling of Food,* **Federal Register,** December 3, 1997
[8] Sandra Boodman *Poultry Peril: What is Campylobacter and Why is it the Leading Cause of Food Poisoning* **The Washington Post**, December 9, 1997.
[89] P.C. p.12

risks from industries are assessed and compared to risks from other sources of cancer and respiratory disease."[90]

The misallocation of resources due to the pursuit of problems exhibiting rapidly diminishing returns to investment is widely claimed. One critic of current policy asserts, for example, that his calculations suggest "a reallocation of resources to more cost-effective programs (that)… could save an additional 60,000 lives per year at no increased cost to taxpayers or industry. Alternatively, the country could save the same number of lives, but at an annual saving of $31 billion."[91]

Dioxin and Diminishing Returns. Regulation of dioxin emissions from paper mills appears to entail the first explicit recognition of the issue of diminishing returns by agencies regulating health and safety issues. In any case dioxin appears to be the first substance with respect to which EPA has explicitly recognized the diminishing returns issue. There remains however, an open question of whether the notion of diminishing returns was used by EPA as a rationale for a policy undertaken for other reasons, or whether actual calculations and findings of diminishing returns drove policy.

On November 14, 1997, in what may become a precedent ruling, the EPA announced "cluster rules" for pulp and paper mill emissions, including dioxin in particular. [92] From the mid-1990's, environmental groups had been demanding a "zero level of tolerance" with respect to dioxin and this was a time when dioxin reductions in response to prior policies had already reached a 94% reduction level. However, when EPA finally issued its cluster rules on paper mill emissions, it demanded a reduction of dioxin levels to achieve a total of "only" a 96 % reduction -- not 100% -- at an additional estimated cost of $1.5 billion.

In any case, in response to strong criticism of the new rule from environmentalists, the EPA spokesperson, EPA Assistant Administrator for Water Robert Perciasepe, argued that the marginal returns did not justify the costs involved in achieving a greater dioxin reduction percentage. The ratio of marginal costs to marginal gains, it seemed, was simply getting too high as pulp and paper mills approached 100% reductions in dioxin emissions. Perciasepe noted that the 1993 plan for a 97% reduction would have cost $1.2 billion more than the proposed 96% reduction and that cost was not justified by the relatively small additional gain.[93]

The Uncertain Problem. The regulatory history of this substance has been dogged by questions of the actual health effects of dioxin exposure. The considerable uncertainties about this issue have been treated quite differently outside the U.S. In the 1980s, Canada and European countries set dioxin limits less stringent than EPA's by two or three orders of magnitude. Officials in these countries concluded that a different cancer model applied to dioxin. Additionally, many of these countries have come to focus on a water quality indication called AOX. This indicator is not directly related to any particular dioxin types or chlorine precursors but, rather, is an aggregate measure of the totality of the organochlorines discharged from paper mills.

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[90] Ibid p.12

[91] Dale Hattis, *Drawing the line: quantitative criteria for risk management.* **Environmen**t, July 17, 1996

[92] The cluster also includes a "speed-up" cleanup of 73 polluted waterways, a 50% reduction in volatile organic compounds, and a 37% reduction in particulate emissions.

[93] *EPA Adopts Paper Mill Regulations*, **Portland Oregonian**, November 15, 1997

A second set of scientific uncertainties involving dioxin has to do with the assessment of alternative sources of dioxin. In the U.S., municipal and medical waste incineration are the dominant known sources of dioxin, but the total releases of dioxin from all sources (including natural sources such as forest fires) is highly uncertain. Nonetheless, the policy debate has been dominated by the rules set for paper mills; and in this regard -- scientific uncertainties not withstanding -- environmental groups have consistently demanded a "zero level of tolerance" for dioxin emissions. Particularly important to their argument is the fact that dioxin is highly persistent and bio-accumulative, thereby posing a particularly threatening human risk through the eating of fish and other food sources exposed to dioxin. Dioxin has also been fingered as a possible endocrine system disruptor as well as a potent carcinogen based on animal lab tests.

But Was it Diminishing Returns or Increasing Political Resistance? Newspapers in paper producing regions carried headlines like "Pulp, Paper Mill Pollution Rules Toughened" [94] reflecting the commentaries and explanations of the policy by EPA spokes people that these new rules were, indeed, very tough. But what was new and different about the new EPA rules was that first they represented a relaxing of earlier EPA positions on acceptable dioxin emissions; and , second and most important, the rules were issued in explicit recognition of the rising marginal costs of pollution mitigation and of the narrowing gains to be made in long-regulated areas.

These points were brought out in EPA responses to criticisms of the cluster rules from environmental advocacy groups like the Natural Resources Defense Fund, whose spokesperson argued that: "These standards will allow the pulp and paper industry to continue their routine contamination of our waterways."[95] Yet, dioxin emissions were to be reduced by a total of 96%, under the new rules. In reality, what the environmentalists were reacting to was the fact that EPA had backed away from an historical position of advocating total elimination of dioxin and a position proposed in 1993 that dioxin emissions should be reduced by 97%. No matter what position one has on these matters, it is a startling change from the 1970s and 1980s that the dispute was over the difference between 96% and 100% pollution reductions, or especially the remarkably small difference between 96% and 97% reductions in emissions.

Yet, the new 96% level was itself estimated to cost only $1.8 billion, suggesting that the pulp and paper companies must be very close to the 96% standard already. And that very conclusion is strongly suggested by the comments, for example, of Llewellyn Mathews, executive director of the Northwest Pulp and Paper Association: "The water regulations won't have much impact on Oregon and Washington mills because they reduced their discharges of dioxin and chlorinated organics three years ago in anticipation of the rules. Its almost anticlimactic now that the regulations are out."[96]

As usual, the direct opposition to the rules come from certain states led by activist environmental groups. For example, the Natural Resources Council of Maine argued persuasively that federal regulations don't do enough to keep dioxin out of Maine rivers. The principal argument was that even very small emission amounts add up over time because dioxin is bioaccumulative and is taken up by fish and other waterborn creatures.[97] However in a law suit brought by the NCRM,

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[94] Richmond Times Dispatch, November 15, 1997

[95] *EPA Order $1.8 billion Plan to Clean Up Mill's Discharges,* **Washington Post**. November 15, 1997

[96] Ibid.

[97] *Regulations to Cut Dioxin Discharges Environmentalists Say Standards Not Enough to Protect Maine Rivers,* **Bangor Daily News,** May 14, 1998

the argument was that the EPA violated the Clean Water Act by not requiring the industry to use the best available technologies for wastewater pollution control. In any case, the argument was accepted by the Maine legislature, which passed a law establishing a standard of a "zero detectable level" of dioxin in the emission streams of paper mills. And the law was to take effect by July 31, 1998, only a few months into the future.[98] Under the law, dioxin is considered "undetectable" in all mill waste if the concentration is below 10 parts per quadrillion - the lowest level at which laboratories can reliably measure dioxin. Maine lawmakers in 1997 passed a more stringent dioxin law than federal rules. Not only is the 1998 law also tougher than federal law, Maine's law requires mills to implement the new bleaching process - known as elementally chlorine free, or ECF - by July of 1998 while federal rules don't require the transition until 2001. Maine's law also requires companies to test fish near their bleach plants for dioxin.

Mandated Evaluation: Adaptation as Crisis Management

Similarly, but much more explicitly and forcefully, the Congress, in the 1987 amendments to the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), required that all pesticides that have been approved and registered before 1984 had to be reapproved and reregistered by EPA no later than 1997. Though this was a tall order, providing ten years for the effort seemed reasonable to most parties except the most truculent of environmental advocacy groups. More than six years later, in 1993, GAO returned to the pesticide reregistration issue and concluded "reregistration may not be completed until 2006," more than 30 years after the effort began.[99]

Particularly troubling was GAO's assessment that EPA is fundamentally limited in its ability to recognize new scientific evidence as a basis for reevaluating previously established regulations. That assessment suggested that the slow pace of reregistration is apparently not simply a matter of bureaucratic inertia, shortage of resources, or lack of analytic expertise. Instead, incorporation of new scientific evidence in risk assessments of already registered pesticides was restricted by essential faults in EPA's databases and data management capabilities. Consequently, because the data necessary for reliable, high confidence calculations of potential exposure and dosage risks were not available, new evidence indicating a pesticide may pose unacceptable toxicity risks cannot be effectively assessed. Nor was the data available for undertaking meaningful cost-benefit analyses of alternative regulatory standards for controlling pesticides posing potentially unacceptable risks. That is, GAO was not able to find at EPA, reliable data on the quantity of pesticides used on food crops nor data on how substitutes for currently used pesticides might affect crop yields.[100] Furthermore, GAO found that quantitative estimates of pesticides' benefits were generally imprecise because some of "the data on which they are based are frequently of poor quality or missing altogether."

From 1991 onward, the GAO produced a long series of analyses and updates on EPA's progress, or lack of progress, in reregistration of pesticides. In their usual fashion of avoiding anything bearing on policy issues, GAO focused their efforts on determining whether EPA had the capabilities necessary to incorporate all the relevant scientific data and to evaluate that data in terms of whatever criteria are deemed appropriate by policy-makers. The titles of their reports essentially

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[98] Dieter Bradbury, *EPA Sued Over Rules on Dioxin Discharge the Natural Resources Council of Maine nd the Penobscot Nation Join A Suit Seeking to Rid Rivers of Dioxin From Paper Mills.* **Portland Press Herald,** May 13, 1998.

[99] GAO, **Pesticides: Pesticide Reregistration May Not Be Completed Until 2006,** May 21, 1993

[100] GAO, **Pesticides: Better Data Can Improve the Usefulness of EPA's Benefit Assessments**

tell the whole story. Just to cite a few as examples: "Pesticides: EPA Lacks assurance That All Adverse Effects Data have Been Reviewed"[101]; "Pesticides: EPA's Information Systems Provide Inadequate Support for Reregistration"[102]; and "Pesticides: Information Systems Improvements Essential for EPA's Reregistration Efforts."[103]

The Lessons Of Pesticide Regulation

What lessons can be drawn from this history of pesticide registration? First, the Data problem we identified initially has been a dominant problem in the case of pesticide re-registration and cancellation. This problem appears to have been partially due to a persistent problem of Bureaucratic Inertia, an inertia in no small part reflecting recognition of powerful external political interests. However, such inertia is not a major part of the overall problem. There is no particular reason to assume that EPA, or other environmental policy related agencies, suffer from any less of the normal problems of bureaucratic behavior than other federal agencies. However, not all other agencies are assigned by the Congress extraordinarily heavy and complex regulatory burdens, while at the same time being subject to periodic budgetary floggings and political abuse.

Throughout the history of the pesticide programs -- but just as apparent in other program areas -- EPA has been assigned tasks by the Congress to perform the task with limited resources and almost absurdly short time schedules within which to operate. The experience of the 1986-87 debate over amending FIFRA is classic in this regard. The agency is assigned significant new tasks and much shorter time periods to perform those tasks than in the past -- but is expected to perform all of this with fewer than 15% of the staff it previously had. This can only be described within the heading of Legislative Irresponsibility -- another of our themes in explaining the action of the Dead Hand.

Beyond the political consideration, the pesticide cases raise several fundamental technical issues with respect to the Dead Hand. The most obvious is the role of the apparently declining number of substitutes for existing pesticides as we move forward in time and more and more pesticides are removed from the available list. Now, just as industry is highly likely to plead competitive loss in the face of almost any regulation affecting its interests, in the area of regulation the lack of substitutes is an effective claim in this regard. We might label this the Iron Law of Substitution.

In retrospect, it is unlikely that any of the agricultural interests who defended EDB in the name of the lack of substitutes would today trade methyl bromide for a return of EDB. It would seem that farm groups simply were not experienced with methyl bromide and they preferred "the devil they knew to the devil they didn't know." And there can be little doubt about the capacity of American business to create innovations in the face of any number of constraints -- not the least of which is regulation. Nonetheless, there has to be consideration given to the problem of substitution. Innovation may happen in time but not necessarily very quickly. A long sequence of product bans -- as in the DBCP to EDB and now to methyl bromide -- can obviously lead to a severe lack of economically viable substitutues, at least in the short run.

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[101] GAO**, Pesticides: EPA Lack assurance That All Adverse Effects Data have Been Reviewed**, Oct. 30 1991

[102] GAO**, Pesticides: EPA's Information Systems Provide Inadequate Support for Reregistration,** Oct. 30, 1991

[103] GAO**, Pesticides: Information Systems Improvements Essential for EPA's Reregistration Efforts,** Nov. 23, 1992.

V. Conclusions

Adaptation: The Lessons of History

We have resurrected the dead hand metaphor to characterize a dimension of environmental regulation that has heretofore received very little attention: The difficulty in significantly changing, replacing or terminating regulations once they are in place. Our review of the historical record documents the substantial legal, bureaucratic, economic and political barriers to significant modifications of existing environmental regulations. Decisive resistance to adaptive change appears even when there is new scientific information contrary to current policy, clear evidence of diminishing returns to current policy, new technology offering more cost-effective policy alternatives, or unanticipated and clearly undesirable side effects of current policy.

Given that a remarkable degree of agreement has emerged within a relatively broad cross-section of the political spectrum that it is both possible and necessary to improve environmental regulations, why has so little happened? That agreement reflects a widely shared view of the weaknesses of the traditional command-control, "one-size-fits-all," single-medium focus of environmental regulations. The upshot, it is argued, has been regulatory rules and standards that are characterized as too "rigid," too bedeviled by unintended policy consequences, and overly restrictive in specifying compliance actions. Yet, in spite of all the criticism of past regulatory rule-making, the problem of failing to adapt policy, once it has been established, to new information and to new circumstances has been almost entirely overlooked. Moreover, there has been little critical examination of the regulatory policy evaluation system, the methods and procedures for collecting scientific and technical data on which evaluations can be made, or of the structures and procedures by which scientific advisory groups and political leaders review, modify or replace existing regulatory policies.

Though the shortcomings of existing regulations are the basis of proposals for change in the policymaking process, there does not appear to be a constituency in support of revisiting past decisions and potentially adapting existing regulations. The focus of the policy debate, instead, is on avoiding the errors of the past in making current decisions, not in correcting those past errors. In this manner, current proposals for changing the policy process do not address the issues of policy evaluation and adaptation. Indeed, there is little attention paid to the potential benefits to be realized by adapting existing regulations to new scientific and technical information. And in the context of high and rising social costs of environmental protection, and in the face of new and potentially very costly problems (e.g., reduction of fine, airborne particulates or global warming), the correction of inefficient regulations currently in place can be crucial. If there are not significant efficiencies to be found in existing regulations, then the deep criticism of current regulatory policies must be grossly misplaced.

Not only does the emerging "consensus" about the core regulatory problem ignore policy adaptation, but that consensus also is premised on a number of assumptions that direct the search for solutions away from the opportunities inherent in adapting existing regulations. For instance, too much of the emphasis in the policy debate is focused on regulatory "failures," as though the problem needing correction is limited to avoiding repetition of past failures. But, after thirty years and many billions of dollars in environmental cleanup, what we have described as the "Problem of Success"

may be as important as problems of failure. Successful environmental clean up poses the issues, for example, of when is it "clean enough?" When do diminishing returns to new investment set in and how should regulation be changed accordingly? In addition, avoiding systematic review of past decisions denies the efficiencies that can be gained from resetting policy priorities over time (and priorities are not necessarily a function of success or failure). Furthermore, such oversight prevents exploitation of the opportunities inherent in the new technologies and new scientific evidence -- whether or not current regulations are successful on some cost-benefit basis.

Rather than addressing systemic problems, most proposals for change are addressed to one or another of the widely recognized limitations of a policy process that emerged without an overarching rationale; the process is simply the end-result of a long sequence of piecemeal, uncoordinated legislation, judicial rulings and responses to emergent political demands having no particular policy theme: It simply happened. Therefore, making piecemeal adjustments -- as prescribed by most critics of environmental policy -- to a process that itself emerged from piecemeal responses to a range of policy problems is not an approach likely to produce particularly effective, long-term policy improvements. The overriding conclusion of our analysis is that meaningful changes in regulatory performance over time require fundamental changes in the over-all policymaking process.

It is in the failure to recognize this fundamental requirement, we believe, that current proposals for modifying the regulatory policy process, miss the main point. Because the policy debate has come to focus on a particular view of the problem to be corrected, it has limited the range of "solutions" considered. Proposed alternatives to the current rule-making process, while not valueless, do not address the systemic change that would be needed to allow new information to be introduced. Our analysis finds current proposals for changing regulatory policymaking not only too narrow (and piecemeal), but also directed at a definition of the policy problem that is fundamentally flawed: The problem of command-control regulations. To address this problem the policy debate has come to focus on the need for both more "flexible" and more "integrated" regulations; efforts to improve risk assessment; programs for cooperative partnerships with industry; and or the need to introduce more market-oriented policy instruments.

The inherent limitations in these proposed "improvements" to environmental regulations as a basis of "reform" are revealed in the programs of the Clinton administration to "reinvent regulatory policies." The administration has employed a virtual "shotgun" approach in which essentially all the prominent proposals in the policy debate are being tried. The shortcomings that have been found in these programs arise, we believe, from the basic failure to recognize the need for more fundamental, systematic change. Those innovative programs required equally innovative enforcement personnel and programs at the local level, unique monitoring and evaluation procedures, and adaptive responses by EPA managers to issues that had not previously been confronted. In effect, EPA was attempting to run at least two different regulatory systems when most critics wanted reform because EPA had been unsuccessful at running one system.

The basic dynamic of resistance to change and the failure to establish more cost-effective standards and rules generally does not simply reflect the dominance of bureaucratic inertia, or political gridlock, or the particular political power of either industry groups or environmental groups. All of these factors may play a role, but successful cases of adaptation show clearly that, when there is strong political demand for change and/or a strong commitment from the political leadership, none of those factors is sufficient to resist change.

The dead hand effect arises from the interplay of two sets of forces within the policy process. One set of forces arises from political resistance to adaptation and change in the face of available (and possibly even more efficient) alternatives. This resistance arises from the interests of the various stakeholders in maintaining a regulation, interests which most often become wedded to the existing regulations once they are set. Almost independent of other considerations, the certainty of existing circumstances is preferred by most stakeholders to the uncertainty of revisiting the prior regulatory decision. In a political system with as many points of opportunistic political entry as exists in the US, the ability to predict the outcome of a new round of decision-making -- especially in light of the protracted period probably involved -- tends to seriously reduce the interest of most players in pursuing that course.

Industry claims to favor adaptability, but often prefers the reliability afforded by regulatory stability. Once regulations are established, whatever may have been the attitudes by industry in front of the decision, industry adapts to the regulation, establishes advantages within the changed context, and finds it unattractive to change again. In any case, the private sector likes consistency, not sporadic change, and often becomes the strongest advocate of maintaining regulations.

The second set of forces emerges from a sequence of restrictive decisions which were not intended to eliminate options but have that unintended and unfortunate effect. Such a course may emerge, for example, from a sequence of decisions restricting or eliminating virtually all substitutes for products (such as special use pesticides), or by restricting or making economically non-viable virtually all technology options for improving emissions from a particular production process. As we saw in the case of the sequence of decisions beginning with the banning of DBCP and then EDB, it left the agricultural sector with only methyl bromide as an effective fumigant for a number of crops. When the issue of methyl bromide later arose as a ozone depleting substance, the lack of further substitutes in the category of very lethal fumigants has made restrictions on methyl bromide difficult to enforce.

In the first case, policy rigidity arises from political choice. In the second case, the dead hand effect emerges for technical reasons and has effect when political choice is denied -- policy becomes restricted to one basic policy alternative. This “lock-in” effect, usually of a sequence of regulatory decisions, is neither intended nor usually the result of resistance to change in the status quo. Instead, it typically results from a failure to analyze fully the implications of each of a sequence of decisions. One form of lock-in results from a sequence of restricting or eliminating substitutes for a product or process (such as specialized pesticides) until only one remains. A second form of lock-in emerges directly form the resort to regulations based on technology standards. Given the investment implications for industry, once a technology standard is set, it becomes long-lasting.

A third and not at all appreciated form of lock-in involves the increasingly important role of scientific forecasting models used in regulatory rule-making. The model is a representation of the “real world” but is not, of course, a true representation. Increasingly, as in the recent cases of rules on reformulated gasoline and the SO2 emission reduction program, the focus of the policy dispute becomes the model. Not only to protect one’s interests but also to “fix” the resulting regulatory standards to the extent possible, the fight becomes one of what version of the model with what assumptions will be the current and future basis of regulation.

Whether or not there is strong political will for change, the resistance to such change generally comes from a variety of stakeholders with seemingly opposed interests. Furthermore, all of

these stakeholders may, in the policy debate, present similar criticisms of existing regulatory regimes, especially of existing command-control regulations. Nonetheless they all may defend the status quo. Their *perceived* interests are best served by the status quo than by facing the incalculable uncertainties of entertaining change. And the dominant uncertainties are *not scientific uncertainties.* For all the talk about the role of scientific uncertainty in regulatory decisions, it is not scientific uncertainty that dominates reconsideration of regulations: The dominant uncertainties are political and come down to a question of whether stakeholders believe or have high confidence in: the ability of the federal government to make credible commitments that agreements to establish modified regulations will be successfully defended against opportunistic political actions of opponents to the agreement. The most credible commitment is specific legislative authorization, but time has undermined the credibility of this avenue for at least two reasons:

- either opportunistic actions by disadvantaged groups undermines the agreement over time through amendments to the legislation,

- or the legislation is so thorough and sustaining that the legislation itself becomes the major barrier to further adaptive change – adaptive change that is desired by an overwhelming majority of stakeholders

It is important to observe that the benefits of greater adaptability are easier to conceive in principle than in reality. Many who might viscerally leap to the defense of any potential change in regulatory policy that at least suggests the possibility of greater leniency, may discover that the assumed benefits often become less "self evident" as the implications are brought into closer focus. The fact of greater regulatory adaptability may be intuitively attractive and critics of environmental regulation as well as some business interests may view the possibility of relaxing or terminating existing regulations as attractive in any case. However, it is seldom all that clear up-front whose interests are served by potentially greater adaptability -- if there are any interests served at all as they are currently perceived, or if those interests are simply not clearly defined or appreciated. Indeed, an essential role for regulations and others favoring adaptability is to divine strategies by which a broad coalition of stakeholders come to see their interests served by adaptive change to regulations.

Industry might, for example, embrace the idea of adaptability in the expectation that relief might summon from their ability to demonstrate excessive costs or limited benefits from a given regulation. Yet, there is a serious tradeoff for industry in accepting conditional regulations. Fixed regulations at least eliminate one major uncertainty for industry in making their long-term product-market and investment decisions. In an important sense, initiating regulations with an intent to adapt the policy in light of new information, *effectively moves the burden of uncertainty from the regulator to the regulated.*

From the perspective of the regulating agency, a resort to "trial-and-error" or precautionary principle-led initial regulations – with the clear intent to adapt those regulations as more and better information becomes available – removes the burden of justifying regulations in terms of high confidence estimates of costs and benefits. If the agency proves wrong in this initial judgment about appropriate regulatory action, it can change the regulation and the only loser may be the industries who had to make investments in response to those regulations.

No doubt at least in part because of these considerations, industry has consistently opposed open-ended regulation, preferring the certainty of even very stringent regulation to the uncertainty of

"flexible" regulation. Such regulation leaves it exposed to opportunistic challenges to its programs either by competitors who might gain from regulatory modification or from environmental groups. As our case studies showed, the more likely challenge is from industry competitors.

If the story is mixed on the industry side in terms of its interest in adaptive change, environmental groups have generally been unwilling to support regulatory standards and rules comprising "flexible" or "adaptable" terms which provide opportunities for industry to challenge those rules either in court or in the regulatory process on the basis of need, fairness or cost ineffectiveness. A particularly interesting case of environmental group opposition to adaptation in the face of new science involved PERC. We saw how a combination of environmental groups and state agencies effectively resisted EPA's proposal to delist PERC as smog precursor. Those environmental groups specifically did *not* challenge EPA's conclusion about PERC as a cause of smog, indeed they agreed with the conclusion. Their argument was that PERC was a carcinogen and that any regulation that restricted a carcinogen should not be relaxed.

State environmental agencies did not want to remove PERC from the list because to do so meant that those states would fall into non-compliance with Clean Air Act standards. That is, reductions in PERC emissions were the factor that had placed these states in compliance, forget whether compliance was bought by restriction on an irrelevant substance. The problem with the positions taken by both of these opponents to adaptation was that leaving PERC on the list meant that there was, by definition, less active efforts to restrict other substances that were, in fact, smog precursors. In this case, the problem for environmentalists was that the science advisory groups of EPA could never come to a clear conclusion about whether PERC was or was not a carcinogen and should be regulated as such.

This leaves us with the final, potential source of resistance to adaptation – the federal regulatory agencies themselves. In most references to the regulatory agencies, the presumption of the problem of change they face is one of "bureaucratic inertia." But the notion of bureaucratic inertia ignores the fact that these agencies, just like industry and environmental groups, have interests they are promoting. And their interests reflect their business: To establish, enforce and defend regulations. The principal constraint in promoting this interest for the agencies is the time and resources consumed in getting standards and rules established. The Administrative Procedures Act is the principal adversary. It takes between four and seven years for most regulations to meet all of the requirements set by court interpretations of that Act and the requirements of internal government reviews. Given these demands, and the large inventory of still-unresolved regulatory problems demanding attention, why would the EPA or other regulatory agency seek to revisit established regulations? Adaptation simply increases the already heavy burden on EPA and increases the demands on scarce resources. In particular, given the inherent preference of many stakeholders in preserving the status quo in light of their investments, the burden of finding the necessary constituencies to support change may be even greater than the problem of finding constituencies to support initial regulations.

We have raised the issue of the distinction between "flexibility" and "adaptability" and whether there are tradeoffs between them in setting regulations. Flexibility refers to the latitude or discretion provided to EPA by authorizing legislation and by EPA to its local enforcement agents. That discretion is intended to allow variation in emission reduction requirements in light of local differences among sources of the same or similar pollutants. If flexibility therefore refers to variation in enforcement of new regulations, then adaptability refers to changes in existing enforcement measures over time in response to new information or changed circumstances. An

adaptive rule-making process is one that is sensitive to new scientific information, able to evaluate and reset policy priorities in light of new information, able to take decisions in timely fashion, and flexible in the evaluation and review procedures employed in modifying on-going policies.

To caste the adaptability-flexibility tradeoff sharply: If adaptive policy is feasible and the capabilities for effective adaptation are in place, does this change the preference for flexible regulatory enforcement policies? Or put differently, does adaptive capacity and the greater expectation of adaptive responses to new information change the preference for command-control regulations? Going a step further, the question becomes: How many aspects of policy can be left open-endedly flexible, adaptable and, therefore, uncertain as to their ultimate qualities and dimensions?

After all command-control instruments have many advantages in enforcement, monitoring and evaluation. The regulators know what they are looking for and have many fewer considerations in making local judgments about enforcement requirements. Industry knows what its constraints are – and presumably what they will be -- in making product and investment decisions. Environmental groups also have an easier task in that they don't have to fight over the legitimacy of enforcement activities in many locations and even more sources of pollutants. Furthermore, a fundamental issue in moving from command-control to more flexible regulations is the need for different kinds of information to measure environmental performance and verify that facilities are performing acceptably. What criteria will guide performance evaluation at the federal level, quite apart from the divergences in flexible performance targets at the local level?

One clear advantage of the current system is its conceptual simplicity. Process, technology, and design standards generally are easier to articulate and implement than are performance standards or, especially, performance standards that are unique for different locations and pollutant sources. With command-control regulations, regulators at the local level know what they are looking for, those things are tangible and generally physical, and can be readily assessed. The criteria are met or they are not; and if effective policy evaluation systems are in place, federal regulators can tell whether the standards are met or not.

Given the significantly greater enforcement demands of flexible regulations, one wonders whether it would not be easier to promote adaptability in the context of command-control regulations. Because very effective evaluation systems are a sine qua non of effective adaptation, and are easier to implement in the context of command-control regimes, adaptability would seem easier in that context. Furthermore, the administrative burdens of flexible systems are so much heavier than command-control regimes that this consideration again seems to favor command-control. In the end, if adaptation of regulation is to be a principal concern of regulatory policy, the potentially competing benefits between flexibility and adaptability at the very least demand serious analysis of the tradeoffs on a case-by-case basis.

It will be difficult to achieve a consensus for change without different constituencies understanding how the new system will work and how well it will protect the environment, or how it will allow companies to operate more freely and efficiently. None of these constituencies is willing to abandon the existing legal and regulatory framework without assurances that their agendas will be protected. Yet a truly new regulatory system cannot be implemented within the existing policy-making framework, and the shortcomings of that framework are what makes people want to move toward a new system in the first place.

Whatever the strength of the perceived need for change, moving from the existing regulatory system to something different, irrespective of its constituent elements, presents compelling problems. A central issue in moving from the existing command-and-control approach to an alternative one is the need for different kinds of information to measure environmental performance and verify that facilities are performing acceptably. In the minds of many regulators, one virtue of the current system is its conceptual simplicity. Process, technology, and design standards generally are easier to articulate and implement than are performance standards. Regulators at the local level know what they are looking for, those things are tangible and generally physical, operating criteria apply and can be readily assessed. The criteria are met or they are not; the regulators need not analyze whether the actions satisfy some ambiguous policy goal.

The overriding conclusion of our analysis is that meaningful changes in regulatory policy require fundamental changes in the process by which that policy is made -- not simply efforts, for example, to improve risk assessments, or to employ different policy instruments, such as voluntary enforcement or market incentive regulatory programs. Rather than addressing systemic problems, most proposals for change are addressed to one or another of the widely recognized limitations of a policy process that emerged without an overarching rationale; the process is simply the end-result of a long sequence of piecemeal, uncoordinated legislation, judicial rulings and responses to emergent political demands having no particular policy theme: it simply happened. Therefore, making piecemeal adjustments -- as prescribed by most critics of environmental policy -- to a process that itself emerged from piecemeal responses to a range of policy problems is not an approach likely to produce particularly effective, long-term policy improvements.

In pursuing systemic change the clear benefits accruing form more adaptive regulatory programs should be a key element. The opportunities in pursuing a more adaptive approach to regulation go well beyond the potential efficiencies in exploiting new scientific information and new technologies. In a world where environmental problems are becoming more complex (both scientifically and politically), uncertainties may well be far greater than in the past. The demand for scientific “certainty” or at least high probability assessments to justify regulations cannot be supported. If action is to be taken on the basis of the “precautionary principle” in the face of high uncertainty, the regulations will have more of a “trial-and-error” basis. This will be feasible and justifiable only if an effective policy evaluation and service system is in place and the expectation of adaptations comes with the decision.