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FINAL REPORT

RESEARCH IN GEOSCIENCES POLICY

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RESEARCH IN GEOSCIENCES POLICY

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FIGURES AND APPENDICES

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INTRODUCTION

This is the final report for a project on Research in Geosciences Policy, NASA Grant NAGW-1415, covering the period January 1, 1991 to June 30, 1992. Previous work was reported by Dr. Radford Byerly, Jr., the original Principal Investigator on the project.

The research reported here was performed under a no-cost extension of the project requested by Dr. Byerly.[1] As described in that request, the general task of the extension was to look beyond the adverse physical impacts of global change to the pressures for policy action stimulated by those impacts and to defining the policy problem. "[I]n order for policy actions to be effective they must address the right policy problems, which will be different from and broader than the physical problems." More specifically:

> We will work on defining the policy problems with a view to indicating how practical solutions might be implemented. In particular, public officials need advice on what should be said, and done, and for what purposes. That advice needs to be based on systematic analysis of: (i) The scholarly literature in the social sciences, and related disciplines; (ii) the changing content of the policy debate at the center of attention; and (iii) how citizens perceive and understand issues related to global change. We will conduct this analysis.

Chapters 1 and 2 each report work on defining the policy problem and analyzing the scholarly literature. Chapters 3 and 4, respectively, address the policy debate and citizen viewpoints on issues related to global change. The purpose of this Introduction is to show how the chapters are related to each other and to the

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[1] Letter from Radford Byerly, Jr. to Dr. Dixon M. Butler, NASA HQ, February 8, 1991.

agency's broader goals and programs.

Chapter 1, Defining the Policy Problem, identifies and documents the three most dominant definitions of the policy problem in Washington. Each definition identifies a barrier to major policy action, and suggests what must be done as a prerequisite to major policy action:

* In the scientific definition, the policy problem is construed as uncertainty about the future magnitude, timing, and location of climate change, as well as the human impacts of those changes. Hence we must first reduce uncertainty through scientific research.

* In the economic definition, the policy problem is construed as the enormous cost and questionable effectiveness of the means available to reduce the build-up of greenhouse gases. Hence we must first develop more economical instruments of policy.

* In the political definition, the policy problem is construed as the need to make comprehensive, centralized policy decisions on national and international scales commensurate with the scope of global change. Hence we must first develop the capacity to make such decisions.

Critical examination suggests that these definitions of the policy problem do not meet practical criteria of rationality or the test of practical experience. In effect, the U.S. appears to be *mis*defining the policy problem.

To be sure, there are good reasons to support scientific research to reduce scientific uncertainty, to develop more cost-effective instruments of policy, and to improve our capacity to make policy decisions. But such advances are neither necessary nor sufficient conditions for rational policy action in response to the threat of global climate change. And waiting for such advances is not a valid reason to

postpone policy action: We already know how to curb the build-up of CO_2 emissions and to develop the capacity to cope with the diverse local and regional impacts of global warming, if it occurs, without compromising prosperity and other national interests. We already know how because a decentralized energy strategy met the test of practical experience during and after the energy crisis of the 1970s. With leadership from public officials, that strategy can be adapted and implemented to curb CO_2 emissions and, if necessary, to cope with the diverse impacts of global warming.

The misdefinition of the policy problem, the apparent failure to learn the lessons of the energy crisis, and the scholarly literature suggest that the policy problem may be cultural. By "cultural" we mean generally-accepted perspectives -- bridging differences of personality, interest, and class -- that have evidently and irrationally circumscribed the search for effective policy action. The dominant culture may constitute the policy problem rather than the locus of policy solutions. If so, then the recommended goal for leadership is to enlarge the perspectives that have so far been brought to bear on policy. The first objective is to educate the public and other public officials on the energy crisis as a precedent for climate change policy. The second objective is to use public understanding of the energy precedent to open up the larger cultural issues. This course of action does not imply an *a priori* commitment to any particular policy or cultural outcome. It can be justified in terms of common interests in making more rational decisions and in making them more democratically.

The other chapters in this report develop the implications of this cultural definition of the policy problem for public officials who may choose to take the lead.

Chapter 2, The Energy Precedent, documents and evaluates the lessons of the energy crisis, providing a precedent for climate change policy and a means of educating the public and other public officials.

Chapter 3, The Policy Debate, documents and analyzes what has been written about climate change policy in the *Washington Post*, as a basis for understanding the debate and how it might be opened up.

Chapter 4, Citizen Viewpoints, documents and analyzes citizen viewpoints on climate change policy issues, as a basis for understanding how to communicate non-conventional ideas to the public.

A distinction between conventional and non-conventional perspectives on the energy precedent, climate change policy, and the larger cultural issues runs throughout the report.

The work reported here is relevant to the Global Change Research Program, which overlaps with the agency's programs and goals. Consider the justification of the Global Change Research Program as summarized in the President's budget for 1992:

> This program is designed to reduce the significant uncertainty associated with predicting the behavior of the coupled ocean-atmosphere-land Earth system which determines climate phenomena and to form the basis for rational, comprehensive and cost effective responses to climate change.[2]

The relationship between science and policy is often understood to be serial and tightly coupled: That is to say, the reduction of significant uncertainty is taken as a prerequisite for sound policy responses to climate change. The work reported here suggests that it would be advantageous to reinterpret the relationship as parallel and only loosely coupled, and to proceed accordingly.

Reinterpretation of the relationship would be advantageous to policy because we need not wait for the reduction of scientific uncertainty to take rational and cost-effective policy action. As noted above, we already know how to begin to curb the

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[2] Office of Management and Budget, *Budget of the United States Government for Fiscal Year 1992*, Part Two, pp. 100-101.

build-up of CO_2 and to learn how to cope with climate change through a decentralized energy strategy. Moreover, comprehensive policy responses are not likely to be approved intact in our pluralistic political system, even if they are otherwise rational. The National Energy Plan of 1977 is a case in point.

Reinterpretation of the relationship would be advantageous to science because the conventional understanding leaves science unnecessarily vulnerable. A scientific program once justified as the basis for climate change policy becomes vulnerable when policy-makers begin to question its policy relevance -- perhaps because they have found a different basis for policy in the meantime, or because other policy problems have diverted their interest and attention. In the long run, a scientific program that fails to meet the high expectations set by a policy justification undermines the credibility of science.[3] Note that it will be much easier to fulfill the scientific expectations for a predictive model of the integrated Earth system than to fulfill the policy expectations for it.[4] On the other hand, scientific programs justified primarily on scientific grounds are more likely to enjoy the stability and continuity of support on which good science thrives.

A parallel and loosely coupled relationship between science and policy is consistent with the informal "social contract" worked out between representatives of the public and publicly-supported scientific researchers after World War II. According the Office of Technology Assessment,

> This social contract implied that in return for the privilege of receiving Federal support, the researcher was obligated to produce and share knowledge freely to benefit -- in mostly unspecified and long-term ways

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[3] For example, the failure of the National Acid Precipitation Assessment Program to meet expectations cast some doubt on the policy relevance of climate change programs. See Leslie Roberts, "Learning from an Acid Rain Program," *Science* 251 (15 March 1991), pp. 1302-1305.

[4] The policy justification raises harder questions about what must be predicted, on what geographical and time scales, how precisely and accurately, and how soon? And how will we know, *ex ante*, that all significant feedbacks and interactions affecting its predictions have been included?

-- the public good.[5]

The Global Change Research Program benefits the public good, and so would policy actions that begin to reduce the threat of climate change and to increase our ability to adapt, if significant change occurs. But the Program and the policy actions need not be tightly coupled in series.

At the conclusion of our work under this grant, we were pleased to learn that public officials have also begun to appreciate the cultural aspects of the policy problem and their implications. The Chairman of the Committee on Science, Space, and Technology began a recent article with the observation that "The controversy surrounding global change says much about our culture and especially the respective roles of science and politics in American society."[6] Near the end he wrote that

> The immediate challenge for science and technology must not be viewed as the need to reduce scientific uncertainty about climatic warming. This is a hollow ambition. It is too easy to support and too unlikely to bear fruit. The real challenge is to find ways to increase the quality of life of humankind throughout the world...[7]

In retrospect, we hope our work responds to that challenge.

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[5] Office of Technology Assessment, *Federally Funded Research: Decisions for a Decade*, OTA-SET-490 (Washington: Government Printing Office, May, 1991), p. 4.

[6] George E. Brown, Jr., "Global Change and the New Definition of Progress," *Geotimes* (June, 1992), p. 19. This article excepts Brown's comments at the GSA Global Challenge round-up at the 1991 annual meeting in October, 1991, in San Diego.

[7] *Ibid.*, p. 21.

CHAPTER 1

DEFINING THE POLICY PROBLEM[1]

Ronald D. Brunner

Introduction

Ozone depletion, deforestation, high temperatures, and the greenhouse effect have generated growing concern in the United States about global climate change. For example, Congress appropriated $659 million for the U.S. Global Change Research Program for FY 1990, and $955 million for FY 1991. The President's budget for FY 1992 requested $1.186 billion, an increase of 24%.[2] The President's budget for FY 1993 requested $1.37 billion, another increase of 24%. This growing concern begs the question: What is the policy problem, given the various signs of climate change?

Definition of the policy problem is important because further research -- and policy recommendations, decisions, and actions -- are misguided and probably futile if the policy problem is misdefined in the first place. Recall the well-worn story of the drunkard who lost his watch on the dark side of the street but searched for it on the other side, under the street light. The street light, like a problem definition, bounds the search for policy solutions. This paper raises the disturbing possibility

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[1] This chapter is a revision of Ronald D. Brunner, "Global Climate Change: Defining the Policy Problem," *Policy Sciences* 24 (1991), pp. 291-311.

[2] Office of Management and Budget, *Budget of the United States Government for Fiscal Year 1992*, Part Two, p. 102. Table E-10 also includes the distribution of the program's budget by agency.

that the U.S. is misdefining global climate change as a policy problem.

The first section of the paper documents three related definitions of the policy problem that now dominate the center of attention and policy in the U.S. The second section critiques these dominant definitions, focusing on global warming for the sake of concreteness. It contends that the dominant definitions meet neither the criteria of rationality nor the test of practical experience; they do, however, bound the search for policy solutions. The third section suggests another definition of the policy problem, based on ideas that have received little attention outside scholarly circles. The implications for policy and policy research on global climate change are reviewed in the Conclusion.

I. Dominant Definitions

The three definitions of the policy problem that are now dominant emphasize, respectively, the alleged scientific, economic, and political barriers to effective policy responses to the threat of global climate change. Like any other threat to common interests, global climate change is an opportunity for diverse groups to advance their respective interests by various means that include problem definition. In the competition to define the policy problem, these definitions are dominant because have been selectively circulated and recirculated at the center of attention to the virtual exclusion of other ways of construing the problem.

In the *scientific definition*, the policy problem is construed as profound uncertainty about the future magnitude, timing, and location of climate change, as well as the future impacts of such changes on human populations. This definition supports the position that major action is premature on scientific grounds, and that more scientific research is required to predict climate changes and human impacts. This is the primary position of the Bush Administration and of some scientists directly involved in climate research. Scientists do differ on the need for action, but these differences are secondary to their agreement on the need for more funding and

more research.

Statements by the President's science advisor, D. Allan Bromley, illustrate this scientific definition of the policy problem. In late 1989, in testimony before a Senate subcommittee, he said that "we should not move forward on major programs until we have a reasonable understanding of the scientific and economic consequences of those programs."[3] Early in 1990, in a letter introducing a report to Congress on the U.S. Global Change Research Program for FY 1991, he wrote that

> The research program presented here is a key component of the President's overall approach to the global change issue. This approach has, as its central goal, the provision of a sound scientific basis for developing national and international policy on global change.[4]

According to the report, a sound scientific basis for policy is "An improved predictive model of the integrated Earth system and a better understanding of human interactions with this system..."[5] The corresponding parts of the equivalent letter and report for FY 1992 remained much the same.[6] Thus the Administration emphasizes research as a prerequisite to major action programs.

In the *economic definition*, the policy problem is construed as the enormous cost and questionable effectiveness of the means available to reduce the build-up of greenhouse gases. This definition supports the position that reasoned action is premature on economic grounds -- at least until technology lowers costs, more

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[3] D. Allan Bromley as quoted by Warren T. Brookes in "The Global Warming Panic," *Forbes* (December 25, 1989), p. 97. The issue before the subcommittee was the Administration's refusal to sign an international draft resolution calling for stabilization of emissions of greenhouse gases by the year 2000.

[4] *Our Changing Planet: The FY 1991 U.S. Global Change Research Program*, A Report by the Committee on Earth Sciences and A Supplement to the U.S. President's Fiscal Year 1991 Budget.

[5] *Ibid.*, p. 1.

[6] *Our Changing Planet: The FY 1992 U.S. Global Change Research Program*, A Report by the Committee on Earth Sciences and A Supplement to the U.S. President's Fiscal Year 1992 Budget. For example, "approach to the global change issue" was changed to "approach to the global stewardship" and "a sound scientific basis" was changed to "a sound scientific and economic basis."

effective technologies are developed, or climate change makes action unavoidable. This is a secondary position of the Bush Administration and the primary position of most economists.

A front-page story in the *New York Times* illustrates this economic definition of the policy problem. The story reports a consensus among economists that through the next century, trillions of dollars probably would be required to curb the build-up of carbon dioxide (CO_2), a greenhouse gas that contributes to global warming.

> Some effort to curb carbon dioxide may eventually prove to be a cost-effective means of coping with the greenhouse effect. But in the near term, most economists conclude, a major effort to limit carbon effluent makes little economic sense unless it can be justified on grounds of energy security or tax revenue.[7]

A feature article in *Forbes* illustrates the precision and certainty often attributed to particular economic research results:

> The Environmental Protection Agency finds that just to stabilize U.S. CO_2 emissions at present levels would force 30% taxes on oil and coal, while to meet environmentalists' demands for a 20% reduction in U.S. CO_2 emissions would require a tax of $25 per barrel of oil, and $200 a ton on coal, effectively doubling U.S. energy costs.[8]

The article was skeptical of global warming projections, but uncritically accepted these economic projections. Even if the uncertainties of economic projections are acknowledged with a warning to policy makers, the warning tends to be mitigated by the apparent precision and certainty of associated numbers and graphs.[9]

In the *political definition*, the policy problem is construed as a questionable ability to coordinate and enforce centralized policy decisions on scales commensurate

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[7] Peter Passell, "Economic Watch: Cure for Greenhouse Effect: The Costs Will be Staggering," *New York Times* (November 11, 1989), p. 1.

[8] Brookes, *op. cit*, p. 98.

[9] See, for example, the exhibits used in a briefing on *Economics and Policy of Climate Change: Survey of the State of the Art*, The White House, April 6, 1990. The first exhibit reads: "Warning Label on Global Warming: This Topic Contains Enormous Uncertainty. We Know Almost Nothing." Later exhibits include many figures and graphs.

with the scope of global climate change issues. This definition supports the position that major action requires greater capacity to effect centralized and comprehensive decisions at national and international levels. Not surprisingly, this is the position of most people who have some formal or effective role in decisions made at these levels.

Elder statesman Elliot Richardson used this definition in support of his proposal for a treaty "to coordinate and enforce international action" on global warming:

> Environmentalists and politicians can argue the costs and benefits of international action on global warming from now until doomsday, and they probably will. But nothing will get done without an international mechanism to develop, institute and enforce regulations across national boundaries.[10]

A similar political position was taken by the presidents of the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine after considering the scope of global change problems:

> Many possible courses of action ... involve multiple and interlinked costs and benefits transcending both national and generational bounds. Such problems can only be assessed, and prudent long-term response policies can only be effectively developed, at the highest political levels. Global change is quintessentially an issue for leadership at the level of heads of state.[11]

This report, transmitted to President-Elect Bush, advocates the strengthening of national and international mechanisms for the coordination of research and policy on global climate change.[12]

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[10] Elliot L. Richardson, "How to Fight Global Warming," *New York Times* (February 7, 1990), p. A23.

[11] The report and covering letter are reproduced as pp. 10-21 in *Global Warming*, Hearings before the Subcommittee on Energy and Power of the Committee on Energy and Commerce, U.S. House of Representatives, February 21 and May 4, 1989, Serial No. 101-31 (Washington: Government Printing Office, 1989). See p. 13 for the passage quoted here.

[12] *Ibid.*, p. 16.

The scientific, economic, and political definitions of the policy problem have been selected from the milieu and moved up into the center of attention and policy on global climate change. As shown in Figure 1.1, President Bush used versions of these three definitions to structure his opening remarks to a White House Conference on April 17, 1990. Consider also the summary justification of the Global Change Research Program in the President's FY 1992 budget:

> This program is designed to reduce the significant uncertainty associated with predicting the behavior of the coupled ocean-atmosphere-land Earth system which determines climate phenomena and to form the basis for rational, comprehensive and cost effective responses to climate change.[13]

Qualifications and other definitions of the policy problem can be found in these and other sources. But the other definitions have been inconsequential in the search for policy solutions, even though they have been available in the scholarly literature of many disciplines.

The dominance of these three definitions does not necessarily mean they are the most realistic and worthwhile as bases for policy recommendations, decisions, and actions. Their selection over other definitions could be understood as the convergence of well-placed interests with certain prevalent predispositions in the culture. Americans tend to believe that scientific research can solve major policy problems; and scientists are not likely to question that belief while seeking funds for their research. Americans tend to believe that knowledge of the long-term future is feasible and necessary for rational decisions; and economists are not likely to question that belief while claiming such knowledge. Americans tend to believe that big problems require big (centralized and comprehensive) solutions; and elected and appointed officials in Washington are not likely to question that belief while striving to control attention and policy.

Moreover, it is no secret that public officials often seek advice and support

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[13] *Op. cit.*, pp. 100-101.

Figure 1.1

The Three Dominant Definitions:

President Bush's Opening Remarks
The White House Conference on Science and Economics Research
Related to Global Change
April 17, 1990

...This conference can help in three ways. First, it provides an opportunity to help sort out the science on this complex issue... What we need are facts, the stuff that science is made of. A better understanding of the basic processes at work in our whole complex world -- better Earth system models that enable us to calculate the complex interaction between man and our environment....

The second way this gathering can advance our understanding is to address the economic factor and environmental questions. We know that cleaning up our environment costs money -- a lot of money... And yet, as we move forward, all of us must make certain we preserve our environmental well-being and our economic welfare... Environmental policies that ignore the economic factor, the human factor, are destined to fail.

And this brings me to the third way this conference contributes to a net gain in knowledge. The fact that it provides us the opportunity to form a partnership between nations and across the many disciplines represented here.... And the new partnership must bind nations as well [as disciplines]. The fact of the matter is, no one nation acting alone can safeguard our Earth environment.

Source: The White House, Office of the Press Secretary, *Remarks by the President in the Opening Address to the White House Conference on Science and Economics Research Related to Global Change,* Washington, D.C., April 17, 1990.

from scientists and economists, and that scientists and economists often seek access to funds and influence from public officials. The present point is not to condemn politics, but to suggest that the dominance of a policy problem does not necessarily mean it is the most realistic or worthwhile.

II. A Critique

The dominant definitions of the problem do not meet practical criteria of rationality or the test of practical experience. To be sure, there are good reasons for more basic research on the Earth system, for the development of more cost-effective technologies, and perhaps for stronger political capabilities. But such advances are neither necessary nor sufficient conditions for rational policy action on global climate change in general or global warming in particular. And waiting for such advances is not a valid reason to postpone action to curb CO_2 emissions, for example, given a strategy which met the test of practical experience in the energy crisis of the 1970s and still makes sense today. CO_2 emissions are not the only factors in global warming, but they comprise a separable part on which action is warranted whether or not significant global warming occurs.

Criteria of Rationality

In formal terms, a rational decision depends upon four elements: A set of action *alternatives*; expectations about the future *consequences* of those alternatives; expectations about future *preferences* for evaluating those consequences; and a *decision rule* to select an alternative according to its expected consequences for preferences. This formal outline underlies all theories of rationality. However, the standard theories have been challenged in recent decades by behavioral theories grounded in the observation of real choices and decisions. Differences between the

standard and behavioral theories are key in this discussion.[14]

The standard theories assume that a rational decision must integrate complete and consistent knowledge of *all* alternatives, *all* consequences, and *all* preferences with a decision rule that selects the alternative with the highest expected value. Such God-like omniscience is far beyond the capabilities of mere mortals and machines, and we cannot even come close in situations as complex and open-ended as global warming. Such substantive rationality is an ideal of the standard theory that is never realized in practice. It is nevertheless influential: People sometimes think, talk, or act *as if* substantive rationality has been achieved, or can and should be achieved. One example is the demand for comprehensive and centralized policy.

Observed behavior, on the other hand, is boundedly rational: We can attend to only *some* of the alternatives, consequences, and preferences in any decision situation, and we do so with degrees of reliability, insight, and conscious reflection that fall far short of the ideal. Hence significant uncertainties and ambiguities are inevitable in complex decision situations. However, we can often cope satisfactorily through procedures that are overlooked in the standard theories. For example, it is often procedurally rational to act in modest and discrete steps on parts of a larger problem, in order to reduce uncertainties about consequences, to clarify ambiguous preferences, and to discover anything that might be significant but previously overlooked or misconstrued. Practical experience from each step informs the next step, facilitating a better approximation to rationality.

In short, while we lack the omniscience necessary to achieve the ideal of substantive rationality, we can and do employ procedures to improve the rationality of real decisions in particular situations. The only practical criteria of rationality

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[14] For an introduction to theories of rationality, see Herbert Simon, *Reason in Human Affairs* (Stanford: Stanford University Press, 1983), and James G. March, "Theories of Choice and Making Decisions," *Society* 20 (November/December, 1982), pp. 29-39. March notes that some choice behavior is sensible even if it is not rational according to the formal outline.

stem from the behavioral theories.

Rationality in Practice

The scientific definition of the policy problem presumes that major action in the face of profound uncertainties and ambiguities is irrational. In the spirit of the standard theories, rationality depends upon a much better approximation to a complete and consistent substantive understanding of global climate change -- and that understanding, in turn, depends upon funding more basic scientific research.

However, it is procedurally rational to develop policy independently of on-going but incomplete basic scientific research -- first by implementing alternative prototype programs that are designed (in part) to discover what is feasible and preferable in the field; and then by weeding out, propagating, or supplementing the prototypes according to the test of practical experience. For example, a rational policy process could evolve cost-effective programs to reduce CO_2 emissions in selected localities, and then diffuse and adapt those programs to many other localities. In the face of profound ambiguities and uncertainties, good policy is experimental and self-correcting on the basis of experience. Thus a predictive model of the integrated Earth system is not necessary to proceed rationally.[15]

Moreover, a predictive model of the integrated Earth system is not sufficient for rational decisions on global warming. Clarifying the future consequences of alternatives is only one element of a rational policy process, which also involves the invention, evaluation, and selection of action alternatives. In addition, a rational policy process provides rules for reconciling substantive differences over the realism

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[15] In the same spirit, the historian Lynn White, Jr. in *Dynamo and Virgin Reconsidered: Essays in the Dynamism of Western Culture* (Cambridge: M. I. T. Press, 1971) criticizes the modern tendency to disparage technology development that proceeds without a deep or comprehensive understanding of the science involved. He also observes that the development of technology proceeded more or less independently of scientific research until the first half of the 19th century.

accuracy of those predictions have been included? As a caution against scientific hubris, skeptics can point to predictions a decade and a half ago that we were entering a new ice age.[16] Skeptics can also point to chaos theory, which suggests fundamental limits on the predictability of determinant but non-linear systems. For example, perturbations smaller than measurement errors can trigger massive changes in system behavior.[17] More generally, continuous modification of complex models does not necessarily improve their forecast accuracy.[18]

The basic research already funded in the Global Change Research Program will contribute some answers relevant to some policy issues. But it will also generate additional questions, which will generate additional funds and additional research, which will generate additional questions, and so on -- until the public and public officials are no longer concerned or funds are unavailable. Closure on all the important scientific issues -- not to mention the broader policy issues -- is not a realistic prospect.[19]

The economic definition of the policy problem also presumes that action in the face of profound uncertainties and ambiguities is not rational. The approach, however, is to absorb uncertainties and ambiguities through quantification and model specification -- *as if* any guesses about the future consequences of alternatives and the future preferences for evaluating those consequences had already been eliminated through research, and any remaining substantive differences had already been resolved through politics. Consider, for example, the *Forbes* article quoted above, which attributes to the Environmental Protection Agency some precise results on the energy tax increases

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[16] Brookes, *op. cit.*, p. 97, reports that one well-known global change scientist, in a 1976 book, supported the popular view that a little ice age could be coming. Brookes also asks, "could we be witnessing the 1990s version of earlier scares: nuclear winter, cancer-causing cranberries and $100 oil?"

[17] James Gleick, *Chaos: Making a New Science* (New York: Penguin, 1987).

[18] William Ascher, "The Forecasting Potential of Complex Models," *Policy Sciences* 13 (1981), pp. 247-267.

[19] The policy relevance of large scientific programs has been called into question. See Leslie Roberts, "Learning for an Acid Rain Program," *Science* 251 (15 March 1991), pp. 1302-1305.

realistic prospect.[19]

The economic definition of the policy problem also presumes that action in the face of profound uncertainties and ambiguities is not rational. The approach, however, is to absorb uncertainties and ambiguities through quantification and model specification -- *as if* any guesses about the future consequences of alternatives and the future preferences for evaluating those consequences had already been eliminated through research, and any remaining substantive differences had already been resolved through politics. Consider, for example, the *Forbes* article quoted above, which attributes to the Environmental Protection Agency some precise results on the energy tax increases required to stabilize U.S. CO_2 emissions. The boundary conditions, theoretical assumptions, data limitations, and other qualifications necessary to understand the results are not mentioned in the article, leaving the impression that we know what it would cost to stabilize CO_2 emissions.

Any such impression is unwarranted by the experience of economic forecasting in energy policy. In a comparative study published in 1978 by the National Academy of Sciences, several modeling groups used the same initial conditions and assumptions about economic growth to project the outcomes of six policy scenarios to 2010.[20] William Ascher summarized major discrepancies among the results of the modeling groups:

> In forecasting energy consumption, the base case projections for the year 1990 vary up to 19% for total energy, and by more than 50% for electricity generation. Some models project five times the consumption of oil than other models; even when the two extreme projections ... are dropped, one remaining projection of oil consumption is less than half the levels forecasted by the other two models. One model projects

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[19] The policy relevance of large scientific programs has been called into question. See Leslie Roberts, "Learning for an Acid Rain Program," *Science* 251 (15 March 1991), pp. 1302-1305.

[20] National Research Council, Committee on Nuclear and Alternative Energy Systems, Synthesis Panel, Modeling Resource Group, *Energy Modeling for an Uncertain Future*, Supporting Paper 2 (Washington, D.C.: National Academy of Sciences, 1978).

more than twice the consumption of nuclear energy than the others.[21] There are also major discrepancies in production and price forecasts. For example, under scenarios that constrain coal and shale oil development, the price of coal over the period from 1990 to 2010 increases two-fold in one model and decreases by nearly half in another model. According to Ascher, "The unavoidable conclusion is that some of the models must be wrong in quite significant ways on policy-relevant issues."[22] Quantification and formal model specifications do not eliminate uncertainties and ambiguities.

Experience also shows that complex models can be misused to lend an aura of scientific respectability to *a priori* political positions. For example, early in 1977 the Project Independence Evaluation System (or PIES model) was used by the White House energy planning staff to promote the National Energy Plan as a prerequisite to energy independence. Barry Commoner summarized the paper trail of changes made in the PIES model at the request of the staff, and concluded in part:

> By arbitrarily changing the PIES model, the White House planning staff was able to make the import-saving effect of the [National Energy] Plan appear to be more than four times larger than it had been before the changes were made.[23]

Similarly, an energy project at the International Institute for Applied Systems Analysis (IIASA) drew policy conclusions that were subsequently shown to misrepresent its models and results.[24] Quantification and formal model specifications do not guarantee scientific objectivity or political neutrality.

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[21] Ascher, *op. cit.*, p. 252.

[22] *Ibid.*, p. 253. Ascher goes on to note that "even agreement across models need not be an indication of validity; they could all be wrong. For example, all energy models predicting the 1975 levels of U.S. electricity, petroleum, and total energy consumption projected these levels higher than they actually turned out to be." For details on the forecasts of 1975 levels, see William Ascher, *Forecasting: An Appraisal for Policy-Makers and Planners* (Baltimore: Johns Hopkins University Press, 1978), Ch. 5.

[23] Barry Commoner, *The Politics of Energy* (New York: Knopf, 1979), p. 15.

[24] See Bill Keepin, "A Technical Appraisal of the IIASA Energy Scenarios," *Policy Sciences* 17 (1984), pp. 199-275. Keepin and Brian Wynne subsequently published a shorter report as commentary in *Nature* 312 (20/27 December, 1984), pp. 691-695.

Economic analysis is clearly important when applied to tractable problems in a rational decision process -- such as estimating and evaluating the cost-effectiveness of discrete pilot projects. But on the larger and less tractable problems, the assumptions of the analysis become more interesting than the results and the results are best discounted in proportion to their scope: Forecasts many years ahead and on a global scale are educated guesses at best. Economics has only begun to account for ecological and related costs of growth,[25] and to consider such basic issues as the assignment of intergenerational rights to natural resources implicit in neo-classical theory.[26]

The political definition of the policy problem presumes that heads of state and their advisers know enough to coordinate and enforce a policy on global warming at the national or international level. The presumption of knowledge is optimistic if the reference is to a narrow policy focusing on one aspect of the overall problem of global warming. The presumption is utopian if the reference is to a comprehensive policy encompassing most major parts of the overall policy problem.

A comprehensive policy that is centrally coordinated and enforced at the national or international level would not approximate substantive rationality. Among other things, such a policy would discount or ignore significant differences among localities and regions that would be differently impacted by warming. Quite apart from the additional knowledge required by such differences, any policy alleged to be substantively rational from the standpoint of the nation or the globe as a whole would be less than rational when significant local and regional differences are taken into account. However, such differences are a valuable source of diversity in an

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[25] Peter Passell, "Rebel Economists Add Ecological Cost to Price of Progress," *New York Times* (November 27, 1990), p. B5.

[26] Richard B. Norgaard and Richard B. Howarth, "The Rights of Future Generations and the Role of Benefit-Cost Analysis in the Policy Process," *Policy Sciences* (forthcoming). An earlier version of this paper was presented at the Twelfth Annual Research Conference of the Association for Public Policy Analysis and Management, October 18-20, 1990, San Francisco, CA.

experimental, self-correcting policy based on modest and discrete pilot programs.

A comprehensive policy that is centrally coordinated and enforced would not be procedurally rational. Such a policy implies that action on any separable part of the overall global warming problem would be delayed until all parts of the problem were addressed comprehensively -- even if some parts warranted earlier action. For example, action on CO_2 would be delayed until all the greenhouse gases could be addressed; action in one country would be delayed until other countries were ready to act. Such a policy would also entail enough bureaucratization to transform a change in any part, however constructive, into a difficult, costly, and unwanted disruption of the whole. It is more rational to proceed on each separate part of the global warming problem as action becomes warranted, with responsibility and accountability for the separate actions decentralized.[27]

A comprehensive policy is not likely to be politically realistic in any case. The comprehensive National Energy Plan developed by the White House energy planning staff in 1977 is a case in point. In promoting the Plan on national television, President Carter argued that the nation faced a binary choice: "The most important thing about these proposals [the National Energy Plan] is that the alternative may be a national catastrophe."[28] In a covering letter, he wrote that "it is a carefully balanced Plan, which depends for its effectiveness on all of its major parts."[29] However, Congress took apart the legislation to implement this comprehensive and "carefully balanced Plan," distributed the pieces to several

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[27] For a case study on this point, see Ronald D. Brunner, Maryann Friday, and Eugene Tierney, "The Organization and Management of a Community Energy Initiative," in Ronald D. Brunner and Robin Sandenburgh (eds.), *Community Energy Options: Getting Started in Ann Arbor* (Ann Arbor: University of Michigan Press, 1981), Ch. 2, pp. 21-70.

[28] "The Energy Problem," The President's Address to the Nation, April 18, 1977 in the *Weekly Compilation of Presidential Documents*, Vol. 13, No. 17, p. 560.

[29] The letter, dated April 29, 1977, is reproduced before the text of *The National Energy Plan* by the Executive Office of the President, Energy Policy and Planning (Washington, D.C.: Government Printing Office, 1977).

committees in both houses, considered many of the proposals more or less independently of the others, and introduced many alternatives to those proposals. The five bills that became law a year and half later only loosely resembled the initial legislation.

Of course there is a role for national leadership and centralized policy in response to global warming. But that role is limited by the number and complexity of the specific policy problems involved compared to anyone's capacity to understand them all; and by the practical political need to rely on policies that make some sense to the local, regional, and other interests that are motivated and able to participate. Policies that make sense only from the top down are difficult to enact and prohibitively expensive to enforce on national or global scales.

Finally, these dominant definitions of the policy problem presume rather than clarify the value preferences that are used as criteria for evaluation and goals for planning in any rational decision process. This is not surprising. Scientists often represent their work as independent, in principle, of any moral, ethical, or political position. Neo-classical economists start with the assumption that tastes and preferences are given, and like scientists, typically have no special training or competence in the clarification of values.[30] Appointed public officials are prone to accept the preferences of elected officials, who in turn are prone to use whatever moralizations the public will accept.[31]

Consider, for example, *Policy Options for Stabilizing Global Climate*, a draft report to Congress by the U.S. Environmental Protection Agency in February, 1989. The title expresses a preference for stabilizing the global climate. However,

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[30] See the Introduction to Robert B. Reich (ed.), *The Power of Public Ideas* (Cambridge: Ballinger, 1988).

[31] Abraham Kaplan emphasizes the dualism between moralization and vulgar pragmatism in *American Ethics and Public Policy* (New York: Oxford University Press, 1963).

stabilizing the global climate is not an end in itself but a means that begs justification in terms of other preferences. Procedural rationality is served by making those other preferences explicit in order to adapt them, if necessary, to changing circumstances.

For example, the underlying preference may be to stabilize "the" American way of life. But life in America has been conceived and lived in myriad different ways over time and across groups. Some of these ways may be less burdensome for the global ecology yet quite satisfactory for the Americans who live them -- and potentially for others as well. And the ways of life that are more burdensome for the global ecology may not be sustainable if the globe has, in fact, entered an era of rapid climate change induced by human activities on an unprecedented scale. The sustainability of American (or Western) ways of life merits explicit consideration before they are promoted or accepted as models for the Third World to emulate.

The preferences expressed or implied in any policy are not standardized and stabilized, once and for all, even though scientists, economists, politicians and others often assume or act as if they are. It is procedurally rational to reconsider the mutual adaptations among alternatives, consequences, *and* preferences as events unfold. Putting preferences on the table for discussion adds a degree of freedom in the search for policy solutions.

Test of Experience: The Energy Crisis

The energy crisis of a decade and a half ago is the most relevant experience for understanding global warming as a policy problem. On the one hand, many of the policy perspectives shaped during the energy crisis are now being applied to global warming, often by the same policy analysts and public officials. On the other hand, what was learned about the consumption of fossil fuels is directly relevant, since the consumption of fossil fuels accounts for about two-thirds of the CO_2 build-up.

Amory Lovins transformed the energy crisis into a quasi-experiment in the fall of 1976, when he proposed a "soft path" strategy as an alternative to the traditional "hard path" strategy. Part of his challenge was a definition of the policy problem that brought social goals or preferences to the fore:

> ...the energy problem should be not how to expand supplies to meet the postulated extrapolative needs of a dynamic economy, but rather how to accomplish social goals elegantly with a minimum of energy and effort, meanwhile taking care to preserve a social fabric that not only tolerates but encourages diverse values and lifestyles.[32]

National energy policy in response to the oil embargo in 1973-74 presumed the first definition of the problem, but included some efforts consistent with the second definition of the problem. Some details on the alternatives are necessary to understand the quasi-experiment and its results.

National energy policy focused on increasing supplies of energy through the expansion of centralized production and the development of more sophisticated energy technologies. Lovins characterized this as the hard path strategy. It included enhanced production from domestic fossil fuel resources, on land and offshore, to reduce dependence on oil imports; construction of the Alaskan pipeline and other means of distributing enhanced production over long distances; continued promotion of nuclear power; and, looking ahead, plants to demonstrate breeder reactor technology and technologies for synthetic fuels and shale oil production.

National energy policy also included peripheral efforts to reduce energy consumption through conservation and efficiency, and to begin a transition toward renewable energy resources (such as solar and low-head hydro) as long-term substitutes for fossil fuels and nuclear power. These efforts were consistent with the soft path. The technologies involved are typically easy to understand and use, and

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[32] Amory Lovins, *Soft Energy Paths: Toward a Durable Peace* (San Francisco: Friends of the Earth International, and Cambridge: Ballinger, 1977), p. 13. See also "Energy Strategy: The Road Not Taken?" *Foreign Affairs* 55 (October, 1976), pp. 65-96, which was the earliest work on the soft path to attract a great deal of attention.

matched in scale and geographic distribution to end-use needs. Hence they can be readily adapted to diverse local circumstances through decentralized decisions made by state and local authorities and by businesses and households -- all of whom typically have little say in centralized-supply or high-technology decisions.

The results of the quasi-experiment are rather clear, despite the difficulty of tracking the soft path through Federal energy information systems.[33] According to various estimates, covering roughly the decade following the 1973-74 oil embargo, savings in energy consumption through conservation and efficiency contributed nearly twice as much as additions to energy supply in meeting national needs. Among the additions to energy supply, the development of renewable resources contributed more than fossil fuels. Even though nuclear power was a major factor in the additions to energy supply, the nuclear power industry scaled back its plans by a factor of two over this period and is now essentially stagnant.[34] The disposal of nuclear wastes and the decommissioning of obsolete nuclear plants remain unsolved problems. And finally, the breeder reactor, synthetic fuels, and shale oil demonstration projects spawned by the energy crisis are either moribund or terminated.

In short, while Washington was preoccupied with a hard-path energy strategy, the peripheral soft path elements of national policy combined with millions of decentralized decisions turned out to make the most difference in meeting national needs. Of course these decentralized decisions were not in direct response to Lovins'

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[33] In effect, these information systems presume and institutionalize a hard path strategy. Important aspects of the soft path are virtually invisible in them. The author is indebted to Susan Iott for extensive research on the results of the quasi-experiment. Her sources include the *Monthly Energy Review*, published by the Energy Information Administration of the U.S. Department of Energy; U. S. Congress, Office of Technology Assessment, *Energy Use and the U.S. Economy*, OTA-BP-E-57 (Washington, D.C.: Government Printing Office, June, 1990); Eric Hirst *et al.*, "Recent Changes in U.S. Energy Consumption: What Happened and Why," *Annual Review of Energy* (1983), pp. 193-245; a draft paper on "Impacts of Improved Efficiency" by Lee Schipper *et al.* ; and an interview with Amory Lovins.

[34] According to the *Monthly Energy Review* (July 1989), p. 89, the total design capacity of nuclear generating units (operable and projected) dropped by one-half in one decade from 1976, the peak year, to 1986. This reflects the cancellation of plans to add to nuclear generating capacity.

challenge but to the diverse needs and circumstances faced by citizens everywhere. Rising energy prices stimulated innovation and the widespread replication of workable solutions, old and new.

The implications for global warming policy are rather obvious: We already know how to begin to reduce CO_2 emissions through the conservation and more efficient use of fossil fuels and the substitution of renewable energy resources. These are, on the whole, the least-cost alternatives for meeting our end-use energy needs according to the test of experience; and this is a more reliable basis for policy than the projections of complex models.[35] Moreover, the potential for further progress in the U.S. through conservation, efficiency, and renewable resources is still vast according to engineering estimates[36] and to standards set by the most energy-efficient industrial countries. Hence there is little uncertainty about the realism or worth of a soft path strategy to reduce the consumption of fossil fuels and to ameliorate the build-up of greenhouse gases, whether or not global warming occurs. In more fashionable terms, a soft path strategy provides "insurance" against the risk, and "no regrets" if significant global warming does not occur -- and it is procedurally rational.

The question is not the outcome of the quasi-experiment, but what has been learned from it. In various places around the country, people have learned through direct experience that decentralized energy decisions, based on modest technologies, can be both politically feasible and cost-effective in practice. For example:

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[35] See Ascher, *op. cit.* Consider also that a model is a simplified representation of the real world. Hence it necessarily excludes some factors in the real world and obscures others through aggregation. These factors typically interact with the factors explicitly represented in the model. The only reliable way to gauge the significance of these interactions for policy purposes is to act on the model in the real world and to examine the results. As engineers sometimes put it, "What hasn't been tested [in the real world] can't be trusted."

[36] See, for example, Arthur H. Rosenfeld and Daniel Hafemeister, "Energy Efficient Buildings," *Scientific American* 258 (April, 1988), pp. 78-85.

* In 1976 in Davis, California, contractors unsuccessfully fought the imposition of a municipal building code that required the use of passive solar energy in new residential construction. After learning how to comply with the code and examining the results first-hand, the contractors endorsed it as an effective means of reducing energy bills without increasing construction costs.

* In 1976, after months of controversy, Seattle decided to rely on conservation and hydro development instead of additional investments in the Washington Public Power Supply System (WPPSS) to meet its projected power needs to 1990. The early results of the decision exceeded expectations. The wisdom of the decision was reaffirmed in 1983, when WPPSS defaulted on $2 billion in bonds to construct two canceled nuclear reactors.

* Also in the mid-1970s, a nuclear engineer and planner for a Wisconsin utility unsuccessfully fought state regulations mandating least-cost alternatives to meet new electricity demand. On the basis of experience, however, he now endorses such least-cost alternatives as conservation and efficiency programs as well as small, modular, coal-fired plants that minimize risk when new capacity is needed.[37]

Note that scientific and economic research were insufficient for policy innovation in these cases. Political leadership was necessary to precipitate a conflict that challenged an obsolete policy and substituted a new one; and the direct experience of successful implementation was necessary to include those who had resisted in a new consensus. The primary role of research was to design promising policy innovations.

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[37] The Wisconsin story was told by several participants at the Retrospective Conference on Energy/Environment Management at IIASA in Austria in June, 1987. For background, analysis, and sources on the decisions in Davis and Seattle, see Ronald D. Brunner, "Decentralized Energy Policies," *Public Policy* 28 (Winter, 1980), pp. 71-91.

However, the lessons of the energy crisis have been largely ignored in Washington, D.C. For example, shortly after leaving office in 1981, two energy officials of the Carter Administration argued the case for centralized energy policy to meet the national security threat posed by Western dependence on foreign oil. According to the former Assistant Secretary of Energy for Policy and Evaluation and his principal deputy, "Energy policy is best dealt with by placing accountability in one place with capability for policy integration, international coordination, and technical judgment."[38] This is an eloquent statement of hard path hubris. When the statement was made, energy savings from millions of decentralized decisions were already undermining the cartel's international power.

National energy policy since the Carter Administration has sought to reduce the role of government but retained a preference for hard-path technologies. Research funding on renewable energy resources fell by 89% in constant dollars over the last eleven years. Meanwhile, funding for DOE's magnetic fusion program was cut only 7% and basic energy research increased by 47% in constant dollars.[39] Signs of global warming have drawn attention to a new generation of "safe" nuclear power plants to reduce CO_2 emissions.[40] More recently, amidst turmoil in the Persian Gulf, the focal point of national energy policy has been the Administration's proposals to expand drilling for oil in Alaska and offshore. Ironically, the continuing acceptance of conservation, efficiency, and renewables at the periphery of national energy policy helps avoid a direct, public debate between the hard and soft path alternatives.

National energy policy is less responsive to experience than to a view of reality

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[38] William W. Lewis and Lester P. Silverman, "The Value of Central Managing of Energy," *New York Times* (March 15, 1981).

[39] David P. Hamilton, "Energy R&D Funding Shift Urged," *Science* (7 September 1990), p. 1101.

[40] For an assessment of this alternative, see Bill Keepin and Gregory Kats, "Greenhouse Warming: Comparative Analysis of Nuclear and Efficiency Abatement Strategies," *Energy Policy* 16 (December, 1988), pp. 538-561.

tacitly accepted as a matter of faith (if not interest) in and around Washington. Essentially the same view of reality constrained the search for solutions to energy problems almost a decade and a half ago by relegating the soft path to the periphery. Lovins recognized the conflicting views of reality at the time:

> Underlying much of the energy debate is a tacit, implicit divergence about what the energy problem "really" is. Public discourse suffers because our society has mechanisms only for resolving conflicting interests, not conflicting views of reality, so we seldom notice that those perceptions differ markedly.[41]

We still seldom notice the conflicting views of reality. And essentially the same view of reality now constrains the search for effective responses to the threat of global climate change. Because that view of reality meets neither practical criteria of rationality nor the test of practical experience, alternative views still merit careful consideration.

III. Alternatives

The alternatives have been described in the scholarly literature as "ideological," "religious," and "cultural" ideas, as well as a "new consciousness" and a different "view of reality" or "world view." The differences in terms are less significant than the common allusion to basic ideas of potential value to society that are not now debated at the center of attention and policy in the U.S. Fortunately, the alternatives are debated in the scholarly literature, as we shall see by example below.

To visualize the confrontation between the alternatives and the accepted world view, imagine a cone-shaped space filled with ideas. The narrow tip of the cone represents the restricted scope of ideas that are debatable within the world view accepted at the center of attention. The broader base represents the fuller range of ideas that are debatable among scholars and others below and beyond the center of

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[41] *Soft Energy Paths, op. cit.*, p. 12.

attention. Diffusion of alternative ideas up and in toward the center is normally restricted: For example, the ideas may be filtered out because they are perceived as threatening or as foolish within the accepted world view. Occasionally, however, the less-threatening ideas are partially incorporated into the accepted world view in order to defend it. And sometimes the ideas that make up an accepted world view are displaced piecemeal through reform or wholesale through revolution.[42]

The alternative ideas include Amory Lovins' summary, in twelve succinct points, of the world view that had co-evolved with the soft path strategy.[43] Three points are especially relevant here:

* Lovins observed that "we know next to nothing about the carefully designed natural systems and cycles on which we depend," but took this as a caution "to preserve flexibility and resilience, and to design for large safety margins..." when we act.

* He contended that "energy, technology, and economic activity are means, not ends, and their quantity is not a measure of welfare; hence economic rationality is a narrow and often defective test of the wisdom of broad social choices..."

* Affirming faith in ordinary people, he contended that "concepts of central governance by a cynical elite are unworthy of the people, increase the likelihood and consequences of major errors, and are ultimately tyrannical..."

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[42] For an introduction to the theory of ideological change, which includes hypotheses on the circumstances under which various outcomes occur, see Harold D. Lasswell, Daniel Lerner, and Ithiel deSola Pool, "The Comparative Study of Symbols: An Introduction," in Pool (ed.) *The Prestige Press: A Comparative Study of Political Symbols* (Cambridge: M.I.T. Press, 1970), Ch. 1. See also Harold D. Lasswell and Abraham Kaplan, *Power and Society* (New Haven: Yale University Press, 1950), especially Chs. V and X.

[43] Ibid., pp. 12-14, from which the following selections are taken.

These points have had little influence at the center of attention after a decade and a half, but they could be revived as direct challenges to the three dominant definitions of the policy problem.

Sustainable development is another alternative idea and a good candidate for early diffusion into the center of attention on global warming. Writing in *Scientific American*, William C. Clark quotes an authoritative source, Gro Harlem Brundtland, who

> ...characterizes sustainable development as paths of social, economic and political progress that meet "the needs of the present without compromising the ability of future generations to meet their own needs."[44]

Sustainable development is relatively non-threatening to advocates of the dominant definitions and unobjectionable for ordinary citizens -- at least until the policy and program implications are spelled out. But a major function of such key symbols is to frame the debates over specific policies and programs. Moreover, preserving options for future generations makes sense from a procedurally rational standpoint. Note that a preference for intergenerational equity is also implied in the U.S. Constitution, which was established in part to "secure the Blessings of Liberty to ourselves *and our posterity*..."

Moreover, "sustainable development" is arguably the common rallying point for representatives of various alternatives to the accepted world view. Despite differences in meaning, frequent repetitions of the phrase build pressure to move sustainable development up and in to the center of attention. However, the idea has made little headway so far, if coverage in the *Washington Post* is taken as representative of the ideas at the center of attention. A computer search of the electronic edition from 1985 through May, 1991 turned up only 16 stories or op-ed pieces (of approximately 460 on global climate change) in which "sustainable" or its

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[44] William C. Clark, "Managing Planet Earth," *Scientific American* 261 (September, 1989), p. 48.

variants were used as references to a policy goal.[45] (The Worldwatch Institute deserves credit as the single most important source for directing attention to sustainability in this sample.) Nevertheless, it is conceivable that a President or member of Congress might publicly advocate sustainable development as a general aim and aspiration of policy, and thereby invite others to debate particular policies and programs in those terms.

However, it is now hardly conceivable that a President or member of Congress would publicly question the meaning of economic growth as a policy goal, along the lines of the critique by the economist Fred Hirsch in 1976.[46] Hirsch argued that social welfare declines as economic growth increases when social congestion is significant. For example, more automobiles produce more traffic jams if not gridlock in congested areas.. Under these circumstances, more automobiles reduce social welfare but count as economic growth. Similarly, additional educational credentials are needed to compete for jobs in congested markets but *not* needed to perform those jobs. Credentialism reduces social welfare but counts as economic growth. To the extent that traditional measures fail to account for these social costs of economic growth and for other ecological costs, they distort decisions and inhibit adaptation.

Moreover, it is now hardly conceivable that a President or member of Congress would take up the challenge of the historian Lynn White, Jr. in 1967. White traced the historical roots of our ecologic crisis to "the Christian dogma of man's transcendence of, and rightful mastery over, nature."

> Both our present science and our present technology are so tinctured with orthodox Christian arrogance toward nature that no solution for our ecologic crisis can be expected from them alone. Since the roots of our trouble are so largely religious, the remedy must also be

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[45] The author is indebted to Carolyn M. Hennefeld for this observation.

[46] Fred Hirsch *Social Limits to Growth* (Cambridge: Harvard University Press, 1976).

essentially religious, whether we call it that or not.[47]

Lewis W. Moncrief later argued that "Judeo-Christian tradition is only one of many cultural factors contributing to the environmental crisis."[48] Similarly, the social anthropologist Timothy C. Weiskel characterizes the environmental crisis as "a fundamental crisis in meaning, value and belief for the industrial world..."[49]

Yet we will need extraordinary political leadership on global climate change if, as these scholars contend, the dominant culture constitutes the problem rather than the locus of policy solutions. Global climate change could be another symptom of a culture that creates science-based technologies powerful enough to threaten its own survival. Before the atom bomb, John Dewey wrote that "A culture which permits science to destroy traditional values but which distrusts its power to create new ones is a culture which is destroying itself." Abraham Kaplan added the qualification that "Not science itself but the leaden shield that insulates it from ethics and politics is deadly."[50] One task of leadership is to reintegrate science, ethics, and politics in the on-going search for practical solutions to problems created by science-based technology.

This suggests an alternative definition of the policy problem: In the *cultural definition*, the policy problem is a culture that fails to integrate science-based technologies for mastering nature with ethical and political constraints on their use, and thereby jeopardizes its own sustainability. Hence reasoned action begins with leadership that challenges selected elements of the dominant culture and directs

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[47] Lynn White, Jr., "The Historical Roots of Our Ecologic Crisis," *Science* 155 (10 March 1967), pp. 1203-1207; quotations at pp. 1206, 1207, respectively.

[48] Lewis W. Moncrief, "The Cultural Basis for Our Environmental Crisis," *Science* 170 (30 October 1970), p. 508.

[49] "Culture Values and Their Environmental Implications: An Essay on Knowledge, Belief and Global Survival," p. 2. This paper (dated 17 February 1990) was presented at the 1990 Annual Meeting of the American Association for the Advancement of Science in New Orleans.

[50] Kaplan quotes Dewey and adds his own qualification in *op. cit.*, p. 103.

attention to alternatives. The evidence in support of this construction of the policy problem includes the three dominant definitions of the policy problem, which reflect and reinforce cultural barriers to effective policy. The evidence also includes the inability to recognize, at the center of attention in Washington, what worked in response to the energy crises and what did not.

Summary and Conclusion

The perspectives brought to bear on defining the policy problem are important -- particularly the perspectives that bridge differences of personality, interest, and class and may therefore be designated "cultural". The dominant culture presumes, among other things, that:

* Scientific research is a prerequisite for action on a major policy problem like global climate change.

* Rational action depends on long-term, broad-scope forecasts of the cost-effectiveness of policy alternatives.

* Big policy problems like global climate change require big (centralized and comprehensive) policy solutions.

Moreover, the dominant culture presumes that we *can* reduce scientific uncertainty, forecast accurately over the long term and with broad scope, and achieve national or international consensus on comprehensive policy solutions -- and that we *can* do so in a timely fashion. This chapter has outlined the case that these presumptions of the dominant culture are misleading, at best, as a basis for policy in response to the threat of global climate change. If so, then the dominant culture constitutes the policy problem rather than the locus of effective solutions.

From the standpoint of rationality, the dominant culture is the policy problem

because it circumscribes the search for effective policy solutions. While we wait for reductions in scientific uncertainty, for improvements in the projected cost-effectiveness of alternatives, and for agreement on comprehensive national and international policies, we forego modest steps toward ameliorating the buildup of greenhouse gases and learning how to cope with potentially-serious disruptions from global warming. Modest steps are procedurally rational despite (and because of) uncertainties and ambiguities. The decentralized energy strategy that was unwittingly field-tested and proven cost-effective in the aftermath of the energy crisis is the appropriate model for taking the first modest steps to reduce CO_2 emissions. The decentralized energy strategy is also the appropriate means for learning how to cope more effectively with diverse local and regional disruptions if global warming occurs. Yet the dominant culture marginalizes the decentralized energy strategy or leaves it in the dark.

From the standpoint of aspirations for democracy, the dominant culture is the policy problem because it reinforces the particular interests of centrally-placed scientists, economists, and public officials, who are not particularly interested in providing the public with alternatives. In any realistic view of democracy, the people are powerless unless their leaders give them a choice among alternatives on the most fundamental issues.[51] The fundamental issue *not* before the public is *whether* a loose coalition of scientists, economists, and public officials should coordinate and enforce a comprehensive policy on global climate change. Instead, such secondary issues as *when* such a policy is prudent, and *what* that policy should be, dominate the public agenda. Thus the dominant culture obscures the decentralized and incremental alternatives to centralized and comprehensive policy.

Political leadership is necessary to address the problem. The recommended goal for potential leaders is to enlarge the perspectives brought to bear on the issue

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[51] E. E. Schattschneider, *The Semisovereign People: A Realist's View of Democracy in America* (Hinsdale, IL: Dryden Press, 1975), especially the last chapter.

of global climate change, and to make the presumptions of the dominant culture controversial in the process. More specifically:

- The first objective is to educate the public and public officials on the energy policy experience as the relevant precedent. This includes distinguishing the centralized and decentralized energy alternatives, and developing the empirical and normative bases for public evaluation of these alternatives.

    - The empirical basis includes evidence on what each alternative did and did not accomplish, and how; the normative basis includes opportunities for public participation (along with the experts) in the making of policy decisions under each strategy.

- The second objective is to use improved public understanding of the energy policy experience (past and on-going) to open up the larger cultural issues. For example, a case can be made that this experience runs contrary to the presumptions of the dominant culture. In particular:

    - Big policy problems can be factored geographically into their different parts to facilitate multiple, independent, and quasi-experimental searches for solutions that can be adapted elsewhere, if proven successful.

    - Searches for solutions to parts of the problem can avoid global and long-term uncertainties and ambiguities, which are largely intractable, and can rely on existing analytical capabilities to select and evaluate trial solutions of modest scope.

    - Through trial and error in multiple quasi-experiments, we can evolve better solutions without understanding the fundamental scientific principles involved. Existing scientific knowledge can be used select

better trials and conduct better evaluations.

Of course the rich literature on alternatives to conventional culture, selectively reviewed in Sec. III above, provides the basis for opening up many more cultural issues.

The audience for good leadership under these recommendations is not limited to the general public but includes various experts as well. The centrally-placed experts in particular can be expected to mount a vigorous public defense of their presumptions, and should be encouraged to do so.

Are the recommended goal and objectives both realistic and worthwhile? On the question of realism, we know historically that opinions on policy issues and the cultural presumptions behind them are subject to change. (The end of the Cold War provides vivid examples, in both the East and the West.) The level of crisis conditions the pace of change; leadership shapes the direction of change and, at its best, channels heightened emotional energies into constructive directions that eventually alleviate the causes as well as the symptoms of crisis.[52] Appeal to the energy policy experience is crucial because changes in opinions and cultural presumptions (as opposed to their reinforcement) depend on evidence that is perceived as more than propaganda.[53] The question is not whether leadership can effect change, but whether potential leaders will accept the inevitable and uncertain risks of leadership.

On the question of worth, the recommended goal and objectives appeal to two basic aspirations broadly shared within the American political system, rationality and

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[52] See H. D. Lasswell and A. Kaplan, *Power and Society* (New Haven: Yale University Press, 1950), especially Chs. VI and X.

[53] See *ibid.*, p. 113: "Propaganda in accord with predispositions strengthens them; propaganda counter to predispositions weakens them only if supported by factors other than propaganda." Factors other than propaganda include evidence and experience.

democracy. For example, Americans value the competitive marketplace of ideas, which is protected by the First Amendment to the Constitution, because it facilitates the testing and selection of better ideas (rationality) and because it hinders the undue concentration of political power (democracy).[54] Consequently, those who differ on specific issues -- for example, whether a particular response to the threat of global climate change is a net cost or prudent insurance -- can nevertheless appeal to their common interest in more rational and democratic decisions and attempt to resolve their differences on that basis. Climate change policy, we believe, can become more rational if the search for solutions is broadened beyond the dominant culture and if preferences (including policy goals) are made explicit and opened up for discussion. Policy can become more democratic if the people are given a choice between important alternatives on the most fundamental issues.

Acceptance of the recommended goal and objectives for political leadership does not entail advocacy of any particular outcome, either at the level of climate change policy or at the level of culture. Acceptance does require that leaders draw a sharp distinction between centralized and decentralized energy strategies, and between the dominant (or conventional) culture and the subordinate (or non-conventional) culture. Without making the distinction sharp, the distinction is not likely to get across to the general public. However, the synthesis that would eventually emerge, in dialectical fashion, from the confrontation of sharply-drawn alternatives cannot be predicted with confidence or in detail, nor is there much point in trying to predict it. The marketplace of ideas tends to deliver outcomes that are "messier," as well as more rational and democratic, than the sharply-drawn inputs of advocates on either side.

In conclusion, it is worthwhile to stress the power of ideas in a culture that prizes objectivity and emphasizes the material over the symbolic factors in social

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[54] See the Commission on Freedom of the Press, *A Free and Responsible Press* (Chicago: University of Chicago Press, 1947).

change. Objectivity presumes that knowledge of the real world can be independent of the viewpoint of the observer. Yet Thomas Kuhn has shown that even scientific knowledge is contingent upon a paradigm, which consists of basic assumptions scientists share and is subject to change through a scientific revolution.[55] Moreover, Herbert Simon recognized the main consequence of the fact that no one is omniscient.

> The capacity of the human mind for formulating and solving complex problems is very small compared with the size of the problems whose solution is required for objectively rational behavior in the real world.... [T]he first consequence of [this] principle of bounded rationality is that the intended rationality of an actor requires him to construct a simplified model of the real situation in order to deal with it."[56]

Experience often confirms that there is a difference between the expected consequences of an action in the simplified model and the actual consequences of that action in the real world. In short, there is a significant difference between "The World Outside and the Pictures in Our Heads."[57]

The upshot is that the ideas shaping the simplified, subjective models on which we act are important. Recall Lord Keynes' famous conclusion to the book that revolutionized macroeconomics:

> ...the ideas of economists and philosophers, both when they are right and when they are wrong, are more powerful than is commonly understood. Indeed the world is ruled by little else. Practical men, who believe themselves to be quite exempt from any intellectual influences, are usually the slaves of some defunct economist.[58]

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[55] T. Kuhn, *The Structure of Scientific Revolutions* 2nd ed. (Chicago: University of Chicago Press, 1969).

[56] H. A. Simon, *Models of Man* (New York: Wiley, 1957), p. 199.

[57] This is the title of Ch. 1 in Walter Lippmann, *Public Opinion* (New York: The Free Press, 1965), first published in 1922.

[58] J. M. Keynes, *The General Theory of Employment, Interest, and Money* (New York: Harcourt, Brace, & World, 1965), p. 383. See also R. Reich, *The Power of Ideas* (Cambridge: Ballinger, 1988), especially the Introduction.

CHAPTER 2

THE ENERGY PRECEDENT

Susan E. Iott

The energy crisis of the 1970s is the most relevant precedent for understanding global climate change as a policy problem, and for taking steps to cope with it. First, the centralized strategy invoked more or less as a reflex after the first oil embargo was challenged, within a few years, by a decentralized strategy. These strategies are representative, respectively, of the dominant conventional culture and the non-conventional alternatives to that culture. These different perspectives have been brought to bear on the climate change problem, often by the same policy analysts and public officials. Second, the strategies can be evaluated on the basis of experience. Experience is the best source of insight into what was overlooked or misconstrued in the perspectives brought to bear on a policy problem. We do not yet have sufficient experience with global climate change itself to correct our perspectives on the realism and worth of the alternatives. Finally, what can be learned about the alternative energy strategies is directly relevant to the build-up of CO_2, a major "greenhouse" gas that contributes to global warming. The consumption of fossil fuels accounts for about two thirds of the CO_2 build-up, and the energy precedent shows how to reduce that build-up without compromising other values.

This chapter documents and evaluates the energy policy experience as a precedent for climate change policy. The analysis is intended to be useful to those potential leaders who share the goal of opening up the search for solutions to the climate change problem. In particular, it provides evidence and specific anecdotes

that are especially useful in communicating non-conventional ideas to the public,[1] as well as references to additional literature relevant to the purpose.

The first section of this chapter describes the energy crisis and America's policy responses as a quasi-experiment that provided an opportunity to evaluate alternative energy strategies: A centralized "hard path" strategy and a decentralized "soft path" strategy. The second section documents what the alternative strategies contributed to meeting the nation's energy needs, and other significant consequences including how decisions were made. The third section considers the lessons that can be drawn from the energy policy precedent, and the extent to which those lessons have not been learned.

I. The Quasi-Experiment

The Energy Crisis

The energy crisis was triggered by an oil embargo in October, 1973, following a few weeks of war in the Middle East and years of gradual but profound change in the international oil industry.[2] The Organization of Petroleum Exporting Countries (OPEC) embargoed oil shipments from October 18, 1973 to March 18, 1974. During that period, the price of foreign crude oil rose from $3.00 to $11.65 per barrel, an increase of about 400%. The cost of gasoline for automobile drivers in the United States rose from 33 cents to 56 cents per gallon. As shown in Figure 2.1, the real price of crude oil in the United States leveled for several years, then rose rapidly again in 1979, 1980, and 1981. Thereafter they began to decline to present low

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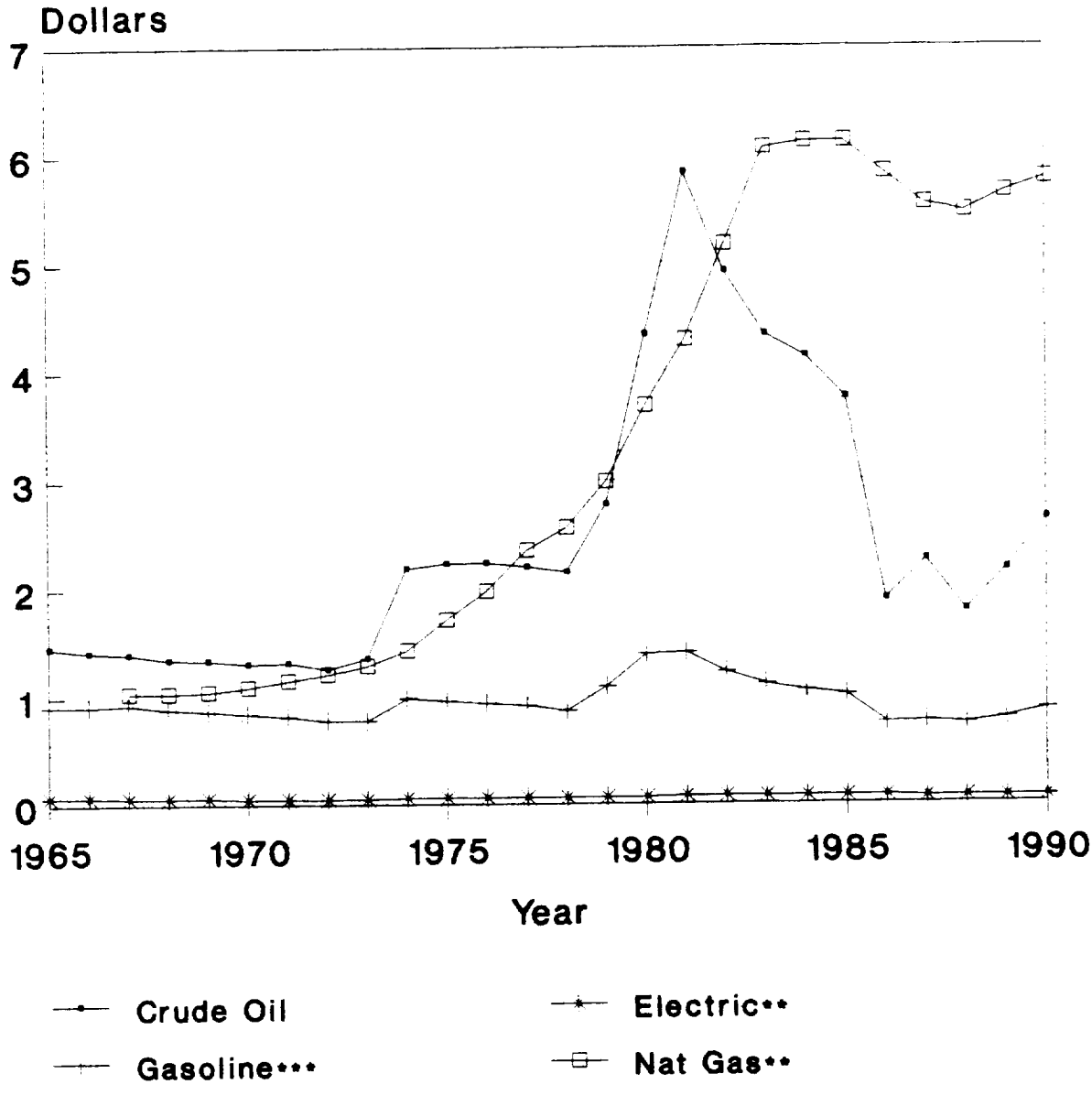
[1] On the communication of policy information in anecdotal or story-like form, see R. D. Brunner, J.S. Fitch, J. Grassia, L. Kathlene, and K. Hammond, "Improving Data Utilization: The Case-Wise Alternative," *Policy Sciences* 20 (1987): 365-394.

[2] For background on the energy crisis, see Congressional Quarterly Inc., *Energy Policy* (Washington: Congressional Quarterly Inc., 1979). On the changes in the oil industry, see J. Blair, *The Control of Oil* (New York: Pantheon Books).

Figure 2.1
Energy Prices 1965-1990
Constant 1982 Dollars per unit*



Source: EIA
*$/mil Btu; $/kwh; $/gal; $/1000 cu ft
** Avg Residential prices *** Leaded

levels. A similar pattern of increases and levelling occurred for the real consumer prices of residential electricity, residential natural gas, and gasoline (leaded regular prices).

Rapid price increases put pressure on households, businesses, and governments at all levels to adapt; high prices remained a problem wherever and whenever adaptation was difficult. These problems were compounded by shortages of gasoline at some stations and long lines at others during the periods of rapid oil price increases. Shortages of natural gas and other energy supplies occurred on a local or regional basis at various times. The crisis stimulated widespread and intense demands for immediate action; reflection on the wisdom of available courses of action was secondary. Conversely, declining and relatively low energy prices over the last decade, together with relatively reliable energy supplies, have encouraged complacency that may set the stage for another energy crisis. In general, rapid or significant changes in the environment, together with a limited capacity to adapt, are the factors precipitating crisis.[3]

Alternative Strategies

President Nixon announced Project Independence in November, 1973. Although virtually every national interest was affected by the energy crisis, the primary goal of Project Independence was to make the United States energy self-sufficient by 1980. The goal was later scaled back to freedom from unreliable foreign oil supplies by 1985. However operationalized, the goal of energy independence was a matter of consensus, and no doubt selected as the primary goal for that reason. The goal implied that the primary policy problem was the vulnerable supply of foreign oil, and that achievement of energy independence would restore the

[3] Leadership based on good policy intelligence may be sufficient to avoid or ameliorate crises. Signs of the coming crisis in the early 1970s, including sporadic and localized shortage of gasoline in the United States well before the embargo, were not fully appreciated by public officials in Washington. Historical failures of policy intelligence are potentially important but largely neglected topics in global change research. .

nation to a satisfactory position.

The quest for energy independence in the post-embargo 1970s focused on increasing the supply of energy through expansion of domestic production and long-distance distribution of energy from fossil fuels and from nuclear power. Both the Ford and Carter energy plans continued this focus on increasing domestic supply, although these plans included increasingly comprehensive efforts to curb national energy consumption. Perhaps the most intense political struggles focused on domestic oil price controls and natural gas price regulations, which were gradually decontrolled and deregulated in the late 1970s and early 1980s to boost domestic production and reduce demand. Conversion to coal, particularly in new utilities, was encouraged because domestic coal reserves were relatively large. The nuclear power industry was assisted in various ways, including an extension of the Price-Anderson Act which limited the industry's liability for accidents and efforts to streamline the licensing process for nuclear plants. The crisis expedited passage of the Trans-Alaska Pipeline Authority Act, which had been stalled in Congress. There were also proposals to construct another pipeline over the Rockies to deliver oil to the Midwest and East Coast. In addition, the Federal government authorized enhanced production from the Naval Petroleum Reserves and creation of a strategic oil reserve to boost domestic supplies in case of another embargo.

For the longer-term future, national energy policy focused on ensuring energy supplies through research, development, and demonstration of new technologies for large-scale production facilities that could easily be integrated into the energy system. In 1970, the Federal government agreed to finance a demonstration plant to assist in the commercialization of breeder reactor technology, which produces plutonium fuel through the fission of uranium. A group of utilities operating as the Breeder Reactor Corporation also invested in the plant to be located on the Clinch River in Tennessee. After the second oil embargo in 1979, the Federal government established the Synthetic Fuels Corporation to bring technologies "from the pilot plant stage and into full scale production by reducing the financial risks to developers

of 'pioneer' plants."[4] The corporation received $18 billion in initial funding and considerable autonomy to achieve a production goal of 2 million barrels of oil equivalent per day by 1992.[5] The goal of the legislation was to fund 30-40 synthetic fuel projects at a cost of $1-$2 billion each.[6] It invested in production of oil from shale, the production of gas and liquid fuels from coal, and fuels from heavy oil and tar sands. For the very long-term, the Federal government invested in research and development of fusion reactor technology. Plans and money for fusion research continue in the 1990s; currently, DOE plans to move the fusion program from the research phase to a "goal-oriented energy development program."[7] To that end, $273 million was spent in 1991 and $337 million have been requested for two demonstration projects; one is the International Thermonuclear Experimental Reactor (ITER) and the other is the Tokamak Fusion Test Reactor.

The energy crisis became a quasi-experiment when, in the fall of 1976, Amory Lovins proposed a fundamental alternative in an article in *Foreign Affairs*, other papers, and Senate testimony.[8] Lovins challenged the focus of national energy policy as a "hard path" strategy, and proposed an alternative "soft path" strategy. He alleged that national leaders had misconstrued the energy problem:

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[4] D. Costain, "Energy Policy and Boom/Bust Cycles: Government Action and Instability in the Development of Oil Shale," *Policy Studies Journal* 13 (1984): 409.

[5] United States House of Representatives Subcommittee on Economic Stabilization of the Committee on Banking, Finance and Urban Affairs, *Contributions of Renewable and Alternative Fuels to Long-Term U.S. Energy Security* 101st Cong., 2d Sess., Serial No. 101-77 (Washington: GPO, 1990) 143 (Fifth Annual Report of the Synfuels Corporation) (Hereafter, *Contributions of Renewables*).

[6] *Contributions of Renewables* 141.

[7] United States Department of Energy, *Posture Statement and Fiscal Year 1992 Budget Overview* (Washington: GOP, 1991) 52-53.

[8] See Amory Lovins, "Scale, Centralization, and Electrification in Energy Systems." Prepared for the *Future Strategies of Energy Development* symposium, Oak Ridge Associated Universities on 20-21 October 1976; and United States Congress, Senate Select Committee on Small Business and Committee on Interior and Insular Affairs, *Alternative Long-Range Energy Strategies* 94th Cong., 2d Sess., Serial No. 94-47 (Statement and Exhibits of Amory Lovins).

> ...the energy problem should be not how to expand supplies to meet the postulated extrapolative needs of a dynamic economy, but rather how to accomplish social goals elegantly with a minimum of energy and effort, meanwhile taking care to preserve a social fabric that not only tolerates but encourages diverse values and life styles.[9]

Thus Lovins attempted to make the domestic energy system problematic, and to put the broader goals affected by that system on the table for discussion.

Among other things, Lovins believed the "hard path" strategy to expand energy supplies by reliance on centralized decisions to construct and manage large-scale, sophisticated technologies would adversely affect broader social goals. Such technologies allow little margin for human error, and are vulnerable to massive disruption from small technical errors or acts of sabotage. For example, a break in an oil, natural gas, or high-voltage power line can have serious consequences in a highly-centralized system. Politically, the "hard path" would concentrate power in the hands of centralized elites and restrict opportunities for ordinary citizens to participate in making decisions. The "hard path" also would be less economically efficient, less environmentally benign, and less tolerant of social diversity than the "soft path."

Lovins believed that the "soft" path could meet our energy needs "elegantly with a minimum of energy and effort" and without compromising other goals, including security, democracy, efficiency, environmental protection, and social diversity. The "soft path" alternative relied on improvements in energy conservation and efficiency to reduce energy consumption, and on the development of renewable energy resources (such as solar and low-head hydro) as long-term substitutes for fossil fuels and nuclear power. The technologies involved are typically easier for the ordinary citizen to understand and use, and are "appropriate" in that they are

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[9] Amory Lovins, *Soft Energy Paths: Toward a Durable Peace* (San Francisco: Friends of the Earth International, and Cambridge: Ballinger, 1977): 13. See also, "Energy Strategy: The Road Not Taken?" *Foreign Affairs* 55 (October, 1976): 65-96, which was the earliest work on the soft path to attract a great deal of attention.

matched in scale and geographic distribution to end-use needs. Hence they can be readily adapted to diverse local and regional circumstances through decentralized decisions made by local, state, and other authorities as well as by private businesses and households -- all of whom typically have little say in centralized-supply and high-technology decisions.

Although Lovins' "soft path" attracted a great deal of interest in the Senate and elsewhere in Washington in the fall of 1976, it was essentially absorbed and neutralized by the Energy Research and Development Administration and by many other established interests with a stake in national energy policy. Nevertheless, the Federal government approved and implemented a variety of means consistent with the "soft path," for reasons that had more to with energy independence and pork-barrel politics than with the broad social critique and goals of the "soft path." These means included regulations to improve the energy efficiency of automobiles, appliances, and buildings; loans and grants for weatherization of hospitals, schools, government buildings, and the homes of the low-income and elderly; tax credits for conservation and the installation of equipment to use various renewable energy resources, including geothermal, solar, and wind; and grants for state and local energy programs.

Priorities

The quasi-experiment was biased in favor of the "hard path" strategy. The consensus goal was clearly energy independence, not the other goals affected by the effort to achieve energy independence. The effort presumed that the task was to restore the domestic energy system after the shift in the international control of oil, not to restructure the domestic energy system to meet other goals as well as energy needs. The effort to achieve energy independence relied primarily on expanding centralized sources of supply, and relegated conservation, efficiency, and renewables to a peripheral position. The Carter Administration's National Energy Plan, introduced in April, 1977, was less imbalanced with respect to supply and demand

measures and with respect to fossil and renewable resources, but it also attempted to centralize more control in the Federal government at the expense of the energy industries. In the end, much of it was rejected by Congress.

While the general intent was to make the "hard path" work, it is not clear how much of an advantage "hard path" measures had over "soft path" measures in terms of concrete help from the Federal government. The analytical problem is formidable because of the number and variety of actions taken, differences in administrative effectiveness, and incommensurables. For example, it is difficult to estimate the worth of the Price-Anderson Act limiting liability for the nuclear industry, compared to a Federal mandate for states to consider demand-management techniques for regulated utilities.[10] It is beyond the scope of this study to assemble reliable data on the magnitude of the "hard path" advantage.

However, the Department of Energy's civilian research and development budget is of some help in this connection, because comparable figures are readily available.[11] As shown in Figure 2.2, the total investment increased from 1973 to a peak in 1981, the last Carter Administration budget. The investment in conservation and renewables increased from nothing in 1973 to 40.2% of the total in 1981. Nevertheless, over the period 1974-1981 inclusive, cumulative additional investments in "hard path" technologies (fossil and nuclear energy and general science) exceeded cumulative additional investments in "soft path" technologies (conservation and renewables) by a small amount. The DOE budget for civilian research and development declined sharply after 1981, as did the funding allocated to research on soft path energies.

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[10] For an attempt to estimate the dollar value of subsidies to energy sources, see H. Richard Heede and Amory B. Lovins, "Hiding the True Costs of Energy Sources," *The Wall Street Journal* (September 17, 1985), p. 28.

[11] R. Sutherland, "An Analysis of the U.S. Department of Energy's Civilian R&D Budget" *The Energy Journal* 10 (1989): 36-53.

Figure 2.2
Priorities: DOE Civilian R&D Budget by Office
Millions of 1982 Dollars

	1973	1974	1975	1976	1977	1978	1979	1980	1981
Conservation and Renewable	0.0	35.2	166.9	302.7	707.3	955.6	1171.8	1651.2	1786.0
Electricity Energy System	0.0	0.0	0.0	0.0	0.0	121.9	120.9	117.9	118.8
Energy Conservation R&D	0.0	16.7	57.2	104.6	248.1	228.5	287.5	308.1	311.2
Geothermal	0.0	11.1	42.2	49.1	75.8	145.4	167.9	143.5	166.0
Hydropower	0.0	0.0	0.0	0.0	3.0		6.4	17.5	3.4
Solar Energy	0.0	7.4	67.5	149.0	380.4	459.8	589.1	1064.2	1186.6
Fossil Energy	99.0	163.0	526.1	584.8	827.6	951.5	849.8	848.3	873.7
Nuclear Energy	596.0	585.2	775.7	824.1	1190.2	1218.8	1113.2	1017.5	869.1
General Science									
High Energy Physics	247.7	233.0	229.7	244.1	252.6	260.4	248.1	255.5	374.7
Nuclear Physics	57.2	70.9	79.3	86.5	95.4	95.7	95.4	95.4	132.8
Total Civilian R&D	1529.3	1635.2	2465.1	2706.1	3845.6	4362.0	4379.1	4201.6	4438.0
Conservation and Renewable Percent of Total Funding	0.0	2.0	6.8	11.2	18.4	21.9	26.8	39.3	40.2

Source: Ronald J. Sutherland, "An analysis of the U.S. Department of Energy's Civilian R&D budget." The Energy Journal 10: (1989) 42.

Figure 2.2 (cont.)

	1982	1983	1984	1985	1986	1987	1988
Conservation and Renewables	837.4	648.1	586.0	591.8	523.0	463.3	240.4
Electricity Energy System	59.8	41.2	40.7	34.4	25.2	23.7	11.6
Energy Conservation R&D	151.9	128.5	139.1	157.4	149.4	137.4	66.1
Geothermal	69.9	55.4	28.1	26.6	23.3	17.7	13.1
Hydropower	3.0	1.9	1.9	0.7	0.4	0.4	0.0
Solar Energy	552.8	421.1	376.2	372.7	324.7	284.1	149.6
Fossil Energy	566.8	299.2	307.2	313.4	386.7	383.2	394.3
Nuclear Energy	819.4	675.4	577.3	370.0	328.4	275.0	264.6
General Science							
High Energy Physics	364.5	414.8	438.3	486.0	432.6	424.6	467.9
Nuclear Physics	133.9	131.9	151.3	162.7	143.8	184.4	202.4
Total Civilian R&D	3492.5	2950.6	2867.7	2737.6	2570.5	2505.9	2375.1
Conservation and Renewable Percent of Total Funding	24.0	22.0	20.4	21.6	20.3	18.5	10.1

Source: Ronald J. Sutherland, "An analysis of the U.S. Department of Energy's Civilian R&D budget." The Energy Journal 10: (1989) 42.

The Reagan Administration deemphasized Federal involvement in energy generally, and in conservation and renewables in particular.[12] The Administration cut personnel assigned to conservation and renewable programs. While Congress consistently refused to cut appropriations for conservation and renewables programs as much as the Administration wanted, the Administration did not spend those appropriations on time and did not keep contracts on schedule. Along with personnel and budget cuts, the reorganization of DOE eliminated or merged some offices with conservation and renewable responsibility.[13]

II. Results of the Quasi-Experiment

This section examines the results of the quasi-experiment. The hard and soft path strategies are compared on the basis of how much they contributed to meeting national energy needs in the decade or more after the first oil embargo. Then each strategy is examined in terms of some other values at stake in energy policy through the analysis of cases.

Meeting National Energy Needs

The hard path strategy contributes to meeting national energy needs by producing additional energy from fossil and nuclear fuels. The soft path strategy contributes by producing additional energy from renewable energy sources and, more importantly, through improvements in energy conservation and efficiency. Conservation and efficiency are contributions in that we meet our national energy needs without having to consume (or produce) more energy: A barrel of oil saved is equivalent to a barrel of oil produced. Both conservation and efficiency result in savings in energy consumption, relative to the amounts that otherwise would have

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[12] M. Kraft and R. Axelrod, "Political Constraints on Development of Alternative Energy Sources: Lessons from the Reagan Administration" *Policy Studies Journal* 13 (1984): 322.

[13] According to Kraft and Axelrod, p. 325, these changes could not be justified as "improved management and decision-making."

been consumed. However, improvements in conservation stem from a change in behavior, such as setting the thermostat at a lower level; improvements in efficiency stem from changes in technology, such as insulation that keeps the indoor temperature at the same level by burning less fuel.

The contributions of hard path are much easier to estimate than the contributions of the soft path. One reason is that the data systems of the Energy Information Administration (EIA) of the DOE reflect and reinforce the hard path viewpoint; another is that it is easier to track production and consumption through large, centralized facilities than through small, decentralized facilities which are much more numerous. For example, the natural gas company can report how many cubic feet flowed past a meter on a main trunk line, but the homeowner typically does not know how much natural gas was saved by the passive solar architecture of her home. Solar and other decentralized sources of additions to energy supply typically show up as energy savings. In any case, the Federal government has not been particularly interested in collecting or disseminating information on the soft path. In 1984, the EIA terminated the serial, *Energy Conservation Indicators*, but even that publication did not attempt to estimate the aggregate contribution of conservation, efficiency, and renewables to meeting national energy needs.

Hence the principal difficulty in assessing the relative contributions of the two strategies is the lack of a definitive estimate of energy savings. As the first step toward making an estimate of energy savings, consider a counterfactual question: How much energy would have been consumed over the period of interest if the energy crisis and its consequences (including changes in national energy policy) had not occurred? If this question could be answered, then energy savings could be calculated as the difference between what would have been consumed and what was actually consumed according to data from the EIA. The logic is straightforward, but estimating what would have been consumed requires some assumptions.

As the second step, assume that the energy efficiency (or inefficiency) of the

U.S. economy in the years before the oil embargo of 1973 had remained constant over the years after the oil embargo. Assume further that the appropriate measure of inefficiency before the oil embargo is the total amount of energy consumed per constant dollar of gross national product (GNP). This is a measure of inefficiency because a higher ratio means that more energy was consumed for each constant dollar of GNP. With these assumptions, it is easy to estimate what would have been consumed in post-embargo years if the ratio had remained constant. The logic is summarized as follows:

If $EC_y / GNP_y = (EC / GNP)_a$,

Then $EC_y = GNP_y \times (EC / GNP)_a$,

Where

EC_y is estimated Energy Consumption in post-embargo year y,

GNP_y is observed GNP (constant $) in post-embargo year y, and

$(EC / GNP)_a$ is observed average inefficiency ratio over pre-embargo years.

Notice that ECy takes into account the fluctuations in GNP in the post-embargo period.[14] A smaller GNP means less energy consumption; a larger GNP means more.

As the third step, consider the data necessary to estimate how much energy would have been consumed without improvements in conservation and efficiency. Figure 2.3 graphs the EIA time series on Total Energy Consumption per GNP, in thousands of British thermal units per constant 1982 dollar over the period 1949 through 1973, the pre-embargo years.[15] Notice that the annual ratios vary little from the trend, and that the trend itself is rather flat. The minimum ratio is in ; the maximum is 27.49 in 1970, only 10% more than the minimum. These properties of the data justify using the average of the annual ratios over the pre-embargo period,

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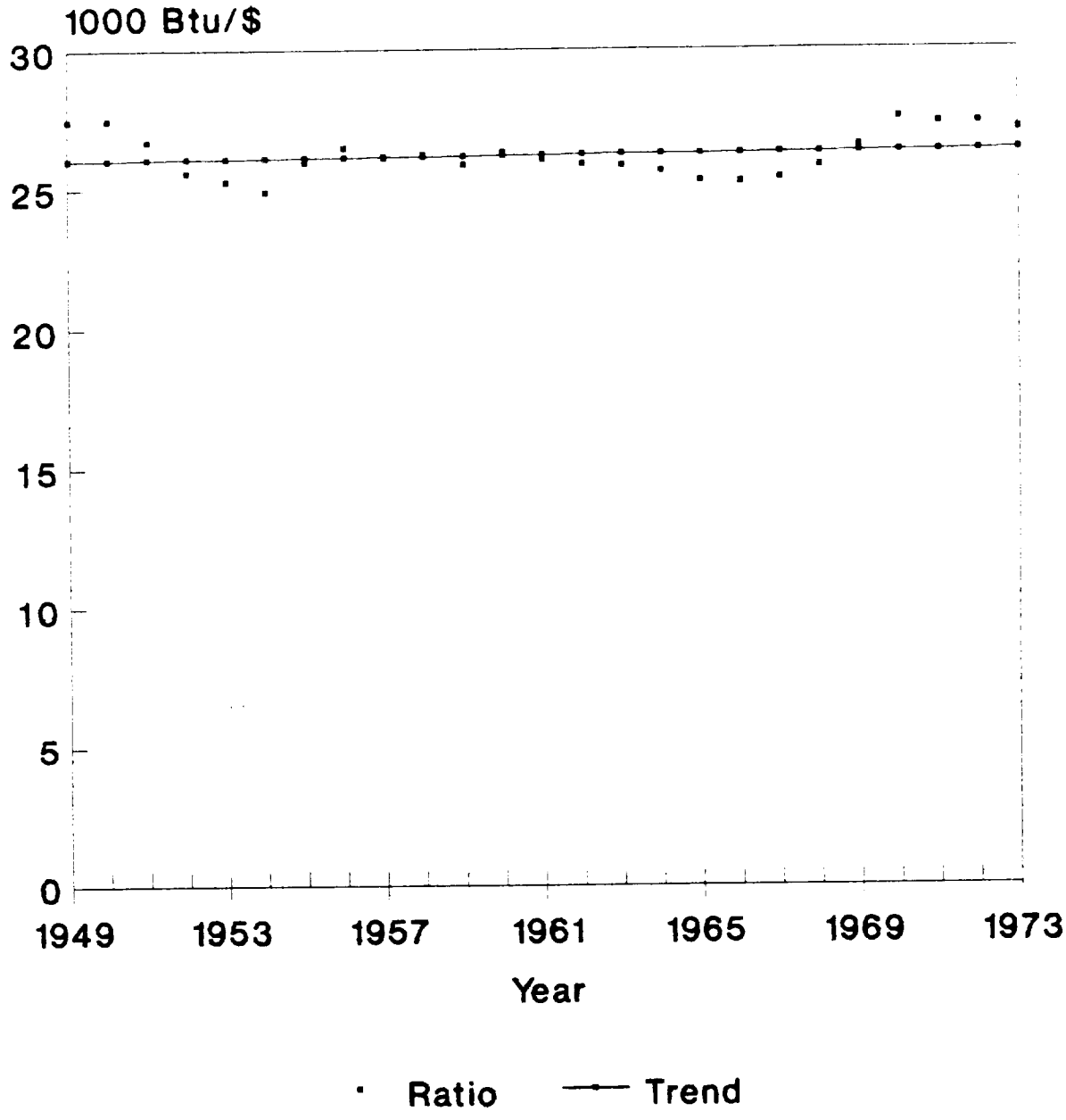
[14] See Energy Information Administration *Annual Energy Review 1988* (Washington: GPO, 1989) 291, for GNP in constant 1982 dollars.

[15] Energy Information Administration, *Annual Energy Review 1988*, Table 8, p. 25.

Figure 2.3
Energy Inefficiency Ratio
1000 Btu/$ GNP*



Source: EIA
*Constant 1982 dollars

26.19 Btus per 1982 dollar of GNP, to estimate how much energy would been consumed without improvements in conservation and efficiency in the post-embargo years. These estimates are higher than actual consumption because there were, in fact, improvements in conservation and efficiency in the post-embargo years.[16] Estimated energy savings in each post-embargo year is simply the difference between estimated and actual energy consumption for that year.

Figure 2.4 pulls together the contributions of the individual hard and soft path sources to meeting national energy needs in the post-embargo period, 1974-1986.[17] The additions are calculated by subtracting out the level of the energy source in the pre-embargo base year, 1973, to emphasize changes after the embargo. Notice that the "additions" for oil and natural gas are negative, which means that production of these nonrenewable resources declined. These negatives are set to zero in calculating total hard path additions, because the declines are picked up in savings, and therefore should be counted only once. Notice also that hard path additions to supply come almost entirely from nuclear and coal. Soft path additions come almost entirely from energy savings.

The results of the quasi-experiment (in terms of meeting national energy needs) are summarized by comparison of the cumulative additions over the post-embargo that are attributable to the hard and soft paths respectively. As shown in the column on the far right of Figure 2.4, cumulative additions attributed to the hard path are about 70 Quads. Cumulative additions attributed to the soft path are 121 Quads. These cumulative additions are proportional to the shaded areas in Figure 2.5, which graphs the annual additions, by hard and soft path, from Figure 2.4. Rough as the estimates of energy savings may be, it is clear that the soft path alternatives contributed more to meeting national energy needs in the post-embargo period. And the soft path was relatively successful despite the hard path priority of

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[16] For example, the inefficiency ratio decreased to 19.95 in 1986.

[17] Energy Information Administration, Table 2, p. 9.

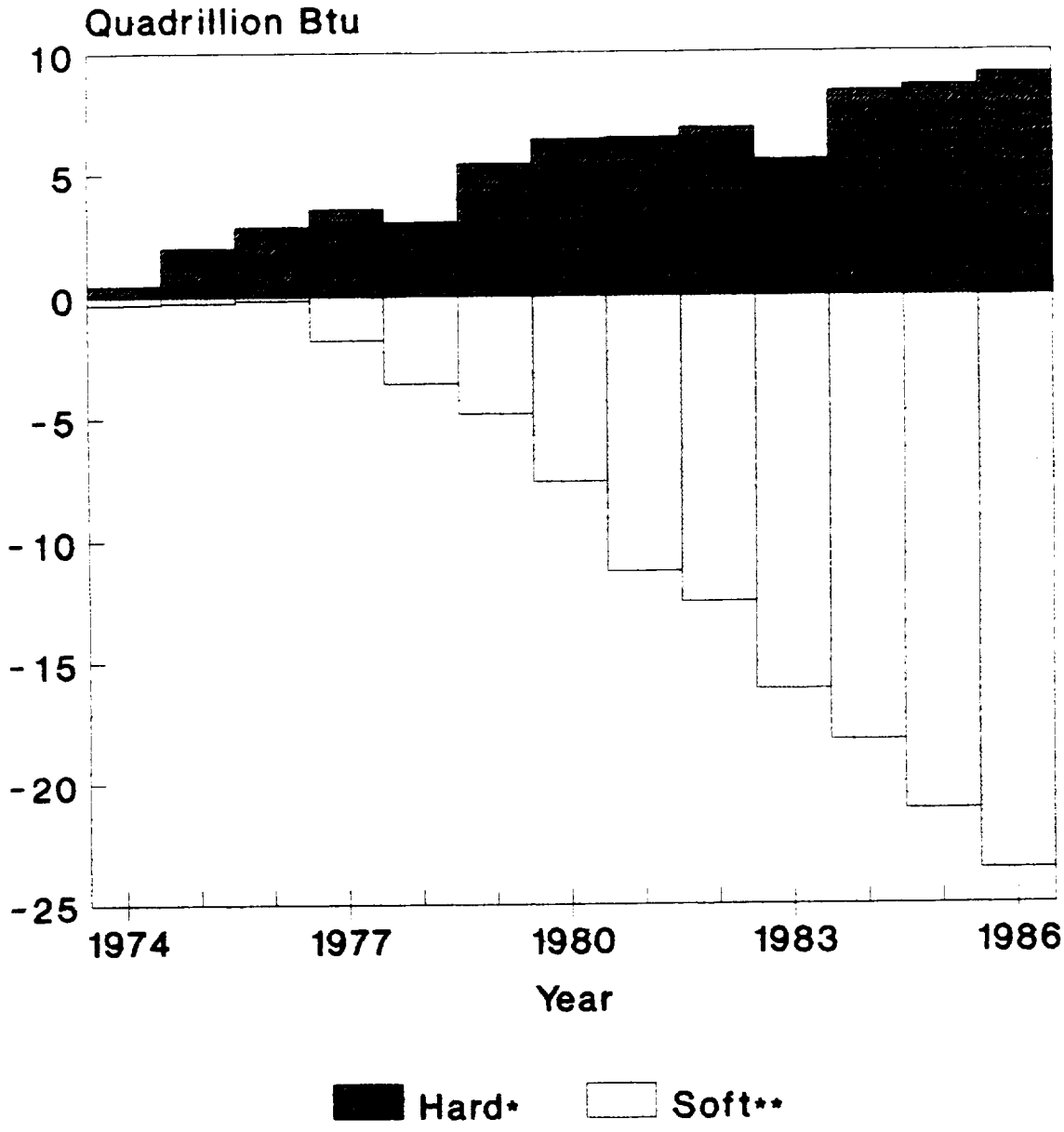
Figure 2.4
Contributions to Meeting National Energy Needs
by Hard and Soft Paths, 1974-1988
in Quadrillion Btu

	Base 1973/	74	75	76	77	78	79	80	Total
Hard Path Additions		**0.44**	**1.99**	**2.86**	**3.56**	**3.03**	**5.42**	**6.44**	**23.74**
Coal									
Level	13.99	14.07	14.99	15.65	15.76	14.91	17.54	18.60	
-additions		0.08	1.00	1.66	1.77	0.92	3.55	4.61	13.59
Nuclear									
Level	0.91	1.27	1.90	2.11	2.70	3.02	2.78	2.74	
-additions		0.36	0.99	1.20	1.79	2.11	1.87	1.83	10.15
Oil									
Level	19.49	18.57	17.73	17.26	17.45	18.43	18.10	18.25	
-additions		-0.92	-1.76	-2.23	-2.04	-1.06	-1.39	-1.24	-10.64
Natural Gas									
Level	22.19	21.21	19.64	19.48	19.57	19.49	20.08	19.91	
-additions		-0.98	-2.55	-2.71	-2.62	-2.70	-2.11	-2.28	-15.95
Soft Path Additions		0.33	0.36	0.16	1.39	3.52	4.84	7.66	**18.26**
Savings	0.00	0.00	0.04	0.00	1.22	3.50	4.71	7.52	16.95
Hydroelectric									
Level	2.86	3.18	3.15	2.98	2.33	2.94	2.93	2.90	
-additions		0.32	0.29	0.12	0.12	-0.53	0.08	0.07	1.00
Geothermal									
Level	0.04	0.05	0.07	0.08	0.08	0.06	0.08	0.11	
-additions		0.01	0.03	0.04	0.04	0.02	0.04	0.07	0.25
Other									
Level	< 0.005	0.00	0.00	0.00	0.01	0.00	0.01	0.00	
-additions		0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.02

Figure 2.4 (cont.)

	81	82	83	84	85	86	Total
Hard Path Additions	7.40	6.87	5.55	8.37	8.58	9.08	**69.59**
Coal							
Level	18.38	18.64	17.25	19.72	19.33	19.51	
-additions	4.39	4.65	3.26	5.73	5.34	5.52	42.48
Nuclear							
Level	3.01	3.13	3.20	3.55	4.15	4.47	
-additions	2.10	2.22	2.29	2.64	3.24	3.56	26.20
Oil							
Level	18.15	18.31	18.39	18.85	18.99	18.38	
-additions	-1.34	-1.18	-1.10	-0.64	0.50	-1.11	-16.51
Natural Gas							
Level	19.70	18.25	16.53	17.93	16.91	16.47	
-additions	-2.49	-3.94	-5.66	-4.26	-5.28	-5.72	-16.01
Soft path Additions	11.19	12.55	16.13	18.23	21.10	23.60	**121.06**
Savings	11.11	12.08	15.37	17.61	20.85	23.25	117.22
Hydro							
Level	2.76	3.27	3.53	3.35	2.94	3.02	
-additions	-0.10	0.41	0.67	0.49	0.08	0.16	2.81
Geothermal							
Level	0.12	0.10	0.13	0.16	0.20	0.22	
-additions	0.08	0.06	0.09	0.12	0.16	0.18	0.94
Other							
Level	0.00	0.00	0.00	0.01	0.01	0.01	
-additions	0.00	0.00	0.00	0.01	0.01	0.01	0.05

Figure 2.5
Additions to Supply and Savings
by Hard and Soft Path, 1974-1986



Source: Figure 2.4
*Nuclear, coal, oil, natural gas
**Conservation, efficiency, renewables

Federal Energy policy. In effect, the nation sought a hard path solution to its energy problems after the first oil embargo, but found a solution that was primarily soft path.

The estimates of energy savings in this analysis fall within the range of other estimates for all or part of the same period.[18] Other studies attempt to identify the causes of energy savings. The energy savings estimated by Hirst, Marlay, Greene, and Barnes are 28 Quads of energy in 1981, 16 Quads from conservation and efficiency and 12 Quads from slower economic growth. The authors' estimate for 1981 is 11.0 Quads; the difference can be attributed to the fact that Hirst, *et al.* consider higher energy prices in their estimates. Schipper, Howarth, and Geller estimate that 19.7 EJ, or about 18.6 Quads of primary energy were saved in 1987; the authors' figure for 1987 is 24.5 Quads. The difference is again due to the method of estimation. Schipper *et al.* do not consider changes in energy-use or changes in energy-using activity as energy savings in their estimates. The Rocky Mountain Institute (RMI) estimate (graph) shows 27.4 Quads of energy savings in 1987. This figure is higher than the authors' because RMI uses an energy inefficiency ratio based on 1973 consumption and GNP to estimate savings after 1973. The Office of Technology Assessment (OTA) estimates 15 Quads of energy were saved in 1985 because of conservation and efficiency efforts, compared to the authors' 21 Quads. Like Schipper, *et al.*, the OTA distinguishes structural causes of energy savings from efficiency savings; OTA attributes 9.5 Quads of savings to structural change, bringing their total estimated savings in 1985 to 24.5 Quads. Causes cannot be specifically

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[18] See E. Hirst, R. Marlay, D. Greene, and R. Barnes, "Recent Changes in U.S. Energy Consumption: What Happened and Why" *Annual Review of Energy* eds. J. M. Hollander, H. Brooks, and D. Sternlight (Palo Alto, Ca: Annual Reviews Inc., 1983) 193-245; Office of Technology Assessment, *Energy Use and the U.S. Economy* Background Paper (Washington: GPO, 1990); L. Schipper, R. Howarth and H. Geller, "United States Energy Use from 1973 to 1987: The Impacts of Improved Efficiency" in *Annual Review of Energy* eds. J. Hollander, R. Socolow and D. Sternlight (Palo Alto, Ca: Annual Reviews Inc., 1991) 455-504; and Rocky Mountain Institute, "U.S. Primary Energy Use: Actual vs. Predicted by GNP" Graph, (Snowmass, Co: Rocky Mountain Institute, 1990). The methods used include 1) regression and counterfactual of aggregate energy use, energy prices, and GNP (Hirst, et al.); 2) energy sector disaggregation, factoring of causes, and calculation of each factor relative to others held constant (Schipper et al.); 3) input-output analysis of energy by sector (OTA); and 4) scaling GNP by a ratio of 1973 energy consumption to 1973 GNP (Rocky Mountain Institute).

proven for the savings, but these studies suggest that structural change (from industry to service-oriented economy), fuel shifting, prices, and conservation programs all played a role in the consumption changes.

The estimations made here attempt to be conservative. The figures are higher than the OTA and Schipper figures in part because those analyses do not consider structural change in energy-using sectors as conservation or efficiency. The accuracy of the estimates depends on the definition of savings used; here, the definition of savings associated with the soft path includes structural and societal changes that impact consumption. Finally, the soft path estimates here are based on an average ratio of energy inefficiency over the period 1949 through 1973. However, the ratio actually increased by 1.3% per year over this period. Use of such increases would have increased the estimated energy savings over the post-embargo period.

Other Values: Hard Path

The comparison of hard and soft path energy should include those other values that Lovins made explicit in the 1970s, including those benefits that cannot be measured and compared in quantitative terms. These include democracy, security, efficiency, environmental protection, and social diversity. The hard path tends to compromise these other values, while the soft path does not. Hence the compromises are unnecessary to some extent. A few examples illustrate the point.

One centralized approach to energy independence was the Alaskan pipeline to deliver north shore oil almost 800 miles to the port of Valdez, from which it could be shipped to West Coast ports. Although federal approval had been stalled for environmental and other reasons, the embargo accelerated passage of the Trans-Alaska Pipeline Authority Act with an exemption from challenges under the National Environmental Protection Act and with limits on liability for oil spills and other

potential damage.[19] The pipeline now carries about 1.6 million barrels of oil a day, compared with U.S. imports of about 6 or 7 million barrels of oil a day. But this contribution is mitigated by compromises in other values. In the authorization, national needs as determined by public officials in Washington overrode environmental and financial concerns of some citizens in Alaska and elsewhere. In the aftermath, some of those concerns were corroborated by damage from oil spilled from the breached hull of the Exxon Valdez.

Nuclear power became uneconomical, quite apart from widespread public objection to nuclear plants or wastes located in the immediate vicinity. By 1975, orders for nuclear reactors began to drop sharply (28 in 1974, 4 in 1975), and by 1982, 100 reactor orders had been canceled and no new orders have been placed since then.[20] The net effect is that the operating and planned capacity of the nuclear industry dropped by half from 1976 to 1986. One nuclear engineer and planner for a Wisconsin utility learned the lesson. In the mid-1970s, he vigorously fought proposed state regulations to mandate least-cost alternatives to meet new electricity demand, because he believed that nuclear power was clearly the best alternative. Now he endorses such least-cost alternatives as conservation and efficiency programs for meeting demand, and when new capacity is needed, small, modular coal-fired plants that can be built in four years. The latter minimize financial risks.

The Clinch River Breeder Reactor was initiated in 1970 to demonstrate the potential of nuclear as a source of independent power and to put in place an industrial base for commercial plants. Like conventional nuclear plants, the breeder technology also proved to be uneconomical. By 1974, projected costs of the plant had more than doubled to $1.7 billion, of which the government would pay $1.3

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[19] For background, see Congressional Quarterly Inc., pp. 6A, 8A-11A.

[20] United States Department of Energy, Energy Information Administration, *Nuclear Plant Cancellations: Causes, Costs, and Consequences* (Washington: GPO, 1983), p. 5.

billion. By 1983, the government had spent $1.5 billion on the project and DOE projected another $1.5 billion from the federal government to complete it.[21] Utilities had spent $257 million on the project by 1983 and DOE projected their share of the completion costs to be about $800 million to $900 million. While DOE estimated the total project costs to be $3.6 billion in 1983, other estimates stood at $8.5 billion (GAO).[22] Other factors, chiefly concern about proliferation of nuclear weapons, led Carter to attempt the termination of the project during his administration. The project was becoming technologically obsolete when it was terminated by the Congress in 1983.

Other Values: Soft Path

On the other hand, different places in the country learned in the 1970s that decentralized decisions about modest technologies could be cost-effective and politically feasible. In 1976, the city of Davis, California passed a building code requiring the use of passive solar in new residences, a move that contractors fought. The contractors actually endorsed the code as cost-effective after learning to comply with it and experiencing the results first-hand. Also in 1976, the city of Seattle decided to rely on conservation and hydroelectric development instead of investing in the Washington Public Power Supply System (WPPSS) to meet its projected power needs to 1990. This decision was reaffirmed when WPPSS defaulted on $2 billion in bonds for two canceled nuclear reactors. Scientific and economic research were insufficient for policy innovation in these cases. Political leadership was necessary to precipitate a conflict that challenged an obsolete policy consensus and led to a new policy; and the direct experience of success in implementation was necessary to include those who had resisted in a new consensus. The primary role of research was to design promising policy innovations.

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[21] A. Murray, "Congress Moving to Scuttle Clinch River Breeder Reactor," *Congressional Quarterly Weekly Report* 21 May 1983: 995.

[22] W. Lanouette, "Dream Machine" *The Atlantic Monthly* 25 (1983): 48.

The economic payoffs of energy efficiency and conservation have been accepted by the world's largest investor-owned utility, Pacific Gas & Electric in California. The utility's conservation and efficiency programs saved customers $3.5 billion by avoiding 1,800 megawatts of new power plant construction since 1976.[23] Successful experience with the different programs led the utility to testify before Congress about the potential savings from efficiency and conservation and the relative cost-effectiveness.

Another utility example illustrates how environmental groups have worked with utilities at the local level to implement energy saving programs. The Conservation Law Foundation (CLF) worked with a Vermont utility, Green Mountain Power, to let the utility earn profit on energy-saving investments.[24] Collaborative efforts between the New England Electric System (NEES) and CLF resulted in the drafting of new regulatory rules that several New England states adopted.[25] The rules provide incentives to utilities that invest in energy conservation and efficiency. In California, the Natural Resources Defense Council (NRDC) worked with that state's utilities to develop similar incentives.[26]

State public utility commissions have played a large role in bringing least-cost planning innovations to the attention of their utilities. Altogether, 43 states have made or are considering changes in electricity regulation.[27] This represents the

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[23] Pacific Gas & Electric, *Regarding Aspects of a National Energy Strategy Concerning Energy Efficiency, Renewable Energy, and Competition* Testimony before the United States House of Representatives Subcommittee on Energy and Power of the Committee on Energy and Commerce, 7 March 1991, Unpublished, 1 (Hereafter, PG & E).

[24] J. Dillon, "Utilities and Environmentalists See the Light: Fighting is Just Waste of Time," *Rutland Herald* 17 March 1991: 1.

[25] D. Stipp, "Utilities Rush to Profit from Selling Less," *The Wall Street Journal* 5 November 1990: B1.

[26] Stipp B1.

[27] Electric Power Research Institute, *Status of Least Cost Planning in the U.S.* (Palo Alto, Ca: Electric Power Research Institute, 1988) cited in R. C. Cavanagh, "Global Warming and Least Cost Energy Planning,"

diffusion of conservation, efficiency, and renewables across the state public utility commissions. The Department of Energy had to respond to the states' efforts by creating an Integrated Resource Planning program in 1986, which is a minimal federal commitment but nonetheless helpful.

The diffusion of decentralized energy alternatives does not require mandates from Washington. The record shows that decentralized energy alternatives proven in practice tend to be picked up and replicated voluntarily when they are perceived as better means of meeting requirements by those who have fallen behind the leaders. However, the diffusion process could be improved significantly if national leaders directed the nation's attention to the leading examples -- thereby putting informal pressure on those who have fallen behind to catch up with the leaders or explain why they can not or should not make the attempt. The federal government can also relax regulatory barriers to replication of proven alternatives, provide seed money to innovation, and perform third-party evaluations to warrant that the claims made leaders do not mislead potential followers. There are still many more gains in energy efficiency to be realized, according to engineering estimates and the standards set by other industrial nations.[28]

III. Lessons Not Learned

The lessons of the energy crisis apparently have not been learned in the nation's capital, even though they have been diffusing slowly around the country and

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Annual Review of Energy eds. J. Hollander, R. Socolow, and D. Sternlight (Palo Alto, Ca: Annual Reviews Inc., 1989) 360.

[28] One estimate of conservation potential states that if the United States became as energy efficient as Japan, it would consume half as much energy as it does today and would gross $220 billion annually, with a net savings of $170 billion. See Arthur H. Rosenfeld and Daniel Hafemeister, "Energy-Efficient Buildings," *Scientific American* 258 (April, 1988): 78-85. Another estimate states that the United States can decrease energy intensity (1000 Btu/$) by 2.5 percent annually by doubling auto and truck fuel economies; promoting utility least-cost alternatives; supporting energy efficiency research for industrial application; and improving building efficiency. The goal of 2.5 percent a year equals the drop in intensity achieved during the 1976-1986. W. Chandler, H. Geller, and M. Ledbetter, *Energy Efficiency: A New Agenda* (Springfield, Va: American Council for an Energy-Efficient Economy, 1988) 14.

have received some attention consistently over the years from the Energy and Power Subcommittee in the U.S. House of Representatives.[29]

Shortly after leaving office in 1981, two energy officials of the Carter Administration argued the case for centralized energy policy to meet the national security threat posed by Western dependence on foreign oil. According to the former Assistant Secretary of Energy for Policy and Evaluation and his principal deputy, "Energy policy is best dealt with by placing accountability in one place with capability for policy integration, international coordination, and technical judgment."[30] Policy on conservation and renewables during the Reagan Administration seems to have been well-summarized in the title of a 1982 internal DOE paper: "Current Federal Effort to Deliberately Obstruct Conservation and Renewable Energy Options in the Development of National Energy Policy".[31] In the Bush Administration, a draft National Energy Strategy emphasizing conservation and efficiency was developed under the leadership of Energy Secretary Watkins, but rejected by the White House.[32] The approved National Energy Strategy emphasizes nuclear energy.

The evidence of lessons not learned in Washington is more than anecdotal, however. To test the claim that the hard path dominates, we assumed that more attention would be paid to the hard path energy sources if they are still considered the more important. Further, we assumed that coverage of energy issues in the *Washington Post* during 1990 was a reasonable sample of the relevant attention

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[29] The Subcommittee hearings included 1991 testimony from PG & E, previously cited. For analysis of the Subcommittee's 1978 hearings on Local Energy Policies, see Ronald D. Brunner, "Decentralized Energy Policies," *Public Policy* 28 (Winter, 1980): 71-91.

[30] W. W. Lewis and L. P. Silverman, "The Value of Central Managing of Energy," *New York Times* (March 15, 1981).

[31] See T. Hobson, "Current Federal Effort to Deliberately Obstruct Conservation and Renewable Energy Policy," internal DOE paper, 18 November 1982, cited in Kraft and Axelrod.

[32] P. Kuntz, "Watkins: Energy *Glasnost*," Congressional Quarterly Weekly Report 2 February 1991: 297.

frame. Using "energy" and other key words, we retrieved the headlines and lead paragraphs of over 1,700 articles from the electronic edition. The sample was edited to eliminate articles that were not relevant to our purpose; for example, articles about energy problems overseas that made no direct connection to U.S. energy needs or policy issues. Then we counted the references to hard path and soft path energy sources that occurred in the sample.

The expectation was that there would be many more references to the hard path sources because they are still considered more important in Washington. This expectation was borne out by the data. Figure 2.6 shows the distribution of attention from January through July 1991 (darker base), the period immediately before the Iraqis invaded Kuwait and threatened oil supplies. Figure 2.6 also shows the distribution from August through December 1991 (lighter extension). Clearly, references to oil, natural gas, coal, and nuclear predominate. The primary effect of the invasion was to increase the attention paid to oil. The focus was on increasing domestic oil production, relaxing offshore oil-drilling regulations, and reopening the Alaskan Wildlife Refuge for drilling. The pattern of response is reminiscent of the 1973 oil embargo, almost eighteen years earlier.

Conclusion

This chapter contends that the soft path alternatives have met the test of experience, that the lessons have not been learned in Washington, and that the world view associated with soft path has hardly been considered. Evidently, Federal energy policy continues to be grounded less in experience after the energy crisis than in tacit faith in a world view that supports the hard path and marginalizes or ignores the soft path.[33]

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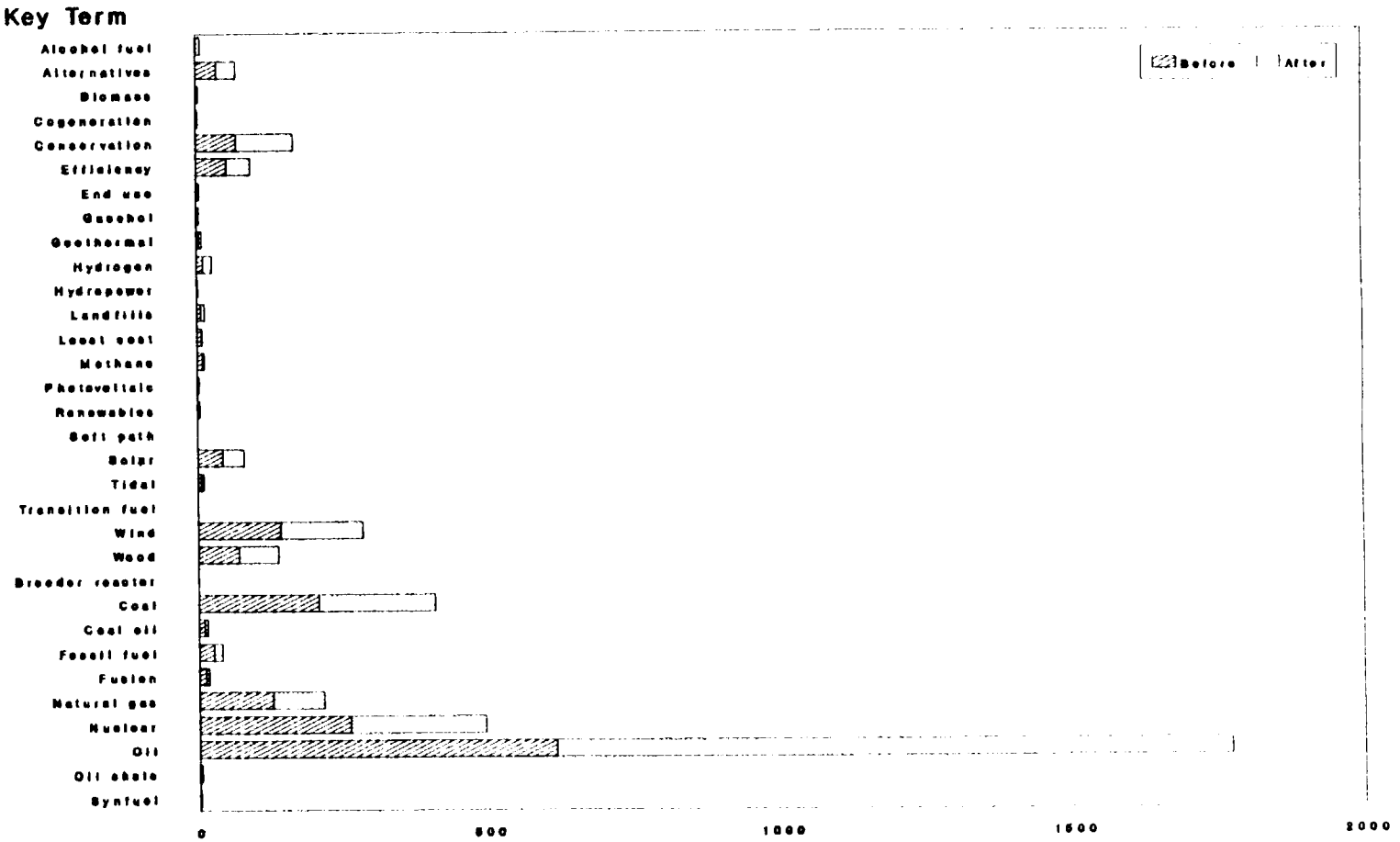
[33] Ronald D. Brunner, "Global Climate Change: Defining the Policy Problem" *Policy Sciences* 24 (1991): 291-311.

Figure 2.6
Hard and Soft Path Key Terms
Before and After Iraqi Crisis 1990



Source: Washington Post
Headline and first paragraph

Lovins recognized the significance of world views in the energy debate in 1976, and observed that

> Public discourse suffers because our society has mechanisms only for resolving conflicting interests, not conflicting view of reality, so we seldom notice that those perceptions differ markedly.[34]

Perhaps public discourse can be improved by leadership that refers the claims of conflicting interests to the test of experience, not tacit faith. And perhaps public discourse can be further improved by making the tacit faiths explicit, so that Americans become aware of the differences and have an opportunity to resolve them.

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[34] Lovins, *Foreign Affairs* 12.

CHAPTER 3

THE POLICY DEBATE

Carolyn M. Hennefeld

Introduction

The policy debate on global climate change is important because it circumscribes the search for policy solutions. Regardless of their potential contribution to better solutions, ideas left outside the policy debate do not have the opportunity to be assessed and refined through competition that is more than academic. Nor do those ideas have the opportunity to compete for a political following. If the limits of the present debate on global climate change constitute the problem rather than the locus of policy solutions, as contended in Chapter 1, then the common interest in more rational and democratic policy decisions would be served by importing some unconventional (if not new) ideas from the academic hinterlands into the national policy debate in Washington.

The purpose of this chapter is to suggest how to open up the national policy debate in Washington, and how to make the major conventional ideas controversial in the process. The first section provides an overview of the debate over the last several years, emphasizing imbalances and changes in the focus of attention over time. This clarifies the evolving historical context of potential leadership. The second section distinguishes conventional and non-conventional ideas on energy policy within the debate on climate change policy, and provides a critique. This clarifies the ideas that might be avoided, played up, or added to the debate, and the

vocabulary with which the ideas might be effectively communicated. Similarly, but more generally, the third section distinguishes the conventional and non-conventional cultural ideas within the debate, and provides a critique. In short, an understanding of the focus and significant content of the debate can be used to inform efforts by potential leaders to open up that debate.

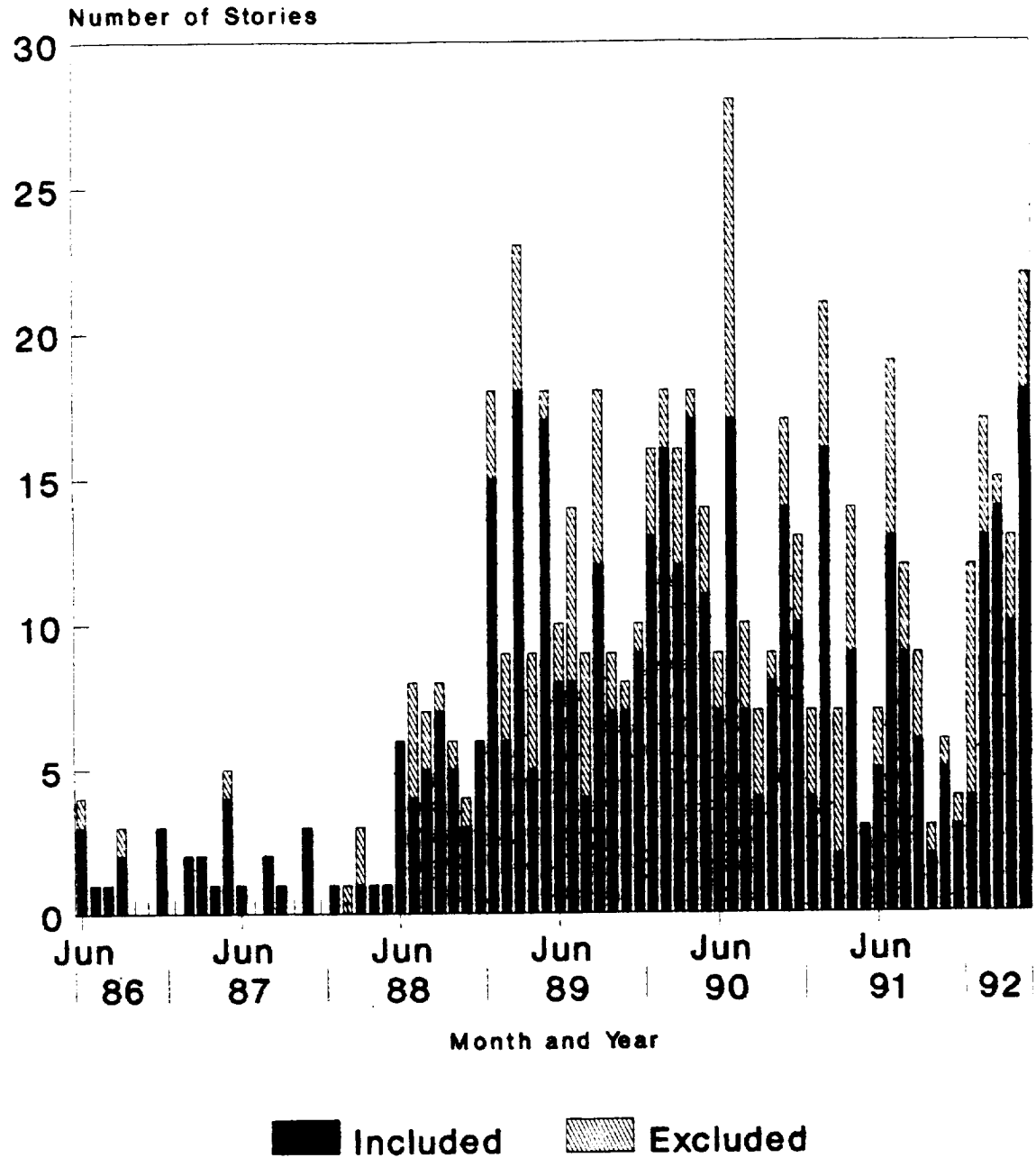
This chapter is based on new stories, features, opinions, and editorials on climate change policy that were published in the *Washington Post* from January, 1986, through May, 1992. In particular, any piece that mentioned "greenhouse effect," "global warming," "climate change," or "global change" was identified by computer search of the electronic edition, and downloaded for analysis by computer and by more traditional methods. Of the 602 pieces identified, 148 were excluded from the text file because they contained little more than a passing reference to "climate change" or one of the other phrases. This remaining text file consists of 454 pieces in electronic form. The changes in the number of stories over time is indicated in Figure 3.1.

The *Washington Post* is an appropriate source given the purpose of this chapter. On the one hand, the *Post* reflects debate on climate change policy by public officials and others with policy expertise, both in and outside Washington. On the other hand, the *Post* helps shape that debate along with many others. It is widely read within the nation's capital, and it influences reporting and opinions disseminated more widely through other media, including television. To the extent that there is such a thing as a "national policy debate," it is carried out primarily in the pages of the *Post* and a few other serious national newspapers -- not only in the op-ed pages, but also in news stories.

I. The Focus of Attention

As noted above, ideas left outside the focus of attention or relegated to its margins have little opportunity to be refined through public debate or to attract a

Figure 3.1
Changing Number of Post Stories
June 1986 to May 1992



Source: Author

public following. Given the goal of opening up the debate on global climate change issues, there is a need to distinguish between conventional and non-conventional ideas. What is "conventional" or "non-conventional" is an ideal type that exists nowhere in pure form. Ideal types are nevertheless useful in identifying, classifying, and clarifying ideas in news and opinion on global climate change issues. The distinction between centralized and decentralized energy strategies, and between the cultures associated with each strategy, provide the basis for distinguishing conventional ideas from the non-conventional. To some extent, however, types must be constructed and illustrated with examples.

By conventional, we mean reliance on scientific prediction to reduce uncertainty as a prerequisite for policy action; preoccupation in the short-term with the economic costs of responding to the threat of climate change; and faith in the longer term that advanced technological fixes will be adequate to cope with whatever change occurs. The supporting world-view presumes the human mastery of nature through science-based technologies, with little regard for possible moral or political constraints on their use. The world-view also presumes that centralized, comprehensive decisions are necessary to cope with big (or potentially big) problems like global climate change -- and that the scientists, economists, and politicians at the top have the ability to find and implement rational policies of that kind.

By non-conventional, we mean the less visible and less well-developed view that scientific predictions are neither necessary nor sufficient for national policy action; that some of the means now available to cope with the threat of climate change are prudent investments; and that changes in ideas and institutions as well as technology will be necessary to cope with whatever change occurs. The supporting world-view presumes that there are ecological limits to the exploitation of nature for human purposes, and that such limits are worth respecting through moral and political constraints. It also presumes that in the face of uncertainty and ambiguity, policy based on multiple, modest, and diverse programs -- and self-correcting on the basis of experience -- is consistent with our shared aspirations for more rational and

democratic decisions.

The distinction between the conventional and non-conventional perspectives as used here should not be confused with popular distinctions, like the distinction between non-environmentalists and environmentalists or between conservatives and liberals. As shown below, environmentalists and non-environmentalists alike espouse both conventional and non-conventional ideas; liberals and conservatives, too, can be found on both sides of the debate. For example, some liberals and conservatives believe in relying on advanced technology and on the most knowledgeable experts, while other liberals and conservatives believe that advanced technology and the technical experts should play a respected but secondary role. Among the latter, the liberals have a populist tradition and the conservatives have respect for market competition and for the states as laboratories.

Key Symbols

To clarify the focus of attention on global climate change issues, we searched the five and half years of text in our sample for the key symbols of the conventional and the non-conventional viewpoints. Perhaps the most obvious are "growth" or "development" or "progress" in the traditional economic sense on the one hand, and "sustainability" or "stewardship" on the other. Such key symbols are highly concise references, providing a means of economizing on the number of words used in a communication. But just what such key symbols refer to is typically unclear; through association with all kinds of specific references (such as policy proposals that are allegedly justified by these key symbols) they come to mean almost anything and everything. For precisely these reasons, key symbols are used to organize a following behind an ambiguous and open-ended complex of ideas and practices -- and for present purposes, they are useful "markers" for tracking the conventional and non-

conventional viewpoints in the policy debate.[1]

The goal here is to understand how these viewpoints are distributed in the global warming debate in the *Washington Post*. Figure 3.2 lists the key words for the conventional and the non-conventional cultures as well as the total number of times each one is mentioned in the pieces from the Post. We generated a concordance of the main cultural markers using the Oxford Concordance Program (OCP); analysis of the concordance, which provides the word and the text surrounding it, allowed us to understand how each word was used. Words used by representatives of both the conventional and the non-conventional perspectives were eliminated from the list. What remains here in Figure 3.2 are potential key symbols that were clearly used affirmatively on one side of the debate or the other. The lists separate relatively specific reference to the energy aspects of global climate change from relatively general references to culture. In each list, the words are arranged by decreasing frequency of occurrence in the sample.

Figure 3.2 shows that the conventional perspective on both energy and culture dominates the agenda in the global climate change issue arena. Ideas from the non-conventional perspective are eclipsed. A brief description of how the words are used in context shows why each word belongs to the purview of either the conventional or the non-conventional side of the debate.

The focus in a majority of the statements about "oil" is on producing more domestic oil; related topics include calls to rely on the marketplace to help produce more oil, requests to decrease dependence on foreign oil, and discussions of the barriers to domestic production, such as limits on offshore drilling and other environmental restrictions. Some references to non-conventional ideas do appear;

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[1] For more on key symbols, see Walter A. Lippmann, Public Opinion (New York: Free Press, 1965); especially Part 5 on "The Making of a Common Will" and pp. 132-133, 150-151. See also Harold D. Lasswell, "Key Symbols, Signs and Icons," Ch. 13 in Symbols and Values: An Initial Study, ed. by L. Bryson et. al. (New York: Harper 1954), pp. 199-204.

Figure 3.2

Potential Key Symbols

Conventional Energy	
Oil	459
Gas	413
Nuclear	329
Coal	207
Electric	128

Non-Conventional Energy	
Conservation	179
Efficiency	166
Solar	131
Wind	32
Renewables	30
Geothermal	21
Hydropower	8

Conventional Culture	
National	529
International	335
Growth	228
Plan(s)(ed)	201
Large	195
Development	191
Big	183
Progress	88
Predict	66
Comprehensive	27
Coordinate(d)(s)	21
Centralized	5

Non-Conventional Culture	
Life	170
Small	168
Nature	77
Local	77
Limits	69
Regional	40
Ethic(s)(al)	36
Sustainable(ity)	36
Moral(ity)	25
Evolve(s)(d)(tion)	21
Values	18
Flexible(ility)	16
Steward(s)(ship)	9
Decentralized	1

Source: Washington Post, January 1986 - June 1992

these include proposals for carbon taxes, calls to decrease oil consumption, and highlights the risks associated with oil use. References to "gas" primarily include optimistic statements about the worth of natural gas (although approximately one-third of the statements refer to carbon or greenhouse gases, so they do not directly apply). Natural gas is referred to as being relatively efficient, a relatively low emitter of carbon dioxide, and environmentally benign; it is also abundant. In general, statements about natural gas refer to different technologies to develop its use and increase the use of the fuel.

"Nuclear" energy is considered a benign substitute for fossil fuels; it is linked with solar and other renewables in the statements. Many statements refer to developing new nuclear technology, and others refer to nuclear as being necessary--the only sane alternative. The public's fear of accidents is viewed as irrational. References are made to how Three Mile Island and Chernobyl doomed the nuclear industry. The inevitable need for nuclear energy underlies many of the statements. "Coal" is referred to in conjunction with oil to describe the impact that burning fossil fuels has on the atmosphere since carbon dioxide is a by-product. About one-third of the statements are critical of coal as a source of energy; the other statements refer to ways to make coal more acceptable, by developing clean coal technology, enacting coal taxes, by stressing the huge reserves found in the U.S.

Increasing "electricity" demand is the underlying assumption of this group of statements as well. Electricity, not oil, is seen as the growing fuel of the 1990s. Prices have fallen and there has been a glut of electricity, but this will eventually end and the country will need new power plants. The statements assume shortages will occur soon and that electricity demand will continue to grow. On the non-conventional side, some references are made to opportunities for electric conservation and the cost effectiveness of investing in efficiency rather than fuels.

On the non-conventional side of the energy debate, the primary symbol is "conservation;" the message of the statements is primarily that conservation has been

proven to work and that an energy strategy must include measures to increase conservation. Automobiles are a prime target for increasing efficiency. A conservation ethic appears to be on the rise in the country, and ample conservation potential exists. Several statements point out the down side of conservation, i.e., that the gains have stopped, the country still needs other sources of energy, conservation has faded as a national habit, it must be balanced with development, and it is equated with freezing in the dark, etc. Energy "efficiency" is presented as a cost-effective way to get more fuel; people are called upon to increase efficiency. The statements indicate the uncertainty surrounding how to become more efficient, whether the government should mandate efficiency, and how or if the efficiency market should be fostered.

The word "solar" is frequently used to explain the greenhouse effect, in that the atmosphere warms because it traps solar heat. Solar power is referred to as a renewable fuel; it is used in conjunction with other renewable sources and most of these statements support increased use of solar, though with few details about how to foster its utilization. Solar is considered quicker, cheaper and more efficient. "Geothermal" energy is linked with other renewable sources as alternatives to fossil fuels; its development in Hawaii highlights some of the conflicts within and between the conventional and the non-conventional approaches. References are to "hydro" power do not clearly advocate one position over another. "Renewable" energies are considered alternatives to fossil fuels and a complement to conservation and efficiency. The statements refer to research and development of technologies, indicating that they are still considered as peripheral energy sources. "Wind" power is categorized with other renewable alternatives as options to fossil fuels.

On the cultural side of the debate, the conventional perspective again dominates the discussion. Use of the word "national" indicates that, in approximately one-third of the uses of the word, action is associated with national groups that have national agendas, such as the National Oceanic and Atmospheric Administration, National Wildlife Federation, National Research Council, and national laboratories.

The substantive uses of national occur in themes such as: national agenda, national energy plan, national leadership, national research concerns, national science policy, and national scope. Mentions of the word "international" occur with themes such as conference, agenda, relations, summit, community, coordination, cooperation, controls, and consensus. The mentions include other countries besides the U.S., indicating that a focus on international solutions to the global warming problem is international itself. Also, two international precedents are mentioned for global warming, the Montreal Protocol and the Marshall Plan.

The word "growth" tends to be used in conjunction with "increased," "economic," and "population." Some statements explicitly describe threats to growth and the desire to avoid stunting economic growth. Growth is occasionally used in non-conventional ways in that some writers question the purpose of growth, they ask how much growth we want, and they contrast growth with sustainability. "Plan" refers primarily to different proposed plans, for example, a spending plan, the Bush plan, the Baker plan, the least-cost national energy plan. These plans tend to be described as comprehensive, long-term, ambitious, concrete, or sweeping. The time frames associated with some statements are 5, 15, or 25 years. All three roots of the word hold to the conventional goal of planning or guiding the future. The mentions of "large" are associated with corporations, expenses, projects, computer simulations, vehicles, and benefits. One statement advocates overcoming large uncertainties.

"Development" is associated with organizations, primarily international organizations. The mentions also include the idea of developing consensus, especially among scientists. Many of the uses of the word discuss research and development, with the intent of increasing funding for this purpose. Oil development and offshore development are mentioned, as are the benefits of economic development. Some statements suggest non-conventional ideas, such as limiting development, accelerating development of non-fossil fuels, and sustainable development. "Big" is associated with Big Green (the environmental ballot initiative in California), with companies and firms, government, deficit, market, and oil. Several statements discuss big cars;

several issues mention either big global economic issues, big global problems, big powers, big picture, and big science. Big is also mentioned with job losses and price tags. One statement suggests the non-conventional view of big, that the lesson of Big Green is to keep it simple -- the problem was not with green, but big.

More than half of the statements associated with "progress" refer to making progress toward some goal, typically a research or policy goal. Some statements associate progress with economic growth, suggesting a narrow conventional understanding of progress as being material. One article dissected the concept of progress from the non-conventional perspective, whereby the notions of narrow economic and technological growth are questioned. "Predict" is used in the statements as a goal to be achieved; it is associated with trying to, attempt to, hoped to, and ability to. The word is also associated with scientists and climatologists who predict, economic models that predict costs, climate models that predict, and scenarios that predict. A few non-conventional uses of the word suggest that it is hard to predict, that we do not know enough to predict, and that the models are not reliable. The word "comprehensive" is used along with words like strategy, effort, statement, bill, meeting, and energy strategy. This pattern of use indicates that global warming is viewed as a comprehensive problem needing comprehensive solutions. Finally, "centralized" is not used very often; one statement calls specifically for centralized authority.

On the non-conventional side of the cultural debate, the majority of statements containing the word "life" refer to the concept of longevity. Life is also associated with way of life, life styles, quality of life, how to live. Several of these phrases are linked with the idea of changing life styles, living less wastefully, and choices affecting American life styles. The use of "small" in the text primarily refers to size. Those mentions that are indicative of a non-conventional viewpoint include small firms, small cars, and small, widely scattered sources. The text also refers to making small improvements and "small is beautiful," in the sense that small gestures are important. "Nature" in the non-conventional sense is not a force to be overcome,

but an ongoing system of which humans are part. The use of nature in the text often refers to nature as such an entity: an independent force, living harmoniously with nature, the intrinsic worth of nature. Even the conventional statements refer to nature as an entity, but in the sense of something separate from humans: visitors to nature, watching nature, manipulation of nature, receiving a blow from nature, and nature, heavens and God. The non-conventional approach highlights "local" programs. Local usually appears with actors: officials, governments, citizens, communities, authorities, economics, regulators, power systems, utilities, and politicians. Local also refers to problems, implications, processes, and control, which indicates some attention is being paid to decentralized action. A small number of statements refer to overriding state and local power, the limits of local, and the hodgepodge local, state, and federal system.

The concept of "limits" is used with the idea of accepting production limits, limits on greenhouse emissions, setting safe limits, and limits to tailpipe emissions. Another non-conventional theme that includes the concept of limits is environmental and ecological limits. The word "regional" in the text refers to the restricted scope of global warming problems. Regional is associated with local changes in climate, with changes in agriculture, with inequities in costs, and with decentralization. Some statements use regional in a conventional manner, for example, stating that air pollution is not a regional problem which suggests that regional solutions do not help solve the problem. Another statement refers to the limits of models in providing regional detail. The use of "ethic" and its variants is associated with concepts such as conservation ethic, a new ethic of conservation and stewardship, a land ethic, and the ethics of ecology. Ethical is associated with corporations and businesses. In the conventional sense, the word is used to equate business ethics with American ethics, and to link ethics with bourgeois. The text also refers to Congress and ethics and the various Ethics Committees. "Sustain" is used mostly as in sustaining economic growth; sustainable and sustainability refer to a way of life. They are used with society, development, world, timber industry, energy sources, future, renewable natural resources to indicate that their consumption should be sustainable.

The clearest statement on "morality" in the non-conventional sense negated environmentalism as a morality play -- as the good guys against the bad guys. "Moral" is associated with the environment in several statements. The larger sense of the word, however, is that morals are part of the decisions that should be made; for example, it is not rational or moral to waste oil, a moral obligation and practical necessity, or a moral lesson. "Evolve" and its variants are used very narrowly to refer to the development of safety controls, thermometers, a role, and telephones. "Evolution" is associated primarily with biology. One statement that approximates the non-conventional viewpoint refers to the American way of life that has evolved. The word "values" is associated with a few different concepts in the text: values are associated with the dichotomous choice of individual versus community; debate should be over values, not programs; narrow utilitarian values should be transcended; traditional tasks should accommodate environmental values. Some references occur to traditional and fundamental values, including duty, honor, and social responsibility, without reference to nature or environment.

"Flexibility" is used in a way that approximates the non-conventional viewpoint. The statements refer to greater flexibility, a broad range, and diplomatic flexibility. Both variations are also used with flexible management and work schedules. Most of the statements using the word "stewardship" refer to nature and therefore reflect a different view of nature than, for example, domination over nature. The term is used in conjunction with leadership, indicating that the two are not synonymous. The key statement using "decentralized" refers to decentralized economies as more efficient.

Finally, the question becomes what the preferred set of markers or key symbols are, given that we hope to open up the debate between the conventional and the non-conventional perspectives. Growth and development represent key symbols for the conventional culture; the antithetical key symbols for the non-conventional culture are sustainability and stewardship. What is missing from the debate that could help people understand the distinction between the two world-views is a

conceptualization about the level where decisions are to be made, i.e., whether to rely on centralized approaches or decentralized ones.

Ordinary Symbols

To understand the evolution of the debate, it is useful to track the usual clutter of ordinary symbols (apart from key symbols) at the focus of attention. This section tracks changes in the focus of attention over time in the policy debate on global climate change. Newspaper stories from the *Washington Post* were analyzed from June 1986 to May 1992. For this part of the analysis monthly word frequency lists were generated using the Oxford Concordance Program (OCP) on the Washington Post database. These ranked frequency lists display the most commonly used words in descending order. The lists indicate what the focus of attention is and how it changes over time. The words in each monthly list were categorized according to whether they were an actor, an arena or a central issue. This was done to foster comparative analysis and clarify the changing nature of the debate. The lists are reproduced in the Appendix of this chapter.

An analysis of the *Post* stories on climate change indicate that the debate is characterized more by *continuity* than by *change*. From June 1986 to April 1991, the debate remained relatively stable with only occasional deviations in the focus on attention. In general, the debate is characterized by the conventional approach, which focuses on action at the national and international levels and seeks centralized solutions based on scientific and technological expertise. In May 1991, however, a significant shift in the focus of attention began. This second interval is characterized by an opening up of the debate on global climate change and the introduction of new ideas, actors, arenas. Yet this new phase in the debate was stifled when attention turned to the Earth Summit held in Rio de Janeiro in June 1992, because the debate reverted to a focus on international, coordinated action. The overall trend in the focus of attention, therefore, points to paralysis and stagnation in defining and analyzing the issues surrounding global climate change.

Figure 3.3
Example of Stable Core in the Focus of Attention

June 1986		November 1988		July 1989		July 1990		January 1991	
Actors		**Actors**		**Actors**		**Actors**		**Actors**	
Scientists	10	President	17	Bush	39	Bush	72	Nations	14
United States	9	Bush	10	Brady	21	United States	41	Administration	6
NASA	8	Reagan	8	President	20	Nations	33	Bush	6
Senate	5	Adviser	6	Leaders	19	Countries	32	United States	6
Administration	4	Companies	6	Nations	18	President	31	Adelman	5
Countries	4	Administration	5	United States	18	Administration	28	Companies	5
Arenas		**Arenas**		**Arenas**		**Arenas**		**Arenas**	
World	5	American	8	Economic Summit	47	Environmental	64	World	16
Global	4	Federal	8	Environmental	27	Summit	60	Gulf	8
Scientific	4	National	8	World	21	World	34	Market	8
Space	4	State	7	Space	18	Soviet	33	National	5
		Government	6	American	17	West	30		
Topics/Issues		**Topics/Issues**		**Topics/Issues**		**Topics/Issues**		**Topics/Issues**	
Greenhouse	11	Science	24	Environment	19	Tax	66	Energy	39
Warming	9	Deficit	15	Debt	18	Carbon Dioxide	54	Oil	30
Temperatures	8	Oil	12	Energy	18	Global Warming	54	War	21
Pollutants	7	Gas	10	Timber	15	Economic	46	Global Warming	16
Atmosphere	6	Research	9	Earth	14	Trade	46	Tax	15
CFCs	6	Tax	9	Trade	14	Energy	37	Price	13
Carbon Dioxide	5	Technology	9	Money	12	Greenhouse	30	Atmosphere	9
Change	5	Dollar	8	Global Warming	11	Emissions	28	Policy	9
Energy	5	Nuclear Power	7	Forest	10	Plants	28	Efficiency	8
Climate	4	Trade	7	Plan	10	Environment	27	Growth	8
Research	4								

It remains to be seen where the debate will go from here.

The overall debate on global climate change (June 1986 to April 1991) is represented by a *stable core* of conventional actors, arenas and ideas; some sample monthly lists can be found in Figure 3.3. A major component of the stable core focuses on national and international action. The stable core is defined by the following actors: President Bush, White House, administration, United States, nations, countries, Congress and the Senate. President Bush (or the Bush Administration) is the single most important actor throughout this period. Scientists, researchers and industry also play a prominent role in the debate, as does William Reilly, Environmental Protection Agency (EPA) administrator. The emphasis is on politics, politicians, and scientists to provide direction for global climate change policy. The core arenas of action on global climate change policy are also characterized by this centralized, top-down approach. They include: world, national, global, government, American, environmental, scientific, international, federal, public, Washington.

The emphasis on scientific and technological expertise in the debate is seen in the types of issues being discussed as well. Conventional energy sources (oil, nuclear, coal, natural gas, fuel) dominate the focus of attention, as do conventional, scientific definitions of global warming. Leading issues include: science, greenhouse effect, global warming, carbon dioxide, CFCs, ozone, temperatures, emissions, methane, gases. The focus is on increasing energy supplies to meet increased energy demands, rather than decreasing demand; the discussion centers on budgets, costs, economics, and resources. Policy and program are also primary topics of discussion in addition to treaty, reinforcing the tendency to use centralized approaches to solve complex, decentralized problems.

Deviations in the stable core occurred under one of two conditions. First, the focus of attention shifts from one set of conventional issues to another set of other conventional topics, such as the Presidential election, or, second, a non-conventional

understanding of the problem gains enough prominence in the debate to compete (however temporarily) with the conventional definition of climate change policy. Although these events constitute deviations from the norm, they do not as yet represent sustained policy shifts in the focus of attention; examples of these deviations can be found in Figure 3.4. An example of the first condition is the 1988 presidential election campaign between Michael Dukakis and George Bush. During September and October of 1988 there was an emphasis on Democratic presidential candidate Dukakis and his support for environmental regulations to reduce acid rain and pollution. Media coverage of his political campaign briefly opened up the debate on climate change policy. Although Dukakis served as a new actor in the global warming debate, attention on his campaign was short-lived; after December of 1988 Dukakis disappeared from the political debate.

A second type of deviation from the norm occurred when the non-conventional approach to climate change policy gained prominence for a brief period in the focus of attention. Examples of this type of deviation include coverage of the twentieth anniversary of *Earth Day* in April 1990, where issues like environmental pollution, diapers, and population growth gained a lot of attention. Perhaps the greatest deviation in the stable core occurred in August and September of 1990 when voters in California were asked to decide about the *Big Green* ballot initiative (Proposition 128). For the first time, voters and people appeared among the top five policy actors of the monthly word lists. Media coverage of Big Green coincided with a focus on conservation, efficiency and opinion polls on climate change policy, rather than a technical discussion of CFCs or energy resources. In each of these deviations from the stable core, the focus of attention remains global and seeks centralized solutions (treaties, political initiatives, etc) to remedy the policy problem. A sustained shift from the stable core would entail a downsized, decentralized approach to global climate change policy.

A significant shift in the focus of attention began in May, 1991, and continued through May, 1992. This shift can be characterized as an opening up of the debate

Figure 3.4
Deviations in the Focus of Attention

September 1988		October 1988		April 1990		August 1990	
Actors		**Actors**		**Actors**		**Actors**	
Bush	33	Dukakis	30	Bush	61	Hayden	29
Reagan	15	Bush	29	People	48	Industry	11
Administration	12	EPA	17	Lovejoy	45	Voters	11
Dukakis	12	Environmentali	13	United States	29	Administration	10
NASA	11	State	12	Smithsonian	25	People	10
Astronauts	10	Mitchell	9	Military	24	President	10
						State	10
Arenas		**Arenas**		**Arenas**		**Arenas**	
Space	47	Environmental	12	Environmental	113	Environmental	30
Detroit	15	Global	12	World	55	National	16
Environmental	15	Government	12	Global	47	Global	13
American	13	Federal	11	National	27	California	7
Public	13	Public	8				
Topics/Issues		**Topics/Issues**		**Topics/Issues**		**Topics/Issues**	
Shuttle	22	Energy	22	Earth Day	74	Energy	43
Pollution	20	Oil	15	Air	38	Oil	31
Acid Rain	17	Environment	9	Energy	37	Initiative 128	22
Air	16	Pollution	9	Environment	33	Campaign	19
Cars	15	Water	9	Gas	31	Big Green	16
Environment	15	Acid Rain	8	Pollution	30	Conservation	14
Gas	15	Global Warming	8	Global Warming	30	Support	13
Challenger	13	Air	7	Diapers	28	Efficiency	12
Nuclear	13	Campaign	7	Planet	28	Bill	11
Program	13	Compromise	7	Population	27	Poll	11

on global climate change. There is a distinctive move away from President Bush and his administration during this period and increased attention on local strategies and individuals. Prominent arenas of action include local government, home, kitchen, state government, and the European community. The policy actors also changed so that focus on the President decreased while Hollywood actors (e.g., actor Ted Danson), environmental groups (such as the *Environmental Defense Fund*), and ordinary citizens who have found ways to remodel their homes to promote harmony with nature all made their way into the top of the focus of attention during this period. The 1992 Presidential campaigns also shifted attention to Democratic presidential contenders Paul Tsongas and Bill Clinton. It is questionable, however, how permanent this change in the debate will turn out to be. In April and May 1992, with the approach of the Earth Summit in Rio, the focus of attention diverted from discussion of these decentralized, non-conventional approaches back to centralized arenas and scientific issues.

II. Energy

This section illustrates conventional and non-conventional ideas on energy policy as expressed in the pages of the *Washington Post*, and then provides some comments and suggestions.

Conventional Perspectives

Representatives of the conventional perspective on energy policy tend to be skeptical of public participation, in part because they fear that citizens will be unable to make informed decisions on complex, technical issues and will not make the 'correct' decision. In September 1989, the *Washington Post* reported on the Department of Energy's (DOE) decision to help finance the design of a new type of nuclear reactor that would be smaller and more standardized than existing nuclear

power plants.[2] In this same article, the *Post* also disclosed that:

> In a parallel effort to make it cheaper and easier to construct nuclear power plants, the NRC has changed its rules to consolidate the licensing process, merging the construction permit and the operating license approval into one phase. This could save years in the complex licensing process, but it has been criticized...by environmentalists, who have challenged the new rules in court, as cutting out citizen participation at a critical phase of the licensing procedure.[3]

These two steps were described as necessary by the Bush administration in order "to keep the 'nuclear option' alive,"[4] despite citizen opposition to having nuclear plants sited in their neighborhoods and despite questions about the viability of the nuclear industry on economic grounds.

> No commercial nuclear power plant has been ordered in the United States since 1978. Utility companies and Wall Street investors have sunk billions of dollars into constructing plants that have never operated, such as Shoreham on Long Island and Seabrook in New Hampshire...[5]

The Bush administration nonetheless proposed funding research through DOE into the new types of reactors.

Skepticism about public judgments takes many other forms. One columnist pointed out that if plants like Shoreham or Seabrook do not go on line, then residents and businesses in those areas will face higher prices for electricity; people "want cheap electricity without accepting the need for new plants. No one wants to pay the higher electric rates that might spur conservation and depress demand."[6] Another writer, in an op-ed piece that appeared in the *Post* in 1988, echoed this skepticism about citizens' ability to do the right thing regarding energy use:

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[2] 09-06-89 Lippman "Energy Dept. to Finance Design of New Reactor; $50 Million Contract to Westinghouse Would Help Revive U.S. Nuclear Power Industry"

[3] Lippman, ibid.

[4] Lippman, ibid.

[5] Lippman, ibid.

[6] 12-21-88 Samuelson "Blackouts Coming?" The *Washington Post* made a similar point in a later editorial, 4-24-89, "The Consequences of Shoreham"

> What needs to be said and done is historically unpopular. During the 1973-75 oil crisis, the two types of proposals that attracted the angriest mail from normally civilized, decent Americans were those that would have raised the price of gasoline and those to increase the number of U.S. nuclear power plants.[7]

In a similar vein regarding oil development policy after Iraq invaded Kuwait, one Senator showed similar skepticism about public participation when he proposed an amendment that was:

> approved in a late-night session after virtually no debate, [that] would grant the president far-reaching power to bypass environmental restrictions [i.e., drill in environmentally sensitive areas, like the Arctic National Wildlife Refuge or off the coast of Santa Barbara] if oil imports exceed 50 percent of U.S. consumption.[8]

Consistent with this apprehension that citizens will not make the 'correct' decisions, the conventional culture focuses on the need for centralized, comprehensive policies incorporating the wisdom of the experts. In 1988, two separate bills were proposed to reverse global warming.[9] The *Washington Post* described these two pieces of legislation; "taken together, the measures would impose strict controls on everything from automobile exhaust to home furnaces, redesign landfills, eliminate [CFCs] and effectively discourage use of coal..."[10] Furthermore, reminiscent of President Carter's comprehensive approach to energy policy in 1977, one bill "calls for a 'Least-Cost National Energy Plan' to be devised by the government..."[11] One Senator who had sponsored this legislation repeated his appeal directly to the public in an op-ed piece that appeared in the *Post* in 1990:

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[7] 10-19-88 Zarb "Ignoring the Energy Issue: How Soon We Forget". Frank Zarb served as Federal Energy Administrator from 1974 to 1977.

[8] 08-21-90 Weisskopf and Lancaster "Environmentalists Fear Setback to Efforts; Oil Shocks of '70s Put Pressure on Clean Air Advocates, but Movement is Stronger Now"

[9] 07-29-88 Weisskopf "Two Senate Bills Take Aim at 'Greenhouse Effect'"; Senators Tim Wirth (D-Colo.) and Robert Stafford (R-Vt.) proposed the two pieces of legislation.

[10] Weisskopf, ibid.

[11] Weisskopf, ibid.

> We must develop a comprehensive national energy policy that makes reduction of greenhouse gases and air pollutants a national objective. . . Global environmental ills have replaced the Cold War as the greatest threats to international security, and we do nothing. We must change course.[12]

Many other environmentalists tend to agree; in fact, one "said it is important...to impose controls on industry so they will know 'what our long-term goals are.'"[13] The wisdom of the experts is assumed and the magnitude of the threat is taken as sufficient justification for their central role.

The politicians who supported these bills assume that a top-down, command-and-control response is essential to elicit the appropriate behavior from industry and citizens. One consequence of demanding a comprehensive, national approach, however, is that deadlock is a frequent outcome, meaning that, ultimately, little action is taken. Even the two Senators who proposed the global warming bills recognized this. "[T]he bills trample on so many interest groups that neither of the chief sponsors...expect to achieve anything more than committee hearings in the remaining months of the current Congress."[14] Similar frustration is likely when the focus of attention is on eliciting international cooperation to reduce greenhouse gas emissions.

Finally, the conventional political approach to energy tends to regard international cooperation as necessary before any action can be taken by the United States, despite the certainty that if the U.S. alone were to reduce its own emissions, the level of greenhouse gases would be less than they otherwise would have been. Typifying this expectation was an editorial that ran in the *Washington Post*: "Speaking

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[12] 02-20-90 Wirth "Hotter and Hotter in the Greenhouse"

[13] Weisskopf, 07-29-88, op. cit.; the person quoted is Michael Oppenheimer of the Environmental Defense Fund (EDF).

[14] Weisskopf, 07-29-88, op. cit. Other writers in the *Post* sample agree that national action is unlikely: 06-12-86, *Washington Post* editorial, "The Warming Trend"; 12-21-88, Samuelson, "Blackouts Coming?"

of international cooperation, it will be central to any realistic attempt to control greenhouse warming."[15] This sentiment was echoed during the 1988 presidential election campaign when both Michael Dukakis and George Bush were reported as favoring an international approach:

> Dukakis would seek...international solutions to the problem [of global warming]. Bush would have the United States take a leadership role and convene an international summit to address the problem.[16]

The conventional culture also tends to scale up economic threats posed by any significant change. For example, the pressure to increase energy efficiency seems to fall most heavily on one industry--requiring the domestic automakers to improve automobile fuel economy--and therefore concentrates the costs. The automakers, as might be expected, oppose such proposals. In 1989, the Bush administration proposed raising the CAFE standards from 26.5 miles per gallon (mpg) to 27.5 mpg for 1990. The *Washington Post* covered the Senate hearings that were held to study the recommendation; one argument put forth by an industry representative against the proposed change was the conventional refrain that Americans must choose between protecting jobs and protecting the environment.

> [F]ormer transportation secretary James Burnley . . . proposed that Congress eliminate CAFE altogether on the grounds that it was 'a dinosaur that should be extinct' and that it was a 'perverse law' that would 'ship American automobile workers' jobs out of this country.'[17]

Later that month, in a *Washington Post* editorial that supported the increase in the CAFE standards, the editorial staff presented the auto industry's side.

> The U.S. [auto] industry responds . . . that higher [CAFE] standards would produce little environmental and other gain at enormous cost (assuming once again that they could even be achieved), and that it is unfair to put the whole burden of energy conservation on a single

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[15] 08-14-88 *Washington Post* Editorial, "Greenhouse Heat..."

[16] 10-03-88 Weisskopf "In Evaluating Bush and Dukakis, Environmentalists Turn to 1983"

[17] 05-03-89 W. Brown "Fuel-Economy Change has Detroit Shifting Gears; New Policy May Force Redesign of Auto Lines"

sector of the economy so beset by foreign competition.[18]

Once again, the industry's stance represents the conventional belief that any significant environmental action would be very costly for the economy.

Some proponents of energy efficiency also emphasize the conventional idea that environmental action would be costly. Some environmentalists claim that avoiding catastrophe would require a complete restructuring of the economy, as well as of political institutions. Both of the bills proposed in the Senate in 1988 called for national action on the issue and "set the price of avoiding the potentially catastrophic results of the 'greenhouse effect' at nothing less than fundamental changes in the U.S. economy."[19] The ultimate effect of such far-reaching assertions, whether the calls are made to encourage or to discourage environmental action, is to reinforce the status quo since the demand for a comprehensive approach tends to accomplish little in the way of producing actual policies. The political system is designed to resist such an approach.

The automobile industry is not the only sector that stands to lose over the issue of energy use. Whereas the nuclear power sector and the natural gas industry have recognized potential business advantages in global warming,[20] representatives of some of the more vulnerable industries--like the coal industry--see only harm if proposals for reducing greenhouse gas emissions gain credence. They have called upon other conventional ideas to bolster the status quo and resist changing current energy practices. One of the main approaches is to argue that the high degree of scientific uncertainty surrounding the extent and regional impacts of potential climate change precludes rational policy-making. In the same *Washington Post* article that

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[18] 05-23-89 *Washington Post* editorial "Clean Air Per Gallon"

[19] 07-29-88 Weisskopf, op. cit. ("Two Senate Bills Take Aim at 'Greenhouse Effect'")

[20] "Natural gas producers and nuclear power interests aren't being crass about it, but they see what may be a small silver lining for them in the thickening cloud of carbon dioxide around the earth..." 07-22-88 Hamilton "Natural Gas Backers See Opportunity in Concern Over Greenhouse Effect"

described the opportunities that the threat of climate change presented for nuclear and natural gas interests, a vice president of the National Coal Association was quoted as saying:

> We think it would be incredibly shortsighted to begin to base energy policy on perceived or alleged or anticipated environmental problems that may be forty or fifty years away - in particular, in the greenhouse areas where there is substantial scientific uncertainty.[21]

A spokesperson for the Electric Power Institute sounded a similar note: "'With that kind of uncertainty, the managers of the industry really have no basis for planning their plants, their production facilities' around the expected impact of the greenhouse effect."[22]

The conventional culture often assumes that the projections made by scientists, economists, and other experts are dependable. In an early *Washington Post* editorials on the issue, the editors claimed that "[i]f the present projections are correct, danger lies ahead within the lifetime of most of the world's present population."[23] Yet, they did not consider whether present projections were correct, and there is an historical basis for skepticism that they are correct. Similarly, representatives of the conventional culture tend to absorb or avoid uncertainty, rather than address it head on.

> According to scientists, greenhouse gases will trap so much heat by the middle of the next century that world temperatures will rise as much as eight degrees...A NASA scientist [James Hansen] testified in Congress last month [June 1988] that...the global warming trend is so hard to reverse that Stafford's ambitious measures could cut only one or two degrees out of the expected eight-degree rise.[24]

Yet, how do they know? On what basis do they make this claim? How can *we* know that they know? The conventional culture invests more faith than reason in these

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[21] Hamilton, ibid.

[22] Hamilton, ibid.

[23] 06-12-86 *Washington Post* editorial, "The Warming Trend"

[24] 07-29-88 Weisskopf "Two Senate Bills Take Aim at 'Greenhouse Effect'"

experts and their projections.

The conventional culture frequently attempts to separate values from facts; science is often viewed as existing in a separate sphere, independent of politics. The *Washington Post* ran an op-ed piece on the debates over star wars [space weapons] and nuclear power. The authors argued that both issues "should be discussed on their technological merits and political polarization on these two issues is deplorable...We...urge that the discussion avoid polarization for narrow political ends."[25] They apparently assume that political polarization is a deplorable interference with the technological merits, rather than a valuable means of bringing the issues to the public.

Representatives of the conventional culture decry people's irrational behavior. One advocate of nuclear power to cut dependence on fossil fuels disparaged people's fear of nuclear technology and its attendant risks.

> Coal miners routinely die of black lung disease and mine disasters. Within a week of [New York's attempt to close the] Shoreham [nuclear power plant by refusing to comply with the NRC's evacuation requirements], 51 German coal miners died of suffocation in a mine accident. (By comparison, 33 people died at Chernobyl.)[26]

Later, in the wake of the March 1989 Valdez oil spill in Prince William Sound, Alaska, this same writer again demonstrated a failure to empathize with people's fears. "Three Mile Island [was] the nuclear disaster that killed no one. The resulting panic, however, doomed American nuclear power [which] has made inevitable an increase in oil and coal use."[27] Finally, he criticized citizens for what he perceived to be their irrational aversion to risk; "The Valdez disaster represents America's attempt to export risk. The only reason we are now so upset is that this time we did

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[25] 09-16-88 Bethe and Seaborg "Star Wars No, Nuclear Power Yes: Don't Let Politics Confuse the Issues"; Hans Bethe is a former Cornell physics professor who helped develop the atomic bomb and Glenn Seaborg served as Atomic Energy Commission chairman.

[26] 06-17-88 Krauthammer "Killing Nuclear Power"

[27] 03-31-89 Krauthammer "We Make Oil Spills Inevitable."

not export it quite far enough."[28]

The conventional culture views technology as a solution to society's problems, even when the effluents of technology are recognized as the source of the problem. A case in point occurs in an early *Washington Post* editorial on the climate change issue that provided a technical diagnosis of the problem and proposed a technical fix: global warming is "the result of air pollution - a massive accumulation of carbon dioxide...It's a powerful argument for increased reliance *worldwide* on nuclear power."[29] The belief that technological fixes can get us out of this predicament is fairly widespread. In 1991, in the aftermath of the Persian Gulf War, two environmentalists separately wrote op-ed pieces in the *Washington Post*. Both pieces were critical of different aspects of the ad hoc energy policy then in effect, but nonetheless both drew upon the technological prowess exhibited in the Gulf War as the standard to which automobile makers should be held. One writer criticized domestic automakers because they claimed that they could not raise auto fuel efficiency standards much higher.

> With the Gulf War providing an unforgettable demonstration of just how sophisticated and effective American technology can be when we try, the argument that 27 mpg [miles per gallon] is the best we can do sounds a little lame even to Detroit's ear.[30]

Another environmentalist wrote an op-ed piece criticizing a bill pending in the Senate that would open the Arctic National Wildlife Refuge up to oil exploration and drilling. He, too, invoked the performance of American military technology during the Persian Gulf War to call on Detroit to improve automobile efficiency.

> The Gulf War put America's technological prowess on display. Meanwhile, back home, the Big Three auto companies say they can't build cars that average 40 miles per gallon...The auto industry can build cars

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[28] Krauthammer, ibid.

[29] 06-12-86 WP "The Warming Trend"

[30] 03-08-91 JTMathews "High Mileage and the 'Safety Excuse'"; Jessica Mathews is vice president of the World Resources Institute and also writes a regular column for the *Post*.

as smart as our bombs."[31]

Proponents of energy technology in the conventional culture tend to focus on the large-scale, centralized energy sources. Nuclear energy receives a high degree of support. In one op-ed piece, the writer claimed that "of all the major power sources, nuclear power is on balance the most environmentally benign."[32] The *Washington Post*, too, continued to promote nuclear power.

> Any rational strategy has to begin with much more serious conservation than Americans are now practicing. But it has to include power generation that doesn't require combustion, and that means both solar and nuclear energy.[33]

Conservation, on the other hand, tended to be a more peripheral consideration, which the *Washington Post* editors acknowledged. "The warming trend gives further urgency to energy conservation, a cause that has become less fashionable in a time when oil tanks are full to the brim."[34] The *Washington Post* reported that DOE "programs to boost conservation and explore renewable and alternative energy sources...have been especially hard hit by budget cutbacks..."[35] Others thought that conservation would never be able to cut energy usage by enough to halt or reverse potential climate change. "To say that conservation is the solution is disingenuous. No industrial society is in any position to cut down its energy use by a third. It's 95 degrees. Which of the Luddites is willing to shut off his air conditioner?"[36]

Lifestyles and living standards are viewed as threatened by global warming.

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[31] 04-21-91 Frampton "Putting Energy Policy on Ice; Arctic Drilling May Be Long on Oil, But It's Short on Vision"

[32] 06-17-88 Krauthammer "Killing Nuclear Power"

[33] 11-25-88 *Washington Post* editorial, "Mr. Reagan and the Reactors"

[34] 06-12-86 *Washington Post* editorial, "The Warming Trend"

[35] 02-22-89 Peterson "Watkins Facing Knotty Problems at DOE; Oil Imports, Greenhouse Effect, Acid Rain Among Concerns"

[36] 06-17-88 Krauthammer "Killing Nuclear Power"

They represent another aspect of the status quo that the conventional culture seeks to protect, more by reflex than by conscious reflection on their realism and worth. One op-ed writer was worried about protecting them when he wondered whether energy sources

> will be adequate to fulfill all our needs without jeopardizing our independence, our environment, the standards of living of each and every American?...Perhaps [the] most important [lesson of the energy crisis] is that our nation's energy policy has the potential to affect the daily lives of each and every American, today and for generations to come.[37]

A *Washington Post* report about the problems facing James Watkins at the Department of Energy as he became Secretary of Energy echoed the sense that lifestyles are threatened. "Both [global warming and acid rain] are environmental problems linked to the burning of fossil fuels...and resolving either is almost certain to entail large scale changes in the way the world uses its traditional energy resources."[38] The conventional culture perceives energy conservation as requiring undue sacrifice.

> 'It's a sort of unfortunate backlash that has happened - that energy conservation was equated with freezing in the dark,' said Robert K. Watson, an energy resource specialist for the Natural Resources Defense Council. 'Unfortunately people are not willing to give up amenities right now. They're going to force our kids to do that.'[39]

The conventional culture tends to be silent about moral constraints and issues. For example, economic growth is prized without really considering what continued growth means. One op-ed writer asked "Will America have the energy it needs to

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[37] 10-19-88 Zarb "Ignoring the Energy Issue: How Soon We Forget"

[38] 02-22-89 Peterson "Watkins Facing Knotty Problems at DOE; Oil Imports, Greenhouse Effect, Acid Rain Among Concerns." In fact, part of the resistance to the global warming bills proposed by Senators Wirth and Stafford stemmed from "complaints that [Stafford's] bill 'demands too much in a few places' and would drastically alter American life styles..." (07-29-88 Weisskopf "Two Senate Bills Take Aim at 'Greenhouse Effect'").

[39] 08-12-90 Hamilton & Brown "Conservation Complacency in the U.S.; Desire to Reduce Consumption Waned as Prices Showed Stability"

ensure future economic growth?'"[40] without also asking what the other value consequences of increased energy use might be. A much stronger sense of the morality of the conventional culture came through in a *Washington Post* report about the political responses to Iraq's invasion of Kuwait in August 1990. Two Senators sought to open the Arctic National Wildlife Refuge to oil exploration and drilling; one Senator was quoted as saying, "'If we're willing to risk American lives to protect a source of foreign imports, we certainly ought to be able to risk environmental consequences to develop' domestic sources."[41] Economic growth is an important goal in the conventional culture. The conventional side of the energy and global climate change issues, therefore, involves taking a centralized approach, is skeptical of public participation, focuses on eliciting national and international cooperation before taking action, and puts pseudo-rationality, economic growth, and technology before the environment.

Non-Conventional Perspective

The political approach pursued by representatives of the non-conventional side of the energy debate is quite different. The starkest example that highlights these differences occurred when Department of Energy Secretary James Watkins announced in July 1989 the steps he would take to prepare the National Energy Strategy requested by President Bush. His strategy embodied democratic ideals since he sought input from citizens as well as from a variety of interest groups.

> Watkins has scheduled public hearings at cities throughout the country to hear what scientists, industry officials, political leaders, economists, environmentalists and ordinary citizens want to do about energy and environmental policy. . . Watkins said . . . that if hearings show that rejection of nuclear power 'is the consensus of the responsible people

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[40] 10-19-88 Zarb "Ignoring the Energy Issue: How Soon We Forget"

[41] 08-21-90 Weisskopf and Lancaster "Environmentalists Fear Setback to Efforts; Oil Shocks of '70s Put Pressure on Clean Air Advocates, but Movement is Stronger Now"; the two Senators were Ted Stevens (R-Alaska), and his colleague, Senator Frank Murkowski (R-Alaska).

of this country, then that's the way the report's going to come out."[42]

Yet Watkins' approach went against the grain of much that had transpired at the national level regarding the development of nuclear energy up until that point. The federal government had been pushing nuclear power. Many local and state officials, however, opposed the impending start-up of new nuclear power plants, especially Shoreham and Seabrook; opponents tried to block the opening of these two plants by refusing to conduct the evacuation exercises required by NRC regulations.[43] In frustration, the Reagan administration ordered the NRC to circumvent the requirement for local evacuation plans, despite local resistance.[44] The *Washington Post* editorial staff recognized that if the federal government continued to override local wishes, its actions would ultimately increase resistance and be self-defeating.[45] Indeed, the NRC further alienated state and local officials, whose resistance increased and led some to demand decentralized control. For example, New York Governor "Cuomo is incensed at the federal intervention on safety plans. He says that if NRC believes nuclear power plants are safe, they should do away with the evacuation plan requirements."[46] Governor Cuomo negotiated with the Long Island Light Company to close and decommission the Shoreham nuclear power plant, a deal that was awaiting approval from the New York State legislature at that time.[47]

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[42] 07-27-89 Lippman "Watkins to Design National Energy Strategy; Secretary Plans Series of Hearings to 'Listen to Everybody' on Environmental Concerns"

[43] 06-17-88 Krauthammer "Killing Nuclear Power"

[44] 01-05-89 McGrory "Double Trouble for Nuclear Foes"

[45] 11-25-88 *Washington Post* editorial, "Mr. Reagan and the Reactors"; "the whole history of the nuclear industry is a warning that overriding local fears and opposition will not, in the long run, build public support for reactors."

[46] 01-05-89 McGrory op. cit.

[47] McGrory, ibid.

Representatives of the non-conventional culture advocate a decentralized approach to energy policy. One op-ed piece in by the *Post* called for a more flexible approach to regulations on a state-by-state basis.[48]

> State-by-state emission caps should be adopted, and states should be given flexibility to use a broad range of cost-effective tools to meet their goals ...Establishing absolute caps on statewide emissions would force states to consider longer-term issues related to growth, land use and local economics.[49]

While acknowledging that a role for government exists, the authors of this op-ed. piece would not have the federal government dictate to states and localities how they should meet the standards set by the federal government. This allows local officials to enact measures that are suitable to the climate, business needs, population, and infrastructure in each area.

The *Washington Post*'s national news coverage in 1990 and 1991 provided examples where states or local utilities took leading roles in developing alternative energy sources.

> Many states have been particularly aggressive in promoting and developing energy efficiency and in funding research into alternative energy sources than the federal government has been...Arizona [for example] has spent $500 million on energy projects, including a 4,000-home solar development on state land.[50]

In May 1991, Southern California Edison and the Los Angeles Department of Water and Power announced plans to cut their carbon dioxide emissions by conserving energy, developing renewable sources, and by switching away from fossil fuels.[51] In each of these examples, the federal government played no role in promoting the policies.

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[48] 09-29-88 El-Ashry and MacKenzie WRI "Killer Air"; the authors are staff members of the World Resources Institute.

[49] 09-29-88 El-Ashry and Mackenzie WRI "Killer Air"

[50] 08-12-90 Hamilton & Brown "Conservation Complacency in the U.S.; Desire to Reduce Consumption Waned as Prices Showed Stability"

[51] 05-21-91 Weisskopf "Two California Utilities Vow Emissions Cuts"

The non-conventional culture also has a different conception of economics as it relates to energy. Representatives of the non-conventional culture point out that

> energy's market price doesn't fully reflect its cost to society. The market price includes the cost of finding, processing and distributing the energy. But it omits some broader costs of pollution, congestion and the insecurity of supplies. The market price also doesn't accurately reflect the replacement cost of today's energy.[52]

Others point out the economic illusions that result from poor accounting: representatives of a solar power company, Luz International Ltd.,

> contend that their [solar] power costs would look even cheaper if governments compared the costs not only of building a coal or nuclear plant but also of digging up fragile landscape for more coal or uranium and polluting the air and water.[53]

The *Washington Post* editors pointed out the need to consider the hidden costs of producing more energy:

> One reason for the ferocity of the political combat over environmental policy is the entrenched idea that cleaner air and better protection have to impose enormous new costs on industry. But not always. If this country's consumption of electricity continues upward at the present rapid rate, the construction of new power plants and transmission lines is going to be gigantically expensive.[54]

This also means that, according to representatives of the non-conventional culture, the full social costs of nuclear energy might make it a less viable solution.[55] One proposal that surfaces relatively frequently in the *Washington Post* sample is to tax energy to incorporate the social costs[56] or to have "users of fossil fuels pay emission

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[52] 01-24-91 Samuelson "Conserve Energy - Tax It." Jessica Mathews agreed: "energy is too cheap in the United States relative to its unpriced costs, especially of pollution" (07-30-90 JTMathews "Energy Tax Options").

[53] 03-02-89 Jay Mathews "Solar-Energy Complex Hailed as Beacon for Utility Innovation"

[54] 02-07-90 *Washington Post* editorial, "Getting Warmer?"

[55] 08-24-89 Booth "Nuclear Power Debate Shifts; Safer Reactors Gain Favor as Earth Heats Up"

[56] Samuelson, op. cit.

fees to reflect the 'full social costs' of the greenhouse gases they generate."[57]

Another point of disagreement between the non-conventional and the conventional perspectives on energy regards the dependability of the economic projections made to support or resist changes in energy policy to address the threat posed by the buildup of greenhouse gases. The non-conventional culture uses a softer approach to prediction, recognizing the uncertainty that is inherent in both economic and scientific calculations regarding future projections in human affairs.

> [T]here is tremendous disagreement about the cost and disruption to society of such reductions. Recent calculations by a Stanford economist and colleagues put the price tag at more than $3 trillion. Other economists project the cost to be far less. Indeed, a National Academy of Sciences panel is meeting next week to investigate whether it is possible to estimate costs of reducing carbon dioxide and the other greenhouse gases.[58]

Given that uncertainty surrounds so many aspects of the climate change issue, the non-conventional culture acknowledges uncertainty and works with it rather than trying to assume it away. One writer suggested that the wise approach would be to do no harm.

> What...is wise policy for a situation that marries major uncertainties with high, and perhaps catastrophic, but certainly irreversible impact?...Prudence dictates that we do nothing that will make the problem worse while all-out research efforts are made to understand what's happening.[59]

Another op-ed writer advocated taking a gradual approach "to the greenhouse problem. 'It doesn't make sense to restructure the whole energy side of the economy based on greenhouse'...But it does make sense to begin using fossil fuels more

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[57] 03-21-89 Weisskopf "How on Earth to Turn Off the Heat; EPA Outlines Requisites to Counter Global Warming Trend"

[58] 03-10-90 Booth "Carbon Dioxide Curbs May Not Halt Warming"

[59] 07-05-88 JTMathews "Gas and the Greenhouse Effect"

efficiently than we are now..."[60] Another columnist likened the non-conventional approach to hedging one's bets, as when deciding whether to believe in God or not; it reminded him

> of the philosopher Blaise Pascal's famous wager argument about the existence of God. Nobody could be sure about whether the deity really existed, Pascal reasoned. But either God was or God wasn't and, in either case, the quality of our future existence may depend greatly on the position we take in our lives. With the eternal to gain from the belief that God exists, and with nothing to lose if there is none, the wise person will choose, then, to believe in God. He who continues to doubt in the circumstances is taking an enormous risk just because he doesn't know which alternative is true.[61]

The non-conventional culture acknowledges that predictions are inexact and incomplete.

> Those who say so [that the earth's atmospheric temperature is rising] could be entirely right. On the other hand, good scientific predictions may also be entirely wrong. The global warming theory . . . involves broad predictions from inexact and incomplete data and is subject to unknown and possibly uncontrollable variables.[62]

Yet the non-conventional culture does not agree that uncertainty necessarily precludes taking action. "This country and the world don't have to wait for the scientists' debate over greenhouse effects to be settled. They already have plenty of work to do, well justified for other reasons, that will also diminish the risk of severe global warming."[63] One columnist pointed out the need to plan for the unexpected: "the pace and direction of change in the energy picture in the last dozen years is a timely reminder to the new administration of just how opaque the future is."[64]

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[60] 07-22-88 Hamilton "Natural Gas Backers See Opportunity in Concern Over Greenhouse Effect"

[61] 04-17-91 Warsh "We Have Nothing to Lose in Heeding Warnings About Global Warming." David Warsh is a columnist for the *Boston Globe*; his column is carried by the Washington Post.

[62] 05-11-89 Yoder "'Defender' of Science"

[63] 02-07-90 *Washington Post* editorial, "Getting Warmer?"

[64] 01-22-89 Will "The Blessings of Cheap Oil"

Technology plays a very different role in the non-conventional culture as well. One columnist warned, based on the disruption caused by the drought and heat wave in the summer of 1988, that technology will not be able to shield us if the climate does change. "Despite the massive power of modern technology, mankind depends on the normal functioning of the planet, especially the climate system, as heavily as did primitive societies."[65] In fact, the Exxon Valdez oil spill prompted another columnist to noted that human technology is problematic; the oil spill was "more ominously another of those episodic warnings about the fragility of our world: the terrifying power that humans hold over, literally, everything."[66]

Yet, technology is acknowledged in the non-conventional culture as having some role, but to serve human needs and not to become an end in itself. Experience is taken as a good test to see what works. On the non-conventional side of the energy debate, therefore, gains in conservation and efficiency are played up. "The country has proved to itself that conservation can work..."[67] The lessons of the energy crises of the 1970s appear to have been learned within the non-conventional culture, and some of those examples have made their way into the *Washington Post*.

> The nation is getting much more bang out of every barrel of oil it burns than it did in 1973. . . The oil price spikes of 1973 and 1979 have succeeded in building a measure of energy conservation into the fabric of American life.[68]

One *Washington Post* report discussed the soft-path energy approach.

> There likely is no better illustration of the potential of energy efficiency than [Amory] Lovins's [Rocky Mountain] Institute in Snowmass, Colo. . . . Its energy-saving devices - from compact fluorescent lamps to triple-pane windows and rooftop solar panels -

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[65] 07-05-88 JTMathews "Gas and the Greenhouse Effect"

[66] 04-01-89 Goodman "Spilled Oil and Lost Illusions"

[67] 08-14-88 *Washington Post* editorial, "Greenhouse Heat..."

[68] 08-12-90 Hamilton & Brown "Conservation Complacency in the U.S.; Desire to Reduce Consumption Waned as Prices Showed Stability." Furthermore, the reporters made this comparison: "If the United States were using oil no more efficiently now than it was 17 years ago, it would need about 52 percent more oil than it uses to sustain today's economy. . ."

> cost $6,000 to install in 1983 and save an estimated $7,100 a year in electricity and heating costs... 'The carbon dioxide and other pollution avoided by substituting efficiency for fuel is thus avoided not at a cost but at a profit,' Lovins said.[69]

Another columnist pointed out that "conservation has far exceeded 1970s projections."[70] Not only did it work, but it worked without drastically altering lifestyles. "The country has proved to itself that conservation...can work without forcing people to live less comfortable lives."[71]

Another aspect of the non-conventional culture is an emphasis on implementing modest trial programs to determine what works, where, and under what circumstances. One columnist admonished that

> "[t]he greenhouse problem is here to stay. The sooner we recognize that and take modest steps to adjust, the lower the eventual costs if and when ...limits on greenhouse emissions become necessary. In the meantime, let us not do something that must later be undone at great expense."[72]

The *Washington Post* reported the advancement of an electric car prototype; what made this particular model more feasible was "'the systems analysis - a combination of many, many modest improvements to produce a car that is a giant leap forward.'"[73] By supporting modest trial programs, it becomes easier to replicate the approaches that work and to terminate the ones that don't. Flexibility is seen as being important when dealing with an issue, like energy demand, that is subject to uncertainty.

> "Demand growth is erratic and uncertain. Utilities do have some flexibility. Without building huge new coal or nuclear plants -- which

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[69] 02-04-91 Weisskopf "From Beer to Utility Bills, Global Warming Measures Carry a Price"

[70] 01-22-89 Will "The Blessings of Cheap Oil"

[71] 08-14-88 *Washington Post* editorial, "Greenhouse Heat..."

[72] 07-05-88 JTMathews "Gas and the Greenhouse Effect"

[73] Quote by Paul MacCready, engineer and founder of AeroEnvironment, a small California-based firm that has been working with General Motors on the new model, called the Impact; 03-11-90 Moore "Electric Cars: Against the Current?"

> have lead times of 10 or 12 years -- they can increase capacity by adding smaller oil- and gas-fired turbines. Electricity is also being generated by nonutility companies and sold to local power systems."[74]

Another aspect of the non-conventional approach involves an emphasis on preventing pollution, rather than cleaning up pollutants after they have been generated. "Rather than relying solely on regulations to control what leaves the tail pipe and smokestack, we need to reduce the generation of pollution in the first place, principally by using less energy."[75]

The non-conventional culture acknowledges that morality has a place in energy policy. One columnist pointed out that there must be "a moral lesson pouring out of this disabled tanker [the Valdez]. We can't leave the remnants of unspoiled wilderness in the hands of an Exxon. We can't risk trading a bay for a boatload of oil, especially while we ask other countries to abstain."[76] Another columnist said that part of the "problem is to reconcile individual and societal self-interest. Dampening energy demand is in our collective, long-term self-interest. Failing to regulate our thirst for energy may create environmental stresses and shortages of power or fuel."[77] Another writer representing the non-conventional culture had an op-ed piece appear in the *Washington Post* that was almost antithetical to the remark made by a representative of the conventional culture regarding the morality of the Gulf War.

> The proposal to sacrifice the [Arctic National Wildlife] refuge is particularly jarring as our troops return from the Persian Gulf War. If we are prepared to shed blood and spend a small fortune largely to protect our access to oil, it cannot be rational or even moral to continue to waste oil at home, and compensate for our unwillingness to end this waste by destroying important parts of America's natural

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[74] 12-21-88 Samuelson "Blackouts Coming?"

[75] 09-29-88 El-Ashry and MacKenzie "Killer Air"

[76] 04-01-89 Goodman "Spilled Oil and Lost Illusions"

[77] 05-24-89 Samuelson "Environmental Delusions"

heritage.[78]

Comments and Suggestions

Inflating the magnitude of the effort and/or the costs, relative to the less extreme non-conventional expectations, is a tactic used by the two Senators who proposed comprehensive global warming policies in 1988[79] to stimulate action on global warming. It is also a tactic used by non-environmentalists to block action. Both are technocratic in this respect. One problem with publicizing environmental issues in this manner is that it eventually can erodes credibility. One columnist expressed his incredulity about repeated "eco-catastrophes."

> The public's attention on such matters is, however, hard to get - and harder still to hold - for several reasons...Today's saturation journalism pounces on environmental episodes - soil erosion today, oil spills tomorrow - and quickly wrings them dry. So there is a constant media hunger for new crises, each one less convincing than the last. Some environmental activists have played fast and loose with facts to arouse alarm.[80]

As developed here, the distinction between the conventional and non-conventional approaches does not coincide with popular distinctions between conservatives and liberals or between non-environmentalist and environmentalists. The article that discussed the two pieces of global warming legislation, introduced in the Senate in July 1988, revealed that the liberal environmentalists mentioned in the piece appeared to be quite conventional in their assumptions about the need for centralized solutions.[81] Other environmentalists may advocate a less centralized

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[78] 04-21-91 Frampton "Putting Energy Policy on Ice; Arctic Drilling May Be Long on Oil, But It's Short on Vision"

[79] 07-29-88 Weisskopf "Two Senate Bills Take Aim at 'Greenhouse Effect'"

[80] 09-18-88 George Will "Who's the Real Environmentalist?"

[81] 07-29-88 Weisskopf "Two Senate Bills Take Aim at 'Greenhouse Effect'"

policy approach, but still see a major need for national leadership and commands.[82]

Representatives of the conventional culture who are skeptical of democracy fail to recognize that the people are capable of good judgment if they have access to materials of good judgment and some alternatives. The materials of good judgment and serious alternatives are the responsibility of leadership. Regardless of who is to blame for poor judgment, however, it is quite clear that the people will not rise and take the lead. A committee of a dozen has difficulty exercising leadership, let alone a committee of 250 million.

Representatives of the non-conventional side of the energy debate might attempt to straighten out their power ambivalence. What are the preferred state and local roles, what is the preferred national roles, and where should balance be struck between the two? The appropriate national roles in a decentralized energy strategy are primarily to direct attention, to provide seed money for decentralized innovation, regulatory changes to facilitate decentralized initiatives that work, and independent (third-party) evaluations for decentralized innovators and followers. Federal elected officials play a leadership role and federal bureaucracies play a support role, but neither group makes decisions that are better left to state and local officials and representatives of the private sector. One can agree with the columnist[83] on the need for someone to take (and we would add, share) a wider view, without centralizing and concentrating all the decisions in whatever entity has the wider view.

Businesses line up on climate change according to their perceived economic stake.[84] The justifications for their positions can be subjected to the test of

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[82] See for example, 09-29-88 El-Ashry and Mackenzie (World Resources Institute) "Killer Air"

[83] 12-21-88 Samuelson "Blackouts Coming?"

[84] See especially 07-22-88 Hamilton "Natural Gas Backers See Opportunity in Concern Over Greenhouse Effect."

experience. For example, the *Post* reported that fuel-switching is an economical way to reduce air pollution. The Hudson, Ohio, School District converted its bus fleet to natural gas; the business manager said, "'We save roughly $10,000 per year on fuel and probably $100 per bus on routine maintenance...We added three to five years to the life of each bus. And there are no pollutants.'"[85] The general claim or general assumption of a trade-off between the economy and the environment might be confronted with examples of this kind. So might the general assumption of compatibility between the environment and economics.

A federal role also exists for evaluating such small experiments as the Hudson fleet and disseminating information about the successes and failures. This acknowledges that the federal government can help others decide which programs to adopt. The federal government already does some of this, whether it acknowledges it or not. One *Washington Post* article discussed the tax credit for coal companies that made it economically feasible to capture the methane from coal seams, spawning a whole new energy industry.

> But only recently have technology and economics combined to make it commercially marketable. The economics includes a federal tax credit...'From EPA's perspective, this is a win-win situation,' said Dina Kruger, a methane specialist in the Global Climate Change division. 'The coal companies make money and we protect the environment' by capturing and selling methane - believed to be a significant contributor to 'greenhouse' planetary warming - that would otherwise be expelled into the atmosphere by mine ventilators...Amoco officials acknowledge that they can make money at this only because of the federal tax credit...[86]

The federal approach currently consists of sponsoring or conducting research on the issues at hand. "To investigate the technical feasibility of such dramatic [CO2] cuts, at least a dozen studies are underway by federal agencies and private environmental

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[85] 02-14-90 Lippman "More Use of Natural Gas as Motor Fuel Explored; Option is Cleaner, Cheaper, Less Convenient"

[86] 04-12-90 Lippman "Long Feared, Methane Now Valued; Technology, Tax Credits Make Use of Coal-Bed Gas as Fuel Feasible"

and energy groups."[87] It is worthwhile to supplement such studies with field experiments to see what works and what does not in practice.

A review of post-hoc forecast accuracy would be helpful to the public when projections are taken or cited as a basis for decision. We question the conventional claim that "scientific uncertainty precludes rational action" by noting adaptive responses (e.g., Dave Porter, Wisconsin Public Service Co., see Chapter 1) and reasserting the common sense of procedural rationality. Issues can be polarized for common ends -- and must be, for the public to participate. While issues can be polarized for narrow ends, as Bethe and Seaborg asserted,[88] polarization can also serve common interests.

The conventional culture is concerned about protecting the existing quality of life and ways of living, without pausing to reconsider it. The non-conventional culture seeks to adapt the existing quality of life and ways to living to emerging natural realities like global warming and/or to human aspirations like sustainability and intergenerational equity. The alternatives are worth posing sharply for the education of the public, and for public decision.

III. The Culture

The Conventional Perspective

The conventional culture is inclined to look to the political, scientific, and economic experts for assistance in making important decisions, rather than trying to build a consensus among the public on how to proceed. This tendency has been reinforced in aspects of the climate change issue that extend beyond the well-defined

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[87] 03-10-90 Booth "Carbon Dioxide Curbs May Not Halt Warming"

[88] See 09-16-88 Bethe and Seaborg "Star Wars No, Nuclear Power Yes: Don't Let Politics Confuse the Issues."

confines of the energy debate. Science, in particular, has played a significant role in the global warming policy debate, as seen throughout this *Washington Post* sample, because the evidence on whether the temperature has started to rise or not is unclear, the possible regional impacts are unknown, and projections about future changes in temperature and climate are replete with uncertainty. One indication of science's central position is the numerous stories in recent years that focus on the President's Science Advisor as well as the attention received by the question of how well science research did in the annual budget determinations.[89]

The best example in the *Post* of the conventional culture's insistence for comprehensiveness in science is found in the report announcing the establishment of the U.S. Global Change Research Program in 1989.

> The aim of the [interagency] program is 'to gain a predictive understanding of the interactive physical, geological, chemical, biological, and social processes that regulate the total Earth system,' according to the report that details the White House research agenda.[90]

Some scientists tend to encourage this connection between policy and science, where action on the policy is held at a standstill until the scientists come up with the answers about the nature of the problem at hand. One columnist, writing from the perspective of a scientist, advocated that people wait a year before deciding what to do about global warming until after the National Academy of Sciences published its major report on the issue.

> Maybe a little centralized authority is what we need...It is precisely here that organized science comes in. Science seems well ahead of journalism or law or business or legislative politics as a way of getting

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[89] See especially 02-02-90 Booth "Science and Technology Fare Well in Bush's Budget." The reporter wrote: "While the Bush budget is full of cuts big and small for many domestic programs, there are increases across-the-board for science and technology and scientific budget watchers are beside themselves with praise for the administration's generosity. The promised budgetary largess includes proposed hikes for all the major civilian science agencies, with some high-visibility jumbo-science projects recommended for dramatic surges in spending. 'The President feels that support of science and technology is one of the best investments he can make on behalf of the taxpayer,' said White House science adviser D. Allan Bromley earlier this week."

[90] 09-01-89 Booth "U.S. Details Global Warming Study; Interagency Program Attempts to Coordinate Federal Research"

> at some aspects of the world. Its traction stems from the idea that to really know something, to pin it down, is to slice it thinner and thinner, through a process of measurement, experimentation, replication and peer review, until a consensus of all really well-informed specialists can be obtained about particular propositions. This characteristic of universal agreement among specialists is the difference between a scientific truth...and a matter of opinion...[91]

This hubris arises in other examples about science and about technology as well. One reporter likened the computer models that simulated atmospheric processes to God's creating the earth in the book of Genesis.[92] Scientists proposed

> dumping hundreds of thousands of tons of iron into the ocean to create giant blooms of marine algae that could soak up much of the excess carbon dioxide believed to be responsible for global warming. If the massive scheme is carried out, researchers say, it would be among the greatest manipulations of nature ever attempted.[93]

But, in this article, "greatest" seems to be meant in a positive way, rather than in a more apprehensive sense in which it could also be taken. Finally, one *Washington Post* columnist tried to get to the heart of the conventional culture; he explored several aspects of the legacy of the 1986 explosion of the Challenger space shuttle. The shuttle symbolizes the central role that technology plays in American politics.

> The sun rises, the sun sets, the tropical clouds cruise overhead like God's own spectator fleet and shadows slide over what has been called the most complicated machine ever built, the triumph of technocracy,

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[91] 04-11-90 Warsh "Celebrating Earth Day Requires a Certain Calm"

[92] 06-12-89 Booth "Computers and 'Greenhouse Effect': The Genesis of Understanding." "In the beginning, there was blank computer screen. And the Earth was without form, and void; and darkness was upon the face of the deep. And the climate modelers said, let there be light. And there was light. Or at least an equation representing solar radiation. The modelers - entering more equations into their computers - gave the Earth mountains, snow cover and six types of vegetation. They gave the oceans depth, salinity and currents. And then the modelers divided the Earth into a grid with thousands of boxes, and they stacked these boxes one upon the other, up into the atmosphere and down to the bottom of the sea. And into each box, the modelers inserted the basic laws of nature that govern climate: the mathematical formulas that describe momentum, heat transfer, evaporation, condensation and precipitation. And the modelers said, behold, this is good, and they switched on their supercomputers to see what they had wrought."

[93] 05-20-90 Booth "Ironing Out 'Greenhouse Effect'; Dumping in Oceans Proposed to Spur Algae"

the logical product of the "can-do" mentality...[94]

The conventional culture also tends to seek a comprehensive political approach that would coordinate international action on the climate change issue before determining what the United States or individual states or communities should do about the potential problem. During several of the Group of Seven's economic summits, some national leaders and some environmentalists tried to raise the issue for discussion to push the international community towards action. The post-summit communique from the July 1989 summit celebrated as "a watershed" the call for an "innovative solution...'the conclusion of a framework or umbrella convention on climate change to set out general principles or guidelines . . . to mobilize and rationalize the efforts made by the international community.'"[95] Subsequent attention surrounding later economic summits and the Earth Summit held in Rio in June 1992 demonstrates the amount of credence put in this approach.

Ultimately, some representatives of the conventional perspective have decided to fight back. A political and economic backlash appears to have developed--against the environmental movement--that tries to protect the conventional culture. The *Washington Post* reported on the recent rise of a Western movement that has acquired some of the rhetoric of the environmental movement, but for very different purposes. Spokespeople for this movement advocate the "wise use" of resources.

> Another new twist is the development of an overarching philosophy to counter what critics have dubbed the 'anti-human' bias of groups such as the Sierra Club. Industry advocates who once couched their arguments solely in economic terms now speak of 'man's place in the ecosystem' and the obligation to use natural resources for the betterment of mankind. 'We, as a matter of biological fact, no choice of ours, are the dominant species on the planet,' said Ron Arnold, executive vice president of the Center for the Defense of Free Enterprise, based in Bellevue, Wash. 'What we think is that man and

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[94] 09-28-88 HAllen "Space Symbols"

[95] 07-17-89 Rowen "Leaders at Summit Warn Bankers on Third World Debt"

nature can live together in productive harmony.'[96]

The crusade appears to be rooted in the logging, ranching, and mining industries.[97] Yellowstone National Park Superintendent Robert Barbee described the depth of the emotion and opposition he faced at a meeting where the Park Service's experimental ecosystems management approach was opened to public discussion:

> 'I went to a meeting in Bozeman (Mont.) and there were 700 people there...You can't imagine the virulence of the outcry....I was Saddam Hussein...a communist, everything else you could think of. One lady got up there, jaw quivering, used her time to say the Pledge of Allegiance, then looked at me and called me a Nazi.'

The fears and emotions tapped by the new Western movement appear to run high, suggesting that the conventional culture is deeply entrenched. The confidence of the conventional culture showed through one column that appeared in the *Post*:

> a virtually universal aspiration - economic dynamism...has done more to improve life for more people in the last 100 years than was done by all developments in all history prior to that. Man is messy, but any creature that can create space vehicles can probably cope. That is, mankind's inventiveness has been, so far, more creative than mankind's environmental impact has been damaging.[98]

The Non-Conventional Perspective

The debate from the perspective of the nonconventional culture on the global climate change issue is less well-defined than in the conventional culture. Important aspects of the non-conventional approach occasionally rise to the focus of attention to be heard. For example, Bill McKibben's book, The End of Nature, contains alternative ideas about humans' view of nature. One columnist appreciated McKibben's work because it raises important questions and makes people think

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[96] 05-16-91 Lancaster "Western Industries Fuel Grass-Roots Drive for 'Wise Use' of Resources"

[97] In the same article, David Alberswerth, public lands director for the National Wildlife Federation, is quoted as saying: "They claim to be protectors of the environment, but you don't have to look very far beneath the surface to find out what they really want is exploitation of natural resources for private financial gain...The philosophical arguments are only window dressing for the same old people."

[98] 09-18-88 George Will "Who's the Real Environmentalist?"

about our current approach to nature.

> 'An idea can become extinct, just like an animal or a plant,' [McKibben] writes, 'The idea in this case is 'nature' - the wild province, the world apart from man, under whose rules he was born and died.' By changing the temperature, we have changed those rules. They are ours and not nature's...[99]

EPA Administrator William Reilly, in an op-ed piece that the *Post* carried to commemorate the twentieth anniversary of Earth Day, echoed these sentiments.

> Our planet's natural systems do not exist just to be exploited or to support human economic activity. Nature has an intrinsic worth that transcends narrow utilitarian values and should be respected. We should all take responsibility for practicing environmental reciprocity, for nurturing and sustaining the planet that nurtures and sustains us...we must remember that living in harmony with nature is both a practical necessity and a moral obligation. Taking care of the environment is not just important for our future - it is our future.[100]

Reilly challenges the conventional approach to nature that reduces things under consideration to economic terms.

> The money we spend on sound environmental programs is an investment in the nation's well-being...Some analysts suggest that the environment will be the growth industry of the 1990s...Using a combination of incentives and tough enforcement of existing laws, we can engage the marketplace in environmental protection without having to rely exclusively on the kind of cumbersome government intervention that we relied on in the past...People everywhere, in developed and developing nations alike, must embrace a new ethic of conservation and stewardship of nature.

Sustainability is a theme that is hinted at in the McKibben and Reilly pieces, but it comes through most clearly in *Post* stories about the Worldwatch Institute. Their annual State of the World reports help draw attention to non-conventional

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[99] 09-16-89 Goodman "Nature Under Glass." Compare this appreciative depiction of McKibben's work with a more conventional and more skeptical account by a *Post* staff writer who interviewed McKibben, 01-03-90 Booth "William McKibben."

[100] 04-22-90 Reilly "A World in our Hands: Forget the Doomsayers - Environmental Action Means Both Progress and Profits"

ideas in the media. In 1990, the Worldwatch Institute set out to envision what a sustainable society would look like and how it might be attained; in the report, a sustainable society is defined as "'one that satisfies its needs without jeopardizing the prospects of future generations.'"[101] Sustainability directly challenges the conventional faith in economic growth. "Basic assumptions about economic growth - that human progress depends on the rising output of goods and services - would be supplanted by an emphasis on other qualities, such as durability and environmental protection."[102]

Finally, an interview with novelist Walker Percy (author of the best-selling book, The Thanatos Syndrome) takes a deeper look at the roots of the conventional culture from a critical perspective. In his view, our way of life is debatable. "It is precisely science and the scientific age...that have leeched the sovereignty out of individual human beings, leaving empty self-less husks searching for meaning in orgies of lust and war, or seeking escape..."[103] Science and technology are presented not as potent factors in modern society, but as objects of satire and criticism for impinging on human dignity, integrity, and uniqueness. His novels "satirize contemporary culture, often with savage force, while exploring how one ought to live a life in a godless technological era that has brought material improvements for many but also horrors beyond anyone's nightmares."[104] Percy was concerned about ethical and religious restraints on the use of science-based technology; quoting Dostoevsky, Percy agreed that "'without God, all things are permitted.'"

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[101] 02-11-90 Lancaster "'Sustainable' Society Urged by Year 2030; Research Group Warns of Global Degradation"

[102] 02-11-90 Lancaster, ibid.

[103] 05-14-87 McCombs "Walker Percy & the Assault on the Soul: The Novelist, Striking a Blow Against Technology in 'The Thanatos Syndrome'"

[104] McCombs 05-14-87, ibid.

Another *Post* article examined the conventional conception of progress, and found it lacking. The author, perhaps without even realizing it, echoed Percy's point that technology has both a wonderful upside, as well as a terrible downside.

> ...people believed in Progress. Life would inexorably improve. We were headed toward a technological utopia. It was just assumed. Today, "Progress" is a joke...Nowadays people believe in Regress. The world is going to hell in a handbasket. It is just assumed...What killed the idea of Progress for most people was the realization that technology was a mixed blessing...Even as technology advances the life span and health of individuals, growing multitudes live in horrifying deprivation...[105]

The non-conventional culture would have society examine its use of technologies to consider the possible unintended consequences that might accompany an unleashing of newfound abilities and powers.

Comments and Suggestions

The evidence found in these *Washington Post* pieces provides hope that the debate about global climate change and the underlying culture can be opened up; what needs to happen is that conventional ideas and values must be made explicit, while non-conventional values and ideas need to be raised to the fore so that representatives of the two world-views can face off against one another. People will then have the information they need to find their place in the debate; they will be able to make informed decisions about who they want to have lead them and about where they want to be led.

One *Post* article, which explored the meaning of Earth Day to individuals, highlighted the potential that exists out in the public that is currently going to waste. Earth Day 1990 garnered a lot of attention in the media, but it is questionable whether many lasting changes resulted. The people who were interviewed for the article generally indicated that they wanted to do the right thing regarding the

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[105] 02-10-91 Achenbach "Desperately Seeking 'Progress' and Coming to Grips with a Future That isn't What it Used to Be"

environment, but felt confused, or even misled, by environmentalists. One environmentalist said that "the main thrust of Earth Day 1990...'is to give people the feeling of empowerment, to make them believe that their individual actions will produce results.'"[106] But what happened instead for many people was that their expectations about what individual contribution each one could make were raised beyond hope of being met; cynicism and disillusionment frequently resulted. "Because environmental leaders, both in and out of government, have been reluctant to list priorities for consumers or to stress which actions are crucial and which ones are almost meaningless, many citizens say they feel more suspicious than empowered."[107] Effective leadership could tap into the potential that exists.

Two articles in the *Washington Post* show how the debate can proceed along these lines because both do a good job of contrasting the conventional culture with the non-conventional. This highlights the differences between the two approaches, allowing the individual reader to consider where he or she stands on these central issues about how to live one's life. The 1988 presidential election campaign presented two candidates who, in general, represented one or the other of the two cultures. One article compared George Bush's more conventional environmental positions with Michael Dukakis' stances, which were rooted more in the non-conventional culture.[108] This article helped give voters a clear choice on the environment; perhaps the opportunity to choose between a candidate who represents the conventional culture and one who represents the non-conventional perspective will become as clear in the upcoming (1992) presidential election. The second constructive column contrasted two books, one rooted in the conventional culture and

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[106] 04-18-90 Booth and Cohn "Sharing the Environmental Burden; Individual Efforts Mix Concern, Confusion and Contradiction"

[107] 04-18-90 Booth and Cohn, ibid.

[108] 10-03-88 Weisskopf "In Evaluating Bush and Dukakis, Environmentalists Turn to 1983"

a second one that exemplified the non-conventional culture.[109] By playing each book and its core ideas off the other, the columnist effectively laid out the conflicting values of each of the cultures in such a way that he pretty much left it up to the readers to decide where they stood.

Conclusion

Our goal has been to reconceive the global climate change debate around the distinctions between the conventional culture and the non-conventional world-view, to transcend the traditional dichotomies between environmentalists and non-environmentalists or between liberals and conservatives. The conventional culture's approach to global climate change and, ultimately, to energy policy--with its insistence on national and international consensus, on scientific evidence and on guarantees that solutions will not ruin the economy--has thus far dominated the policy debate on the issue. Opposing ideas from the non-conventional culture have gained some attention, but analysis over time shows that those ideas have been dwarfed in comparison. Leaders who represent the non-conventional side of the debate can challenge the assumptions underlying the conventional culture to help raise this alternative view-point to the focus of attention.

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[109] 08-29-90 Warsh "Looking into the Future of Planet Earth: Two Sharply Different Views." The book representing the conventional culture is Population Matters: People, Resources, Environment and Immigration by Julian Simon, while the one representing the non-conventional culture is For the Common Good: Redirecting the Economy Toward Community, the Environment, and a Sustainable Future by economist Herman Daly and theologian John Cobb.

Appendix 3.1
Changing Focus of Attention

June 1986		July 1986		August 1986		September 1986		December 1986	
Actors		**Actors**		**Actors**		**Actors**		**Actors**	
Scientists	10					Biologists	7	Reagan	16
United States	9					Scientists	4	Forest Service	12
NASA	8							Agencies	10
Senate	5							Scientists	8
Administration	4							Administration	5
Countries	4							President	5
Arenas		**Arenas**		**Arenas**		**Arenas**		**Arenas**	
World	5			Earth	4	World	5	Environmental	7
Global	4					Earth	4	Federal	5
Scientific	4					Amazon	4	Government	5
Space	4					Biology	3	International	4
Topics/Issues		**Topics/Issues**		**Topics/Issues**		**Topics/Issues**		**Topics/Issues**	
Greenhouse	11	Carbon Dioxide	4	Warming	5	Species	32	Fire	12
Warming	9	Greenhouse	4	Earth	4	Tropical	11	Nuclear	8
Temperatures	8	Increased	3	Sea	4	Extinction	10	Helicopter	7
Pollutants	7	Plants	3	Trend	4	Food	10	Burn	6
Atmosphere	6	Research	3	Change	3	Forests	9	Small	6
CFCs	6	Water	3	Study	3	Genes	7	Air	5
Carbon Dioxide	5			Temperature	3	Plant	6	Blaze	5
Change	5					Animals	5	Smoke	5
Energy	5					Medicine	5	Winter	5
Climate	4					Climate	3	Experiment	4
Research	4					Endangered	3	Initiatives	4

February 1987		April 1987		May 1987		June 1987		August 1987	
Actors		**Actors**		**Actors**		**Actors**		**Actors**	
EPA	6	Gore	10	Gore	20	Administration	4	McDonald	4
Congress	5	Scientists	9	People	9	Hodel	4	Administration	3
Institute	4	United States	9	Brown	6	State	4		
Worldwatch	4	Democrats	5	Administration	4	Shultz	3		
		States	4	Man	4				
Arenas		**Arenas**		**Arenas**		**Arenas**		**Arenas**	
Environmental	6	Soviet	8	World	16			World	4
World	5	Tropical	8	Politics	6				
Global	3	Environmental	6	Summit	6				
Industrial	3	Iowa	4	Venice	5				
		World	4	International	4				
Topics/Issues		**Topics/Issues**		**Topics/Issues**		**Topics/Issues**		**Topics/Issues**	
Report	10	Forests	8	Nuclear	6			Atmosphere	5
Study	5	Project	5	Economic	5			Car	5
Bill	4	Proposal	4	Population	5			Carbon Dioxide	4
Economic	4	Tropics	4	CFCs	4			Energy	4
Energy	4	Earth	3	Cut	4			Foam	4
Consumption	3	Elections	3	Ozone	4			Sun	4
Fuel	3	Fuel	3	Production	4			Temperature	4
Future	3	Greenhouse	3	Study	4			Climate Change	3
Gloomiest	3	Ozone	3	Chernobyl	3			Ozone	3
Pollution	3	Resources	3	Moderation	3			Resources	3

September 1987		November 1987	
Actors		**Actors**	
Administration	3	Gore	71
		House	16
		Senate	8
		Colleagues	6
Arenas		**Arenas**	
Environmental	3	National	7
		Washington	7
		Harvard	6
		Politics	6
Topics/Issues		**Topics/Issues**	
Ozone	6	Arms	15
Treaty	6	Corals	15
Compounds	4	Algae	14
Layer	3	Control	13
		Sea	10
		Water	10
		Vietnam	9
		Carbon Dioxide	6
		Greenhouse	6

January 1988		March 1988		April 1988		May 1988		June 1988	
Actors		**Actors**		**Actors**		**Actors**		**Actors**	
Countries	4	Blake	5	Midgley	7	Scientists	9	Countries	14
Industry	3	Rowland	4	Industry	6	Experts	5	Nations	14
Nations	3			du Pont	6	Schweikart	3	Leaders	13
Senate	3			Krimsky	4			Hansen	10
United States	3			Rowland	4			Baker	9
								United States	8
Arenas		**Arenas**		**Arenas**		**Arenas**		**Arenas**	
International	4	World	3	Society	5	Soviet	7	World	15
Montreal	4			Scientific	4	Exchange	4	Summit	9
Global	3			Environmental	3	Global	3	American	8
				Government	3				
				Industrial	3				
Topics/Issues		**Topics/Issues**		**Topics/Issues**		**Topics/Issues**		**Topics/Issues**	
Treaty	11	Ozone	14	CFCs	31	Greenhouse	7	Greenhouse	26
Ozone	7	Methane	13	Chemicals	16	Program	4	Nuclear Power	20
Chemicals	5	Stratosphere	6	Ozone	13	Climate	3	Debt	12
Controls	4	Population	5	Air	7	Computer	3	Global Warming	12
Policy	4	Vapor	5	Chlorine	6	Dialogue	3	Coal	11
CFCs	3	Air	4	Atmosphere	4	Earth	3	Economic	10
Dangers	3	Atmosphere	4	Change	4			Earth	9
Depletion	3	CFC	4	Environment	4			Energy	9
Leadership	3	Earth	4	Low	4			Heat	9
Negotiations	3	Greenhouse	4	Refrigerators	4			Changes	8
		Growth	3						

July 1988		August 1988		September 1988		October 1988		November 1988	
Actors		**Actors**		**Actors**		**Actors**		**Actors**	
Congress	8	EPA	12	Bush	33	Dukakis	30	President	17
Industry	7	Country	10	Reagan	15	Bush	29	Bush	10
Producers	7	Scientists	10	Administration	12	EPA	17	Reagan	8
Environmentali	5			Dukakis	12	Environmentali	13	Adviser	6
				NASA	11	State	12	Companies	6
				Astronauts	10	Mitchell	9	Administration	5
Arenas		**Arenas**		**Arenas**		**Arenas**		**Arenas**	
World	10	Environmental	23	Space	47	Environmental	12	American	8
Environmental	6	World	15	Detroit	15	Global	12	Federal	8
Association	4	National	8	Environmental	15	Government	12	National	8
		International	7	American	13	Federal	11	State	7
				Public	13	Public	8	Government	6
Topics/Issues		**Topics/Issues**		**Topics/Issues**		**Topics/Issues**		**Topics/Issues**	
Greenhouse	29	Greenhouse	27	Shuttle	22	Energy	22	Science	24
Natural Gas	27	Global Warming	23	Pollution	20	Oil	15	Deficit	15
Energy	23	Earth	22	Acid Rain	17	Environment	9	Oil	12
Fuels	16	Carbon Dioxide	21	Air	16	Pollution	9	Gas	10
Fossil	14	Sea	19	Cars	15	Water	9	Research	9
Carbon Dioxide	11	Heat	16	Environment	15	Acid Rain	8	Tax	9
Methanol	10	Wetlands	13	Gas	15	Global Warming	8	Technology	9
Nuclear Power	8	Gases	12	Challenger	13	Air	7	Dollar	8
Bills	7	Atmosphere	11	Nuclear	13	Campaign	7	Nuclear Power	7
Cost	6	Planet	11	Program	13	Compromise	7	Trade	7

December 1988	
Actors	
Bush	26
President	13
Utilities	11
Researchers	7
Environmentali	5
Arenas	
Environmental	12
National	7
Conference	6
Earth	6
Topics/Issues	
Electricity	14
Ozone	14
CFCs	12
Plants	12
Air	10
Global Warming	10
Methane	10
Atmosphere	9
Greenhouse	9
Power	9

January 1989		February 1989		March 1989		April 1989		May 1989	
Actors		**Actors**		**Actors**		**Actors**		**Actors**	
Reagan	29	Administration	19	Company	20	Reilly	14	Bush	76
Administration	27	Reagan	18	Nations	20	Administration	10	Administration	60
Bush	27	Watkins	18	People	20	Adviser	10	Lujan	39
President	27	Department	15	President	18	Bush	10	President	36
American	17	Bush	12	United States	18	President	10	White House	34
People	15	People	10	Officials	17	People	7	Reilly	26
		Scientists	8			EPA	6	Officials	24
Arenas		**Arenas**		**Arenas**		**Arenas**		**Arenas**	
Environmental	27	Environmental	19	World	56	World	14	Environmental	39
Federal	21	World	17	Environmental	46	International	11	Convention	30
Public	20	National	9	Global	30	Scientific	10	World	30
National	19	American	8	Conference	23	Environmental	8	International	26
Government	18			States	17				
Topics/Issues		**Topics/Issues**		**Topics/Issues**		**Topics/Issues**		**Topics/Issues**	
Global Warming	34	Energy	26	Nuclear Power	37	Corals	30	Global Warming	66
Greenhouse	27	Change	17	Oil	34	Science	19	Greenhouse	35
Oil	22	Global Warming	14	CFCs	33	Oil	12	Fuel	27
Support	22	Greenhouse effect	13	Accident	30	Fish	11	Policy	26
Nuclear	21	Nuclear	10	Energy	30	Reefs	10	Energy	24
Energy	19	Oil	10	Ozone	30	Policy	9	Economic	19
Air	17	Future	9	Greenhouse	24	Water	9	Cars	18
Forests	17	Trend	9	Earth	23	Island	8	Oil	17
Climate	15	Data	8	Atmosphere	22	Conservation	7	Science	16
Program	15	Hearing	8	Environment	20	Nuclear	6	Testimony	16

June 1989		July 1989		August 1989		September 1989		October 1989	
Actors		**Actors**		**Actors**		**Actors**		**Actors**	
Congress	16	Bush	39	Officials	10	United States	32		
Mitchell	15	Brady	21	Scientists	9	Bush	26	Bush	14
People	15	President	20	Maryland	9	Scientists	20	White House	12
Environmentali	13	Leaders	19	General	8	Bank	19	Democrats	10
Industry	11	Nations	18	People	8	Administration	16	Reilly	10
		United States	18			Nations	14	Administration	9
						Researchers/ Industry	13	President	9
Arenas		**Arenas**		**Arenas**		**Arenas**		**Arenas**	
World	15	Economic Summi	47	National	13	World	55	House	28
Environmental	14	Environmental	27	Environmental	12	Environmental	28	Government	17
Earth	13	World	21	Soviet	11	States	26	Tongass	17
National	13	Space	18	Washington	9			Senate	12
		American	17					Environmental	8
Topics/Issues		**Topics/Issues**		**Topics/Issues**		**Topics/Issues**		**Topics/Issues**	
Air	49	Environment	19	Nuclear	28	Global Warming	39	Global Warming	22
Clean	34	Debt	18	Park	26	Research	33	Carbon Dioxide	15
Greenhouse	22	Energy	18	CFCs	21	Carbon Dioxide	25	Ice	14
Bill	21	Timber	15	Global Warming	19	Methane	23	Timber	14
Acid Rain	21	Earth	14	Power	13	Car	22	Forest	9
Models	20	Trade	14	Reactors	13	Emissions	20	Alaska	8
Tree	20	Money	12	Ozone	12	Earth	19	Bill	8
Carbon Dioxide	17	Global Warming	11	Greenhouse	11	Food	19	Budget	8
Standards	17	Forest	10	Temperatures	10	Nature	19	Conference	7
Global Warming	16	Plan	10	Air	9	Climate	17	Greenhouse	7

November 1989		December 1989	
Actors		**Actors**	
Kunin	26	Bromley	16
Bush	25	Bush	16
United States	23	Scientists	16
Administration	20	White House	10
President	19	Administration	9
Reilly	16	Barro	9
Nations	13		
Arenas		**Arenas**	
Environmental	25	World	15
Vermont	14	American	13
World	14	Colorado	10
International	12	Environmental	9
		Government	9
Topics/Issues		**Topics/Issues**	
Emissions	30	Science	26
Global Warming	27	Global Warming	21
Conference	23	Ice	19
Carbon Dioxide	20	Sea	17
Bill	16	Rise	16
Environment	12	Forest	15
Issue	11	Leadership	15
Acid Rain	10	Greenhouse	14
Ozone	10	Tax	14
Clean Air Act	10	Change	13
		Policy	13

January 1990		February 1990		March 1990		April 1990		May 1990	
Actors		**Actors**		**Actors**		**Actors**		**Actors**	
Bush	104	Bush	82	Industry	24	Bush	61	Bush	22
Sununu	85	Administration	57	President	24	People	48	Countries	22
President	56	Reilly	46	People	19	Lovejoy	45	Scientists	20
McKibben	53	President	41	GM	18	President	32	Administration	19
Administration	46	Sununu	36	States	15	United States	29	Bank	19
Congress	34	America	35			Smithsonian	25	United States	19
White House	31	White House	31			Military	24	Nations	15
Arenas		**Arenas**		**Arenas**		**Arenas**		**Arenas**	
Federal	29	World	45	World	25	Environmental	113	World	43
National	28	Scientific	21	Environmental	21	World	55	Environmental	22
State	20	National	20	Washington	18	Global	47	International	12
				Detroit	16	National	27		
Topics/Issues		**Topics/Issues**		**Topics/Issues**		**Topics/Issues**		**Topics/Issues**	
Budget	100	Global Warming	63	Cars	56	Earth Day	74	Global Warming	49
Global Warming	41	Natural Gas	54	Carbon Dioxide	47	Air	38	Carbon Dioxide	42
Policy	32	Budget	28	Car	40	Energy	37	CFCs	29
Programs	26	Change	28	Fuel	39	Economic	33	Report	23
Climate	25	Science	28	Energy	35	Environment	33	Emissions	18
Earth	22	Policy	27	Air	32	Gas	31	Iron	16
Research	22	Energy	25	Methanol	28	Pollution	30	Population	14
Deficit	21	Fuel	24	Gasoline	27	Global Warming	30	Atmosphere	12
Greenhouse	20	Greenhouse	24	Power	25	Diapers	28	Plants	12
Air	19	Economic	22	Electric	22	Planet	28	Marine	11
				Safety	20	Population	27		

June 1990		July 1990		August 1990		September 1990		November 1990	
Actors		**Actors**		**Actors**		**Actors**		**Actors**	
Bush	27	Bush	72	Hayden	29	State	22	Administration	43
Nations	13	United States	41	Industry	11	Bush	14	United States	38
du Pont	13	Nations	33	Voters	11	Senate	14	Bush	25
Countries	9	Countries	32	Administration	10	University	14	House	23
President	9	President	31	People	10	Scientists	13	Scientists	22
United States	9	Administration	28	President	10			Reilly	21
				State	10				
Arenas		**Arenas**		**Arenas**		**Arenas**		**Arenas**	
Environmental	21	Environmental	64	Environmental	30	Environmental	28	Environmental	38
World	15	Summit	60	National	16	National	16	World	28
Arctic	9	World	34	Global	13	California	14	Conference	22
		Soviet	33	California	7	Government	14	National	13
		West	30						
Topics/Issues		**Topics/Issues**		**Topics/Issues**		**Topics/Issues**		**Topics/Issues**	
CFCs	22	Tax	66	Energy	43	Global Warming	39	Global Warming	63
Ice	21	Carbon Dioxide	54	Oil	31	Carbon Dioxide	29	Carbon Dioxide	41
Fund	20	Global Warming	54	Initiative 128	22	Oil	29	Emissions	41
Global Warming	18	Economic	46	Campaign	19	Energy	28	Electric	38
Ozone	15	Trade	46	Big Green	16	Sulfur	26	Gases	31
Defense	13	Energy	37	Conservation	14	Greenhouse	20	Energy	28
Chemicals	11	Greenhouse	30	Support	13	Geothermal	19	Greenhouse	28
Campaign	10	Emissions	28	Efficiency	12	Gases	18	Air	24
Research	10	Plants	28	Bill	11	Fuels	17	Oil	23
Environment	9	Environment	27	Poll	11	Appropriations	16	Clean	22
Greenhouse	9								

December 1990	
Actors	
Bavaria	38
NASA	24
Agency	18
Companies	17
Corporations	15
Arenas	
Environmental	64
Space	39
World	25
National	24
Topics/Issues	
Report	25
Environment	22
Research	22
Valdez	21
Energy	20
Fuel	20
Wood	20
Program	19
Oil	17
Science	16
Panel	16

January 1991		February 1991		March 1991		April 1991		May 1991	
Actors		**Actors**		**Actors**		**Actors**		**Actors**	
Nations	14	Administration	29	Business	10	Panel	15	People	14
Administration	6	Bush	29	Environmentali	9	Workers	11	Groups	10
Bush	6	President	19	Companies	6	Bush	9	Companies	6
United States	6	Nations	18	Businessmen	3	Congress	9		
Adelman	5	United States	17	Ford	3	Industry	9		
Companies	5	People	14			Nation	9		
		Scientists	14			Administration	8		
Arenas		**Arenas**		**Arenas**		**Arenas**		**Arenas**	
World	16	World	37	American	7	Academy	13	National	10
Gulf	8	National	29	Corporate	4	World	11	Federal	9
Market	8	Space	14	Detroit	4	National	10	Public	9
National	5					Earth	9	California	8
								West	7
Topics/Issues		**Topics/Issues**		**Topics/Issues**		**Topics/Issues**		**Topics/Issues**	
Energy	39	Carbon Dioxide	67	Safety	16	Global Warming	30	Power	14
Oil	30	Energy	63	Car	6	Oil	27	Carbon Dioxide	8
War	21	Global Warming	58	Size/little	6	Sequoyah	27	Natural	8
Global Warming	16	Budget	39	Cost	5	Uranium	26	Global Warming	8
Tax	15	Tax	31	Efficiency	5	Energy	23	Emissions	7
Price	13	Emissions	30	Energy	5	Gases	22	Mining	7
Atmosphere	9	Plan	28	Green	5	Ozone	21	Oil	7
Policy	9	Oil	27	Air Bags	4	Report	19	Utilities	7
Efficiency	8	Research	27	Oil	4	Greenhouse	16	Water	7
Growth	8	Greenhouse	25	Pollution	4	Plant	16	Resources	6

June 1991		July 1991		August 1991		September 1991		October 1991	
Actors		**Actors**		**Actors**		**Actors**		**Actors**	
		Columbus	51	Jay Hair	108	Industry	33	World Bank	37
		People	33	Federation	33	EPA	25	Officials	10
		United States	30	People	23	Administration	16	Critics	6
		Ted Danson	15	Farmer	21	Council	13	State	6
		Countries	14	Envir. Groups	16	NASA	13	EDF	5
		Audubon	11	Goldbecks	15	Congress	12	ElAshry	5
		Scientists	11						
Arenas		**Arenas**		**Arenas**		**Arenas**		**Arenas**	
Global	14	World	31	Environmental	70	Environmental	19	World	13
Environmental	8	European	19	Local	18	World	14	Pak Mun	11
World	7	Environmental	17	Soviet	18	Public	8	Environmental	10
		American	16	Kitchen	15			Department	7
		Summit	13	County	13			Envir. Groups	5
Topics/Issues		**Topics/Issues**		**Topics/Issues**		**Topics/Issues**		**Topics/Issues**	
Air	24	Global Warming	29	Trees	44	Air	53	Ozone	8
Conditioners	10	Energy	19	Forests	36	Ozone	34	Project	7
Global Warming	10	Emissions	18	Global Warming	24	CFCs	32	Development	6
Water	10	Carbon Dioxide	17	Air	18	Pollution	26	Environment	6
Lawn	9	Quincentenary	16	Life	13	Process	24	CFCs	5
Clippings	8	Human	14	Logging	13	Chemical	20	Facility	5
Biopesticides	7	Rain	12	Conservation	12	Emissions	19	Layer	5
Energy	7	Reactor	12	Cutting Down	12	Plants	18		
Plants	7	Climate	11	Small	12	Clean Air Act	17		
Population	7	Pinatubo	11	Timber	12	Atmosphere	16		
Efficiency	6					Global Warming	16		

November 1991		December 1991		January 1992		February 1992		March 1992	
Actors		**Actors**		**Actors**		**Actors**		**Actors**	
Sen. Stevens	31	Dingus	6	People	21	Nations	41	Tsongas	56
Congress	16	United State	6	Burkett	16	Bush	26	Clinton	44
Akasofu	14			Lovejoy	14	Officials	23	Bush	30
Scientists	13			Candidates	13	President	20	Administration	21
Senate	12			Ten Danson	12	People	19	House	21
				Gore	12	Candidates	18	United States	17
				Women	12	Tsongas	16		
Arenas		**Arenas**		**Arenas**		**Arenas**		**Arenas**	
University	52	National	9	National	18	Global	51	National	28
Alaska	41	Global	8	Washington	22	Environmental	39	Government	21
Academic	11	Capitol	7	Political	17	World	32	Foreign	20
Scientific	11	Rio /UNCED	7	Hollywood	13	Third World Nations	16	Federal	16
		Washington	6	American	11	Campaign	15	Los Alamos	14
Topics/Issues		**Topics/Issues**		**Topics/Issues**		**Topics/Issues**		**Topics/Issues**	
Energy	44	Tree	19	Money	17	Ozone	37	Energy	49
Research	40	Energy	14	Room	14	Global Warming	37	Tax	40
Defense	22	Carbon Dioxide	10	Campaign	12	Energy	31	Policy	33
Aurora	19	Climate	7	Democratic	11	Power	26	Nuclear Power	31
Change	18	Trees	6	Silver	11	Earth	24	Global Warming	25
Supercomputer	18	Night	5	Weather	11	Economic	24	Research	21
Appropriations	17	Negotiations	5	Committee	10	Wood	24	Greenhouse	19
Projects	17	Global Warming	5	Policy	10	Pollution	21	Emissions	18
Science	17			Star	10	Emissions	20	Plants	16
Greenhouse	15			Temperature	10	Solar	18	Budget	14
								Efficiency	14

April 1992		May 1992	
Actors		**Actors**	
Bush	32	Gore	51
People	23	United Nations	50
Clinton	22	President	46
United States	21	United States	41
President	20	Bush	36
Administration	17	Scientists	30
House	15		
Arenas		**Arenas**	
Environmental	30	Environmental	65
Global	24	Rio	45
Summit	23	Summit	34
Rio	21	World	30
World	21		
Topics/Issues		**Topics/Issues**	
Earth	30	Global Warming	89
Energy	21	Earth	65
Global Warming	19	Carbon Dioxide	55
Beef	15	Climate	52
Emissions	15	Greenhouse	48
Carbon Dioxide	14	Emissions	47
Environment	13	Energy	44
Growth	13	Treaty	44
Bill	12	Environment	40
Economic	12	Gases	31

CHAPTER 4

CITIZEN VIEWPOINTS[1]

Michael H. Lynn

Introduction

Citizen viewpoints are important for leadership on global climate change policy. In general, the task of responsible leadership in a democracy is to raise the most important issues for the public, to formulate the major alternatives on those issues for the public, and to compete on behalf of those alternatives for public support.[2] If the unconventional ideas related to climate change policy are major in potential but marginalized in the national debate, as argued elsewhere in this report, then the primary task of responsible leadership is to raise these unconventional ideas, to pose them as alternatives to the conventional ideas, and to initiate the competition for public support. To be effective in this task, potential leaders need some understanding of existing citizen viewpoints.

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[1] This chapter is adapted from Michael H. Lynn, *Citizen Viewpoints on Global Climate Change: Opportunities and Obstacles for Leadership* (M.A. Thesis, University of Colorado at Boulder, 1992).

[2] Compare E. E. Schattschneider, *The Semisovereign People: A Realist's View of Democracy in America* (Hinsdale, IL: Dryden Press, 1975), pp. 136-137: "The public is like a very rich man who is unable to supervise closely all of his enterprise. His problem is to learn how to compel his agents to define his options.... The power of the people in a democracy depends on the *importance* of the decisions made by the electorate, not on the *number* of decisions they make.... Above everything, *the people are powerless if the political enterprise is not competitive.*"

The purpose of this chapter is to document and analyze citizen viewpoints on climate change issues, as a basis for understanding how to communicate the non-conventional alternatives to the public. The premise is that leaders do not "create" public opinion, but operate on the predispositions of the public. The promotional efforts of leaders can strengthen and give direction to predispositions, but they help weaken predispositions only if supported by direct experience or credible evidence.[3] Hence in the analysis below, particular attention is paid to predispositions that are consistent with the non-conventional alternatives, and predispositions that are inconsistent but subject to challenge through appeals to experience and evidence. In this connection, documentation of the energy policy experience is an important asset for potential leaders.

The first section of this chapter explains the unusual methods used to document citizens viewpoints as a basis for understanding and communication. (Survey methods are less appropriate for such purposes.) The second section presents the data on the structure and content of citizen viewpoints, and considers the reliability of these results. The third section considers the implications of the results for leadership on the narrower policy issues and on the broader cultural issues of global climate change.

I. Methods

Q-Methodology

The purpose of this study is *not* to estimate the percentage of people who have a particular opinion on a question of interest to the investigator. Instead, the purpose is to understand the viewpoints of citizens, in order to clarify how to

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[3] See Harold D. Lasswell and Abraham Kaplan, *Power and Society* (New Haven: Yale University Press, 1950), pp. 113-114, and the remainder of Chapter VI on Symbols.

communicate with them on global climate change issues. The difference in purpose entails a difference of standpoint:

> [M]ost previous work in the behavioral tradition has stressed the *external* standpoint of the investigator, i.e., has begun with his vision of his world according to which all else is measured.... In contrast, there have been fewer attempts to examine the world from the *internal* standpoint of the individual being studied...[i.e.,] trying to understand the political ramblings of the average man.[4]

The internal standpoint of the individual on such complex issues as global climate change consists of many preferences, beliefs, and loyalties that are more or less integrated into a unique whole.[5] The individual will respond to the efforts of potential leaders in terms of his or her viewpoint, and not in terms of one or several discrete opinions.

Q-methodology is appropriate for examining the internal standpoint of the individual and for the purposes of this study.[6] A Q-study is based on a sample of statements (called a Q-sample) selected by the investigator to represent the universe of discourse on an issue. The Q-sample usually consists of a few to several dozen statements, each printed on a separate card; the cards are shuffled to randomize their order. Each respondent expresses his or her viewpoint by sorting these statements.

First, the respondent reads through the statements, placing those she generally agrees with in a pile on the right, those she generally disagrees with on the left, and those she considers unimportant, is unclear on, or feels uncertain about in the middle. Second, the respondent examines the statements more closely, beginning

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[4] Steven R. Brown, *Political Subjectivity: Applications of Q Methodology in Political Science* (New Haven: Yale University Press, 1980), p. 1.

[5] The probability that any two individuals will have the same opinion on a single question is quite high, but the probability that they will have the same opinion on 60 questions is vanishingly small. Hence any viewpoint described comprehensively is probably unique.

[6] Q-methodology is contrasted with R-methodology, the realm of classical statistics including the Pearson product-moment correlation, r.

with the pile on the right. From these statements, she selects the three statements she agrees with most of all and places them below a marker, +5/Most Agree, on the far right of the table. Turning to the pile on the left, she selects the three statements she disagrees with most of all and places them below a marker, -5/Most Disagree, on the far left of the table. Returning to the pile on the right, she selects the four statements she agrees with most, of those remaining, and places below a marker +4. She continues in this fashion, alternating from right to left and gradually approaching the middle, until all the statements have been placed in a distribution that resembles an inverted triangle. Finally, the respondent examines the distribution and moves any statements, if necessary, to make the distribution reflect her viewpoint more accurately.

The result of the sorting procedure is a Q-sort, which gives the direction and intensity of response to each statement relative to all the other statements that comprise the viewpoint. Direction is indicated by agreement or disagreement. Relative intensity is indicated by the difference between, for example, a statement at -3 and another at -4; disagreement with the latter being more intense. Moreover, the meaning of any statement is constrained by the other statements in the Q-sort. For example, a statement of distrust of the federal government is an ideological statement if it occurs in a Q-sort anchored by statements that reflect agreement (+5) with reliance on the free market and disagreement (-5) with government regulation of the economy; in another Q-sort, the same statement of distrust could be non-ideological, reflecting a pragmatic preference for state and local action. Consequently, the respondent, not the investigator, controls the direction, intensity, and meaning of each statement in the Q-sort.[7]

[7] Conversely, in R-methodology, including conventional opinion surveys, the investigator exercises control through standardization of the meaning of each question and the response to it; if the meanings are not standardized, the operational definition of the variable is invalid. The investigator also exercises control by deciding which questions to cross-tabulate with others.

Global Change Q-Sample

The Q-sample, as mentioned above, is an instrument that represents the universe of discourse on an issue. Statements are selected according to a factorial design, which makes the basis of selection explicit and encourages balance and comprehensiveness with respect to the most important dimensions of the universe of discourse. The most important dimensions, given the purposes of the study, are the following three:

Culture (Conventional, Non-Conventional)
Values (Power, Enlightenment, Wealth, Well-Being, Morality, Skill)
Problem-Orientation (Goals, Trends, Conditions, Projections, Alternatives)

Overlapping these three dimensions produces 60 categories (2 x 6 x 5 = 60). We have selected 60 statements, one for each category in the factorial design, from personal interviews, news and other reports, and the scholarly literature.[8] The Q-sample is reproduced in Appendix 4.1, which includes the statements, their classification in terms of the factorial design, and the mean scores within the principal citizen viewpoints as well as the entire sample.

The Culture dimension ensures a balance among statements that are roughly classified as conventional and non-conventional with respect to climate change issues. As operationalized here, the conventional statements are generally oriented toward centralized (national and international) policy decisions, science as the basis for policy, continuing economic growth, protecting existing standards of living, developing natural resources for human progress, and relying on large-scale technologies. In contrast, the non-conventional statements are generally oriented toward decentralized decisions, the limitations of science for policy purposes, the economic costs of

[8] More precisely, the statements were selected and paraphrased from these sources. Paraphrasing is necessary because the source statements seldom meet standards of clarity, consistency of tone, or conciseness required for a Q-study. Paraphrasing works because the same basic idea can be expressed in many way.

environmental degradation, learning sustainable ways of living, developing moral constraints on the exploitation of nature, and relying on small-scale technologies.

The other two dimensions reflect distinctions that are important in sound thinking about any policy issue.[9] The Values dimension distinguishes statements according to the many kinds of preferred outcomes at stake in any policy setting. Here it is practical to use only six value categories: Power (decision making, victory, defeat); enlightenment (news, insight, scientific discovery); wealth (income, ownership); well-being (safety, health, comfort); morality (rectitude, respect, affection); and skill (proficiency, know-how). It is typically a mistake to focus analysis on one or a few values, and to ignore or dismiss the many others as externalities. What is external to an analysis may be critical in the real world; an if so, mistakes will be made when action is taken in the real world.

The Problem-Orientation dimension distinguishes statements according to the five tasks that are logically entailed in any rational policy exercise: Goals (what are the preferences to be realized?); trends (what have the trends been with respect to those goals?); conditions (what factors condition the direction and magnitude of the trends?); projections (what are the possible future trends under various contingencies?); and alternatives (what strategies and tactics will help realize the goals?). To understand the logical necessity of statements of each kind, consider that without alternatives, there is no decision; without goals, there is no basis for deciding among alternatives; without consideration of trends, conditions, and projection, the realism of a decision is questionable.

The respondent knows nothing about the factorial design underlying the selection of statements in the Q-sample, and the sorting of 60 statements gives them the opportunity to express an extremely large number of viewpoints. Hence the

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[9] See Harold D. Lasswell, *A Pre-View of Policy Sciences* (New York: Elsevier, 1971), Chs. 2 and 3 especially.

respondent finds it rather easy to express his or her unique viewpoint by sorting the statements -- which is, of course, the point of the exercise. Anyone else's viewpoint is much more difficult to express.

Data and Analysis

Between May and June, 1991, Quantum Research Services Inc. contacted approximately 115 citizens in the Denver metropolitan area for this study. Quantum used randomly-generated phone numbers in six geographic subareas selected for socioeconomic diversity. In addition, Quantum also used screening questions to select a diverse sample of literate citizens, balanced with respect to socioeconomic standing, gender, age, political identifications, and views on the environment. Of those who met requirements for the sample, 72 were asked and agreed to participate. Each respondent completed a Q-sort and a supplementary questionnaire during an interview in the respondent's home.[10]

The main viewpoints shared among these 72 respondents were discovered and described through statistical analysis. Briefly, we used the correlation, r, between each pair of Q-sorts as a coefficient of similarity between the viewpoints of each pair of respondents, taking into account all 60 statements. (For an identical pair of Q-sorts, possible but extremely unlikely, $r = 1$; for an independent pair, $r = 0$; and for opposed pair, $r < 0$.) Then we clustered respondents together on the basis of similarity using the complete linkage algorithm. For a sample of 72 cases, clustering algorithms begin with 72 single-member "clusters" and produce one 72-member cluster at the end. At each intervening step, the algorithms merge the two most similar clusters (of those remaining) into one cluster. The algorithms differ in the

[10] The interviews were conducted by Quantum employees trained for this study. The respondents were offered and paid $20 each upon completion of the interview.

rule used to select the two most similar clusters at each intervening step.[11] However, other algorithms produced essentially the same clusters of respondents as the complete linkage algorithm, which is evidence of the robustness of the results reported in the next section.

Note that the expectations of conventional opinion surveys do not apply here. In particular, the dependability (including representativeness) of a Q-study does not depend on a large probability sample of several hundred or more. Such samples are required to estimate the quantitative distribution of opinion in a population from sample survey data, but that is not the purpose of a Q-study. Rather, the purpose of a Q-study is to discover and describe the qualitatively distinct viewpoints shared among respondents. For this purpose, the sample must be diverse enough and large enough to include several respondents who represent each significant viewpoint in the population. Any more than several such respondents would be redundant -- in effect, more examples of the same viewpoint. A body of experience backed by theory indicates that a diverse sample of 72 is large enough to fulfill the purposes of this study.[12]

II. Results

Three viewpoints on global climate change issues emerged from the cluster analysis, and are labelled the Traditionalists (TR), Environmental Activists (EA), and Environmental Idealists (EI). This chapter begins with the structure of these viewpoints, including their homogeneity, size, and relationships to each other. Then the content of each viewpoint is described in some detail. Finally, these results are

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[11] For each pair of clusters remaining, the complete linkage algorithm finds the similarity between the two members (one from each cluster) that are most different. It then selects and merges the pair of clusters for which that similarity is highest. For an introduction, see Maurice Lorr, *Cluster Analysis for Social Scientists* (San Francisco: Jossey-Bass, 1987).

[12] See Steven R. Brown, *op. cit.*

compared with the results of other studies to clarify their dependability as a basis for leadership strategies.

Structure of the Viewpoints

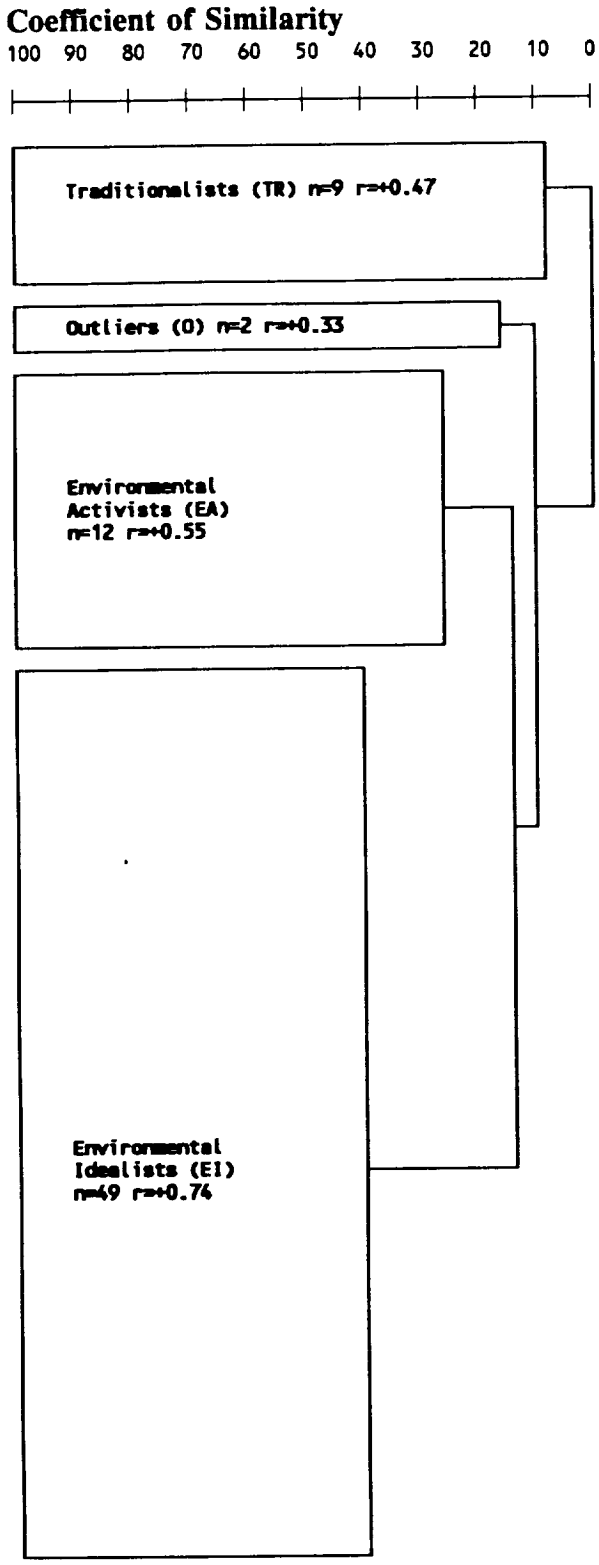
Figure 4.1, a dendrogram, summarizes the structure of the viewpoints that emerged from the cluster analysis. The horizontal dimension of the clusters is proportional to the coefficient of similarity at which the clusters were formed. For example, when two clusters merged into EI, their similarity was about .40; when TR merged with the cluster of everyone else in the last step, their similarity was almost .00. The lower the coefficient of similarity, the later the cluster was formed. The vertical dimension of the clusters is approximately proportional to the number of respondents (n) in them. The average correlation (r) between each member of a cluster and the cluster's ideal type is a measure of homogeneity. The cluster's ideal type is simply the average score on all 60 statements among members of the cluster[13]; it is, in effect, the Q-sort of a hypothetical perfect specimen of the cluster.

Clearly, EI (Environmental Idealists) is by far the largest and the most homogeneous cluster. Statistically, this is very unusual, since normally the homogeneity of a cluster decreases as its size increases. This 49-member cluster includes over two-thirds of the respondents; yet the viewpoints of the two least-similar members in this cluster nevertheless correlate at about .40, and the average correlation of members' viewpoints with the ideal type is .74. EA (Environmental Activists) is the next largest and next most homogenous cluster. The 12 members of this cluster (a sixth of the respondents) have an average correlation of .55 with the ideal type. TR (Traditionalists) are the smallest and least homogeneous cluster, apart from the two outliers.[14] The 9 members of this cluster (an eighth of the

[13] These average scores are reported statement by statement in Appendix 4.1.

[14] The outlier's Q-sorts make little sense. The best explanation is that the respondents did not take the task seriously.

Figure 4.1
Structure of Viewpoints (Dendrogram)



Note: r = average correlation of cluster members with ideal type of the cluster.

respondents) have an average correlation of .47 with the ideal type, and, as we shall see, agree on much less than the EAs and EIs.

The TRs and EIs are the most different viewpoints in the sample, as shown in Figure 4.1. The dendrogram shows that if the whole sample is split into two clusters, it is split between the TRs and the cluster of everyone else. And it is clear that in the cluster of everyone else, EI is the dominant core. Moreover, the correlation between their ideal types is only .26, which is less than the correlation between the TR and EA ideal types (.44) and much less than the correlation between the EA and EI ideal types (.78). Hence the ideal types of the most different viewpoints, TR and EI, can be taken as a frame of reference to locate the individual members of the clusters. The result is graphed in Figure 4.2. The horizontal X-axis represents the ideal type of the TRs; the vertical Y-axis represents the ideal type of the EIs.[15] The X,Y coordinates of each individual member are merely its correlations with the idea types of the TRs and EIs, respectively.

The main point of Figure 4.2 is to show that these viewpoints are not polarized.[16] That is to say, nearly all of the individual viewpoints have some positive (even if small) correlation with both the TR and EI ideal types, and therefore quite literally occupy the middle ground between the ideal types. The exceptions are two members of the TR cluster whose viewpoints are negatively correlated with the EI ideal type, and the two outliers whose viewpoints are negatively correlated with the TR ideal type. High and negative correlations would indicate polarization, stemming from strong opinions about the same statements but

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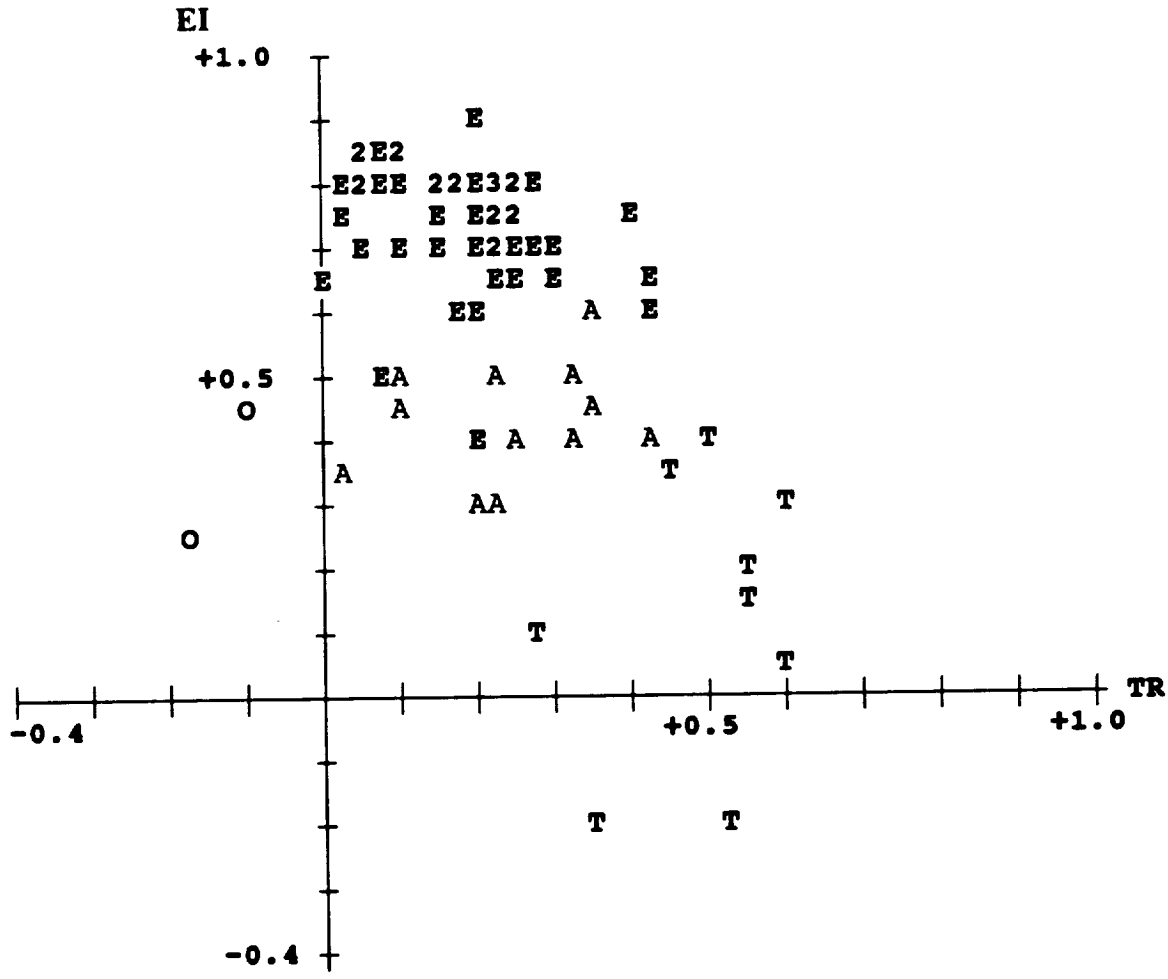
[15] Technically, the angle between the x and y axes should be less than 90 degrees, to reflect the small positive correlation between the two ideal types. They are represented as independent here to enhance the readability of the graph. Note that a perfect specimen of TR would be located at coordinates 1,0; a perfect specimen of EI would be located at coordinates 0,1.

[16] Figure 4.2 also depicts in another way the intermediate position of EAs between TRs and EIs, and the relative size and homogeneity of the three clusters. Note especially how the TRs are dispersed over a rather large and thinly-populated area.

Figure 4.2
Relationships Among Individual Viewpoints

TR = Traditionalist ideal type (X-axis)
EI = Environmental Idealist ideal type (Y-axis)

T = Traditionalists
E = Environmental Idealists (Numbers refer to multiple EIs)
A = Environmental Activists
O = Outliers



in opposite directions. Apart from the exceptions, disagreement among individual viewpoints is largely a matter of strong opinions about different statements.

In summary, the structure of citizens viewpoints on global climate issues is strikingly simple compared to other issues. From the standpoint of potential leaders, note that:

* The dominant cluster of viewpoints, EI, is unexpectedly large and homogenous.
* The only potential opposition, TR, is quite small and rather heterogenous.
* Overall, there is more consensus than conflict in this sample of citizen viewpoints.

Complementary information about the content of viewpoints is also relevant to potential leaders.

Content of the Viewpoints

Consensus within Viewpoints. The shared content or consensus within each cluster consists of the statements that have the highest negative and the highest positive mean scores among clusters members. (These are the statements that would appear at the Most Disagree and the Most Agree extremes in the Q-sort of the cluster's ideal type, the hypothetical perfect specimen.) Statements that are relatively controversial or unimportant among cluster members have mean scores near the middle of the distribution, roughly -2.0 to +2.0. This section reviews the TR, EA, and EI clusters in turn, reporting the consensus among members of each cluster along with their socio-demographic characteristics.

The relatively weak consensus within the Traditionalist (TR) cluster appears to focus on concern about the economic implications of global climate change (see Figure 4.3A). Consisting mainly of male, conservative Republicans (see Figure 4.3B),

Figure 4.3A
Consensus Within Traditionalist Cluster (TR)
Mean Scores (Sample, **TR**, EA, EI)

Disagree

50. I support national taxes on fossil fuel consumption to reduce emissions of greenhouse gases.
(-0.0, **-3.4**, +0.3, +0.6)

54. We should trust the government in Washington to direct and coordinate responses to global warming.
(-3.3, **-2.8**, -4.1, -3.3)

03. I support investing about $1 billion a year to monitor the global climate and develop better scientific models.
(+0.0, **-2.4**, -1.0, +0.6)

31. Environmentalists are virtually powerless against the combination of big business and big government.
(-1.4, **-2.3**, -1.3, -1.5)

48. Economic growth is partly an illusion because it fails to account for damage to nature.
(+0.9, **-2.0**, -0.1, +1.6)

Agree

44. We must learn sustainable ways of living that recognize and respect nature's limits.
(+3.2, **+2.6**, +3.1, +3.4)

08. Global warming, like most other policy problems, is a matter of weighing benefits against costs.
(-0.9, **+2.2**, -1.0, -1.5)

43. Better scientific understanding is required before making major policy decisions on global climate change.
(+0.6, **+2.2**, +2.8, -0.2)

Figure 4.3B
Characteristics of Traditionalist Cluster (TR)

Age	**Mean**: 40.4 years **Range**: 27-79 (52 years) **Distribution**: **#** **Age** (1) 20-29 X (5) 30-39 XXXXX (2) 40-49 XX (0) 50-59 (0) 60-69 (1) 70-79 X
Sex	7 Males; 2 Females
Married	6 Yes; 3 No
Occupation	Professionals. Numbers-orientation
Income	3 Refused; 2 20+; 2 30+; 1 50+; 1 10-;
Race	7 Whites; 1 Black; 1 Hispanic
Education	4 Bachelors; 2 High School; 2 Masters ; 1 Associates
Political Party	5 Republicans; 2 Independents; 2 Democrats
Ideology	7 Conservatives; 2 Moderates; 0 Liberals
Environmentalist?	7 Yes; 1 Maybe; 1 No
Religious?	6 Yes; 3 No
Main News Source	3 TV; 3 Papers; 1 Journal; 1 College; 1 Combination
Trust/Credible	5 Scientists; 3 None; 1 Combination; 0 Environmentalists; 0 Business Leaders; 0 Religious Leaders

the TRs are reluctant to pay for environmental protection, rejecting both taxes on fossil fuels **[50;-3.4]** and investing to develop better scientific models **[03;-2.4]**.[17] These middle-to higher-income, numbers-oriented professionals also reject the idea that economic growth is an illusion because it ignores damages to nature **[48;-2.0]**. This cluster tends to favor a robust, thriving economy over environmental concerns, and perceives the two to be mutually exclusive.

The TRs also distrust the federal government to handle global warming policy **[54;-2.8]**, and believe that environmentalists are not a powerless group **[31;-2.3]**. Consequently, they may view environmental organizations as powerful interest groups capable of exerting control over Washington and big business, perhaps threatening the nation's economy. This cluster's support for better scientific understanding as a prerequisite for policy **[43;+2.2]** and for taking a cost-benefit approach **[08;+2.2]** reflects their caution and skepticism about global warming. In addition, their choice of scientists as the most credible and trustworthy sources of information tends to reinforce the two previous notions.

Finally, and unexpectedly, the TRs agree that we must learn sustainable ways of living **[44;+2.6]**, and they identify themselves as environmentalists. From their perspective, environmentalism and conservatism are evidently compatible, at least in these respects.

The Environmental Activists (EAs) share an action-oriented viewpoint (Figure 4.4A). Consisting of moderately-educated small-business people (Figure 4.4B), they combine environmental concerns with both scientific and economic caution, making them intermediate between the TRs and EIs in these respects.

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[17] The first number within the brackets is a statement number; the second is the mean score on that statement within the cluster.

Figure 4.4A
Consensus Within Environmental Activist Cluster (EA)
Mean Scores (Sample, TR, **EA**, EI)

Disagree

54. We should trust the government in Washington to direct and coordinate responses to global warming.
(-3.3, -2.8, **-4.1**, -3.3)

12. Environmental protection is another burden on the weak and poor in the United States and abroad.
(-2.1, -0.1, **-2.4**, -2.5)

39. Recycling is just one of many time-consuming inconveniences inspired by environmentalists.
(-3.1, -1.6, **-2.2**, -3.7)

38. We should rely on advances in technology to meet such challenges as global climate change.
(-0.7, +0.9, **-2.0**, -0.6)

19. I support policies that would expand the production and use of nuclear power.
(-1.2, +1.0, **-2.0**, -1.3)

Agree

04. We should think globally but act locally, relying on ourselves as citizens to protect the global climate.
(+2.7, +1.6, **+3.3**, +2.8)

10. I support research and development to make better use of renewable resources, like solar, hydro, and wind.
(+3.1, +1.9, **+3.2**, +3.4)

44. We must learn sustainable ways of living that recognize and respect nature's limits.
(+3.2, +2.6, **+3.1**, +3.4)

43. Better scientific understanding is required before making major policy decisions on global climate change.
(+0.6, +2.2, **+2.8**, -0.2)

46. People eventually will have to acquire a sense of stewardship for the Earth and all life on it.
(+3.2, +1.3, **+2.4**, +3.6)

16. I support modest trial programs to discover what can and should be done about global warming.
(+1.5, -0.9, **+2.1**, +1.9)

Figure 4.4B
Characteristics of Environmental Activist Cluster (EA)

Age	**Mean:** 38.1 years **Range:** 22-65 (43 years) **Distribution:** **#** **Age** (2) 20-29 XX (6) 30-39 XXXXXX (1) 40-49 X (0) 50-59 (2) 60-69 XX
Sex	7 Males; 5 Females
Married	7 Yes; 5 No
Occupation	Nonprofessionals. Small business-orientation.
Income	4 10+; 3 Refused; 2 20+; 2 30+; 1 75+
Race	8 Whites; 3 Blacks; 1 Hispanic
Education	5 High school; 4 Associates; 3 Bachelors
Political Party	4 Republicans; 4 Independents; 4 Democrats
Ideology	7 Conservatives; 5 Moderates; 0 Liberals
Environmentalist?	7 No; 5 Yes
Religious?	9 Yes; 3 No
Main News Source	7 TV; 2 Newspaper; 1 Magazine; 1 Combination; 1 Work
Trust/Credible	7 Scientists; 3 Environmentalists; 1 Religious; 1 None; 0 Business leaders; 0 Religious leaders

The EA's action-orientation is local and small-scale, as evidenced by their belief in thinking globally but acting locally **[04;+3.3]**. They also support research and development for renewables **[10;+3.2]**, modest trial programs **[16;+2.1]**, and recycling **[39;-2.2]**. In addition, the EAs reject relying on technological advances **[38;-2.0]** as well as nuclear power **[19;-2.0]**. However, they believe that we need more scientific understanding on global warming **[43;+2.8]** before making major policy decisions.

Philosophically, the EAs support learning sustainable ways of living **[44;+3.1]** and acquiring a sense of stewardship for the Earth and all its life **[46;+2.4]**. This moderate to conservative cluster is the most distrustful of the federal government **[54;-4.1]**. Combined with their small-business background, this distrust fuels a strong support for active programs to protect the environment.

Consensus among the Environmental Idealists (EIs), the large and cohesive cluster, emphasizes environmental ideology (Figure 4.5A). Socio-demographically they are diverse, as evidenced by their varied occupations, fields, parties, and ideologies (Figure 4.5B). Education levels are moderate, and their incomes are mostly middle class.

The EIs are concerned about the Earth's limits, strongly rejecting the idea that the world can support an ever-increasing human population **[32;-4.0]**. They also support learning sustainable ways of living **[44;+3.4]** not based on human greed **[14;+2.6]**, and believe that environmental deterioration is the one cost we cannot afford to pay indefinitely **[06;+3.5]**. They show concern for other life forms and those not yet born, favoring both a sense of stewardship for the Earth and all its life **[46;+3.6]** as well as intergenerational equity **[21;+2.7]**. The EIs also question the values and institutions that have guided progress over the last two centuries **[33;-2.7]**, especially the dominance of man over nature **[20;-3.3]**, and they do not trust the federal government to direct and coordinate responses to global warming **[54;-3.3]**.

Figure 4.5A
Consensus Within Environmental Idealist Cluster (EI)
Mean Scores (Sample, TR, EA, EI)

Disagree

32. The world has the carrying capacity to support an ever-increasing human population.
(-3.0, -0.3, -1.3, **-4.0**)

39. Recycling is just one of many time-consuming inconveniences inspired by environmentalists.
(-3.1, -1.6, -2.2, **-3.7**)

54. We should trust the government in Washington to direct and coordinate responses to global warming.
(-3.3, -2.8, -4.1, **-3.3**)

20. We must respect the Western religious tradition that gives man the right to dominate nature.
(-2.6, +0.4, -1.6, **-3.3**)

17. I oppose federal regulations to force manufacturers to build more fuel-efficient cars.
(-2.5, -0.2, -1.8, **-3.0**)

13. Global warming will turn out to be like other scares, such as nuclear winter and oil costing $100 per barrel.
(-2.0, +0.9, -0.3, **-2.9**)

15. The President and Congress should attend to more important problems than global climate change.
(-1.9, +0.0, -0.4, **-2.7**)

Agree

46. People eventually will have to acquire a sense of stewardship for the Earth and all life on it.
(+3.2, +1.3, +2.4, **+3.6**)

06. I believe that environmental deterioration is the one cost we cannot afford to pay indefinitely.
(+2.7, +1.6, +1.2, **+3.5**)

44. We must learn sustainable ways of living that recognize and respect nature's limits.
(+3.2, +2.6, +3.1, **+3.4**)

10. I support research and development to make better use of renewable resources, like solar, hydro, and wind.
(+3.1, +1.9, +3.2, **+3.4**)

04. We should think globally but act locally, relying on ourselves as citizens to protect the global climate.
(+2.7, +1.6, +3.3, **+2.8**)

27. Global climate cannot be protected without international cooperation and regulations.
(+2.4, +1.1, +1.7, **+2.8**)

21. We must leave future generations with as many opportunities to meet their needs as we have had.
(+2.3, +1.3, +1.8, **+2.7**)

Figure 4.5A (Continued)

33. I have confidence in the values and institutions that have guided our progress over the last two centuries or more.
(-2.0, +0.2, -1.8, **-2.7**)

12. Environmental protection is another burden on the weak and poor in the United States and abroad.
(-2.1, -0.1, -2.4, **-2.5**)

14. We must conceive and construct a world not centered primarily on human greed.
(+1.7, -1.7, +0.6, **+2.6**)

30. I support programs to help families, firms, and localities cut back their fossil fuel consumption.
(+1.8, -0.2, +0.4, **+2.5**)

Figure 4.5B
Characteristics of Environmental Idealist Cluster (EI)

Age	**Mean:** 41.5 years **Range:** 19-75 (56 years) **Distribution:** **#** **Age** (1) 18-19 X (8) 20-29 XXXXXXXX (19) 30-39 XXXXXXXXXXXXXXXXXXX (8) 40-49 XXXXXXXX (4) 50-59 XXXX (7) 60-69 XXXXXXX (2) 70-79 XX
Sex	28 Female; 21 Male
Married	31 Yes; 18 No
Occupation	Wide range covering full socioeconomic span
Income	13 30+; 10 20+; 8 10+; 6 50+; 3 75+; 3 10-; 6 Refused
Race	45 White; 2 Black; 1 Hispanic; 1 Native American
Education	18 High School; 15 Bachelors; 9 Associates; 5 Masters; 2 High School Dropouts
Political Party	23 Independents; 14 Democrats; 12 Republican;
Ideology	17 Moderate; 16 Liberal; 15 Conservative; 1 Refused
Environmentalist?	38 Yes; 11 No
Religious?	30 Yes; 19 No
Main News Source	15 TV; 14 Magazines; 13 Newspaper; 4 Other; 3 Radio
Trust/Credible	24 Scientists; 21 Environmentalists; 1 Congress; 3 Other; 0 Business Leaders; 0 Religious Leaders

This cluster also favors action on a number of levels. On a smaller level, they support recycling [39;-3.7], renewables research and development [10;+3.4], thinking globally but acting locally [04;+2.8], and programs to help families, firms, and localities cut their fossil fuel consumption [30;+2.5]. On a larger level, they support federally mandated automobile fuel-efficiency standards [17;-3.0], and international cooperation and regulations on global warming [27;+2.8].

Finally, unlike the other clusters, the EIs are not skeptical or cautious about global warming, and believe that it is real. They reject the idea that global warming will turn out to be like other scares [13;-2.9], and also reject the idea that the President and Congress should attend to more important problems [15;-2.7].

Consensus Across Viewpoints. Viewpoints in the sample as a whole are relevant to potential leaders who might choose to address an undifferentiated audience, as opposed to separate audiences of like-minded citizens such as EIs. Reliance on statements that are already a matter of broad consensus will tend to reinforce that consensus, even if the statements are interpreted differently within different viewpoints (as is often the case). Reliance on such statements will also tend to elicit a positive response toward the leader who identifies with them. Figure 4.6 reproduces the statements which are a matter of consensus across the three viewpoints, and which also have the highest negative and the highest positive mean scores in the sample.[18]

The TRs, ETs, and EIs all tend to agree on general environmental ideals. For example, they all strongly support acquiring a sense of stewardship for the Earth and all life on it [46], learning sustainable ways of living [44], and leaving future generations as many opportunities as we have had. In addition, they all tend to

[18] Three statements have among the highest negative mean scores in the sample, but are not a matter of consensus since their means scores in TR are positive. These statements refer to respect for the tradition of human dominance over nature [20], confidence in the values and traditions that have guided progress [33], and the belief that global warming will turn out to be like other scares [13].

Figure 4.6
Consensus Across Viewpoints
Mean Scores (Sample, TR, EA, EI)

Disagree

54. We should trust the government in Washington to direct and coordinate responses to global warming.
(**-3.3**, -2.8, -4.1, -3.3)

39. Recycling is just one of many time-consuming inconveniences inspired by environmentalists.
(**-3.1**, -1.6, -2.2, -3.7)

32. The world has the carrying capacity to support an ever-increasing human population.
(**-3.0**, -0.3, -1.3, -4.0)

17. I oppose federal regulations to force manufacturers to build more fuel-efficient cars.
(**-2.5**, -0.2, -1.8, -3.0)

12. Environmental protection is another burden on the weak and poor in the United States and abroad.
(**-2.1**, -0.1, -2.4, -2.5)

01. Only the large-scale, advanced technologies can be effective in responding to global climate change.
(**-2.0**, -1.8, -1.5, -2.3)

Agree

44. We must learn sustainable ways of living that recognize and respect nature's limits.
(**+3.2**, +2.6, +3.1, +3.4)

46. People eventually will have to acquire a sense of stewardship for the Earth and all life on it.
(**+3.2**, +1.3, +2.4, +3.6)

10. I support research and development to make better use of renewable resources, like solar, hydro, and wind.
(**+3.1**, +1.9, +3.2, +3.4)

04. We should think globally but act locally, relying on ourselves as citizens to protect the global climate.
(**+2.7**, +1.6, +3.3, +2.8)

06. I believe that environmental deterioration is the one cost we cannot afford to pay indefinitely.
(**+2.7**, +1.6, +1.2, +3.5)

27. Global climate cannot be protected without international cooperation and regulations.
(**+2.4**, +1.1, +1.7, +2.8)

21. We must leave future generations with as many opportunities to meet their needs as we have had.
(**+2.3**, +1.3, +1.8, +2.7)

09. Sound policy on global warming depends on the integration of science, morals, and politics.
(**+2.2**, +1.7, +1.4, +2.5)

believe that environmental deterioration is the one cost we cannot afford to pay indefinitely [06], and that the world has a limited capacity to support an ever-expanding human population [32]. Potentially at least, there is support for leadership on behalf of these environmental ideals and beliefs.

There is widespread distrust of the government in Washington to direct and coordinate responses to global warming [54]. However, there is support for acting locally, relying on citizens to protect the global climate [04]. And there is a widespread belief that international cooperation and regulations are necessary to protect the global climate. Most believe that sound policy on global warming depends on the integration of science, morals, and politics [09].

Finally, there is a consensus on several courses of action on global warming that are consistent with environmental ideas and beliefs. For example, all three viewpoints show support for research and development on renewable energy resources [10], recycling [39], and stricter regulations on automobile fuel efficiency [17]. Finally, all three viewpoints tend to reject relying on large-scale, advanced technologies [01].

Conflict Across Viewpoints. Figure 4.7 reproduces the statements which are most in conflict across the three viewpoints. The themes represented by these statements are worth avoiding to the extent that building a broad consensus is a relatively high priority for potential leaders.

General economic considerations are an important focus of conflict. In contrast to the EIs and EAs, the TRs show an unwillingness to pay for environmental protection, and are more concerned about the economy. For example, the EIs believe that we must conceive and construct a world not centered primarily on human greed, while the TRs disagree with this notion [14]. Similarly, the TRs disagree that economic growth is partly an illusion for ignoring environmental

Figure 4.7
Conflict Across Viewpoints
Mean Scores (Sample, TR, EA, EI)

Note: Difference between the two most extreme scores is given after parenthesis.

Disagree

50. I support national taxes on fossil fuel consumption to reduce emissions of greenhouse gases.
(-0.0, -3.4, +0.3, +0.6) **4.0**

13. Global warming will turn out to be like other scares, such as nuclear winter and oil costing $100 per barrel.
(-2.0, +0.9, -0.3, -2.9) **3.8**

32. The world has the carrying capacity to support an ever-increasing human population.
(-3.0, -0.3, -1.3, -4.0) **3.7**

20. We must respect the Western religious tradition that gives man the right to dominate nature.
(-2.6, +0.4, -1.6, -3.3) **3.7**

08. Global warming, like most other policy problems, is a matter of weighing benefits against costs.
(-0.9, +2.2, -1.0, -1.4) **3.6**

36. Spending large amounts of money to control the build-up of greenhouse gases is not justified at this time.
(-1.6, +1.0, -1.4, -2.1) **3.0**

Agree

14. We must conceive and construct a world not centered primarily on human greed.
(+1.7, -1.7, +0.6, +2.6) **4.3**

48. Economic growth is partly an illusion because it fails to account for damage to nature.
(+0.9, -2.0, -0.1, +1.6) **3.6**

51. The belief that humans can exploit nature without limit is the root cause of the growing environmental crisis.
(+1.5, -1.1, +1.2, +2.1) **3.2**

03. I support investing about $1 billion a year to monitor the global climate and develop better scientific models.
(+0.0, -2.4, -1.0, +0.6) **3.0**

16. I support modest trial programs to discover what can and should be done about global warming.
(+1.5, -0.9, +2.1, +1.9) **3.0**

43. Better scientific understanding is required before making major policy decisions on global climate change.
(+0.6, +2.2, +2.8, -0.2) **3.0**

damages [48]. Finally, the TRs favor reducing global warming to a matter of cost-benefit analysis [08].

Conflict on general economic considerations carries over into conflict on specific courses of action. In contrast to the EIs and EAs, the TRs are reluctant to take action. The TRs do not support spending large amounts of money to control the build-up of greenhouse gases [36] or having national taxes on fossil fuel consumption [50], while the EIs and EAs tend to favor these approaches. In addition, the TRs and to a lesser extent the EAs do not support investing to monitor the global climate, while the EIs tend to support this [03]. Finally, the EIs and EAs support modest trial programs to discover what can and should be done about global warming, while the TRs tend to reject this approach as well [16].

The priority of man over nature is another area of conflict. The EIs do not accept this traditional priority [20], reject the claim that the world can support an ever-increasing human population, and see the belief that humans can exploit nature indefinitely as the root cause of the ecological crisis [51]. The TRs disagree with these notions. In addition, the TRs are skeptical about the validity of global warming, whereas the EIs believe that it is real [13]. Finally, both the TRs and EAs desire more scientific knowledge, while the EIs are neutral [43].

Dependability of the Results

Perhaps the most surprising result of this study is the relatively small size and large heterogeneity of the TR viewpoint, which is probably closest to the viewpoint expressed in present national policy. This raises the question of how dependable the results might be as a basis for formulating strategies for leadership. The question can only be answered through replication of the study with similar samples both in

and outside the Denver metropolitan area.[19] In the meantime, it is worth comparing the results of this study with selected results of other studies as a gauge of dependability.

A Gallup poll conducted from April 11 to 14, 1991, showed that in response to the question "Do you consider yourself to be an environmentalist, or not?", 78% of a national sample responded yes.[20] This percentage was basically the same across gender, ethnicity, education level, age, income, and political ideology. The *Texas Environmental Survey* conducted in 1990 showed that 62% considered themselves to be "sympathetic to environmental causes but not active."[21] In the Q-study, the 72 respondents were asked the question, "Do you consider yourself an environmentalist?" Seventy-one percent said "yes," which is near the middle of the range between the national and the Texan percentages. The 72 respondents also resemble national probability samples in terms of other political identifications. *An American Profile -- Opinions and Behavior, 1972-1989* shows that as of 1989, 28% of Americans considered themselves liberal, 39% moderate, and 32% conservative.[22] The Q respondents are slightly more conservative, showing 23% liberal, 34% moderate, and 41% conservative.

The Q-study sample matches U.S. Census data for 1980 rather closely on some socio-demographic characteristics. Gender distribution nationally was 51.4% female and 48.6% male, whereas the Q-study respondents are evenly split between female and male. The national distribution by race was 83.1% white, 11.7% black, 6.4%

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[19] As mentioned above, a body of experience backed by theory suggests that such results are replicable.

[20] George Gallup, Jr., *Public Opinion Annual Series 1991*, Wilmington, Delaware: Scholarly Resources, Inc. Survey #GO 122025.

[21] *The Texas Environmental Survey*, Department of Sociology, Rice University. Survey conducted July 28 to August 12, 1990. ,

[22] *An American Profile -- Opinions and Behavior, 1972-1989*, National Opinion Research Center.

Hispanic, and 0.6% other, whereas the Q-study respondents are 85.7% white, 8.6% black, 4.3% Hispanic, and 1.4% other. However, people in the 30-39 year old age group are over-represented among the Q-study respondents compared to national norms, but otherwise the age distributions are quite similar. The most important difference is that the Q-study respondents are more highly educated, with 41.4% reporting 4 years of college or more, compared to 16.2% nationally.

The distributions of opinion on significant Q-sample statements (those with the highest negative and highest positive mean scores) approximate the distributions of opinion on national and/or state survey questions that were similarly worded. For comparison, note that the EIs comprise 70% of the respondents in the Q-study, followed by the EAs and TRs at 17% and 13%, respectively. Where appropriate, the Q-study statement number is given in brackets.

First, general confidence in Washington is low. In 1989, when asked "How much confidence do you have in the executive branch of the federal government of this country?", 57% responded "only some" and 23% "hardly any." When asked the same question about Congress, 60% responded "only some" and 23% responded "hardly any."[23] This tends to match the high level of distrust of the government in Washington found in the Q-study [54]. For example, 93.1% rejected the idea that we should trust Washington to direct and coordinate responses to global warming, whereas only 4.1% agreed, while 2.8% were neutral.

The *Texas Environmental Survey* showed 69% agreeing with the statement "We humans are approaching the limits of the Earth's room and resources." In addition, 78% disagreed with the statement "Humans don't need to adapt to the natural environment because they can change it to suit their needs." These two statements tend to match up with the strong desire to learn sustainable ways of living in the Q-study [44]. 98.6% of the Q-sample agreed that we must learn sustainable ways of

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[23] *An American Profile – Opinions and Behavior, 1972-1989*, p. 656 and p. 672.

living that recognize and respect nature's limits. In addition, the Texas survey showed 64% disagreeing with the statement "Plants and animals exist primarily to be used by humans." Again, this tends to match closely with the high level agreement with the idea of acquiring stewardship **[46]**. The Q-study showed 86.1% agreeing that people eventually will have to acquire sense of stewardship for the Earth and all life on it, with 6.9% disagreeing, and 6.9% remaining neutral.

Renewable energy resources are supported in national polls. For example, a study for the Union of Concerned Scientists conducted in November, 1989, found 61% strongly agreeing and 27% somewhat agreeing with the statement that "An important way for utilities to reduce their use of fossil fuels like oil and coal is to use renewable energy sources like solar, wind, and water."[24] This corresponds to the high support for renewable energy resources among respondents in the Q-study **[10]**, which shows 93.0% supporting research and development to make better use of renewable resources such as solar, hydro, and wind. (Only 1.4% are non-supportive, while 5.6% are neutral.) Support for recycling has been rising over the years, and is currently very high. From 1987 to 1990, those claiming to have made changes in behavior to recycle cans, bottles, and paper has risen from 57% to 84%.[25] Again, this corresponds to the high support for recycling in the Q-study **[39]**. 88.9% of the Q-study respondent disagreed with the statement that recycling is just one of many time-consuming inconveniences inspired by environmentalists, while only 7.0% agreeing, and 4.1% remaining neutral. Finally, regarding faith in technology, *The Texas Environmental Survey* reported 65% disagreeing with the statement that "We will be able to solve our environmental problems through better technologies alone, without having to change our lifestyles." Again, this corresponds to the Q-study result **[01]**, which shows 83.3% of the respondents rejecting the idea that only the large-

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[24] *Global Warming and Energy Priorities: A National Perspective*, A Study for the Union of Concerned Scientists, Research/Strategy/Management, Inc., November 1989.

[25] Riley E. Dunlap and Rik Scarce, *"The Polls – Poll Trends: Environmental Problems and Protection,"* Public Opinion Quarterly, 55:651-672, 1991.

scale, advanced technologies can be effective in responding to global climate change. (Only 9.8% agreed, while 6.9% remain neutral.)

Although this Q-study was not designed to estimate percentage distributions, the distribution of political identifications, other sample characteristics, and opinion on statements in the Q-sample are broadly consistent with national or state studies designed for that purpose. Pending replication of the study, we believe that the sample is diverse enough to include representatives of any significant viewpoint and that the results are not biased toward any particular viewpoint in any obvious way. In particular, the relatively small size and minimal consensus within the TR viewpoint does not appear to be an anomaly. We conclude that the results are dependable as a qualitative basis for formulating leadership strategies.

III. Implications

On the basis of these results, the predispositions of the public provide ample opportunities for leadership in response to the threat of global climate change, and in particular for efforts on behalf of the non-conventional alternatives beginning with a decentralized energy strategy. Before outlining one of these opportunities, however, it is worthwhile to place these results in a broader historical context, which has leadership implications.

Historical Context

Environmentalism, as reflected in the EA and EI viewpoints, is a relatively recent and rising outlook compared to the traditional viewpoint that coevolved with the European settlement and development of North America. Indeed, environmentalism may be in large part a reaction to the adverse effects of settlement and development.

The historic roots of environmentalism in the U.S. can be traced to the conservation movement which began in the mid-nineteenth century. In 1851, Henry David Thoreau articulated the need to appreciate and preserve nature and wilderness.[44] This was followed by a rapid growth in outdoor and nature education, which led to the creation of the two national park systems in North America and eventually the national forest system in the U.S. However, the early movement was mainly anthropocentric and concerned with using scientific management practices on natural resources and their potential products. Three conservationists, most notably George Perkins Marsh, John Muir, and Aldo Leopold, took conservation a step further and applied an ecological perspective to human activities.[45] Their thoughts laid the foundation for the writings of a new breed of environmentalists in the 1960s and 1970s, most notably Rachel Carson, who helped to develop a deep and widespread public concern with pollution as well as humanity's connections to nature.[46] Carson and her successors have helped to shape environmental opinion in our time.

Public opinion polls show public interest in the environment peaking during the first Earth Day in 1970, then declining somewhat through the remainder of the decade. Surprisingly, there was little reaction against environmental protection measures, even though the nation suffered from economic and energy-shortage

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[44] Roderick Nash, *Wilderness and the American Mind* (New Haven: Yale University Press, 1967,) pp. 84-97.

[45] *Ibid.* George Perkins Marsh has been credited with creating the modern concept of ecology, i.e., the study of the interrelationships between organisms and the environment. His most important work, *Man and Nature* (Cambridge: Harvard University Press, 1864), addressed the unintended negative effects of human economic activities on the environment. John Muir saw nature, wilderness, and people as part of a spiritual whole, and strove to preserve wilderness for its own sake. (John Muir, *The Wilderness World of John Muir*, ed. Edwin May Teale, Boston: Houghton Mifflin, 1954.) Aldo Leopold blended ecology and ethics, and saw the land itself as a living organism. His most notable work is *A Sand County Almanac* (New York: Ballantine Books, 1949).

[46] Rachel Carson, *Silent Spring* (Boston: Houghton Mifflin, 1962).

problems.[47] However, the 1980s showed notable increases in public support, perhaps because of frustration over Reagan Administration policies and the emergence of new problems like global warming and ozone depletion.[48] Since then, policymakers, scientists, and environmental activists have served to accelerate this trend during the Bush Administration.[49] Partly in response to the twentieth anniversary of Earth Day in 1990, concern over the environment as well as support for environmental protection measures appears to be at an all time high.

Trends on specific issues show this in more detail. For example, there is a growing preference for environmental quality over economic growth to the point that it is now preferred by large majorities. From 1976 to 1990, those responding positively to the statement "We must sacrifice economic growth in order to preserve and protect the environment" rose from 38% to 64%.[50] New York Times/CBS News polls taken from 1981-90 show agreement with the statement "Protecting the environment is so important that requirements and standards cannot be too high, and continuing environmental improvements must be made regardless of cost" increasing from 45% to 74%.[51] However, it is important not to overestimate the relative importance of the environment. For example, a November, 1990, Gallup poll showed only 2% volunteering "environment" or "pollution" as the most important problem facing the United States. And a July, 1990, Cambridge poll showed that 47% would not be willing to accept a higher rate of unemployment so that industry could better

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[47] R. C. Mitchell, "Public Opinion on Environmental Issues," in *Environmental Quality: The Eleventh Annual Report on the Council on Environmental Quality* (Washington, D.C.: Council on Environmental Quality, 1980).

[48] J. M. Gilroy and R.Y. Shapiro, "The Polls: Environmental Protection," *Public Opinion Quarterly* 50 (1986), pp. 270-79.

[49] R. C. Mitchell, "Public Opinion and the Green Lobby: Poised for the 1990s?," in *Environmental Policy in the 1990s: Towards a New Agenda*, ed. N.J. Vig and M.E. Kraft (Washington, D.C.: Congressional Quarterly Press, 1990).

[50] Dunlap and Scarce, 1991.

[51] Ibid.

preserve and protect the environment. So while an environmental ethic appears to be emerging, it is also clear that economic considerations are of great importance to many citizens.

Surveys also show that increasing numbers of citizens view global warming as a serious problem. From 1982 to 1989, in response to the question, "[D]o you feel the greenhouse effect is a very serious problem, a somewhat serious problem, not too serious a problem, or not a serious problem at all?", the percentage choosing "very serious" grew from 12% to 41%.[52] In addition, a 1991 Florida poll found 70% believing global warming to be serious enough to warrant aggressive action by the US government.[53]

The historical rise of environmentalism, as manifest in these trends, appears to coincide with a decline in the traditional viewpoint, at least in the global climate change context. The results of this study suggest that the traditional viewpoint is much smaller and much less cohesive than it once must have been -- perhaps because leaders have not articulated the traditional viewpoint as often or as well as the environmental viewpoints. For example, there is very little overt anti-environmentalism; the opposition to environmental ideals and initiatives is typically expressed indirectly as opposition to their economic costs. Environmental ideals, if not environmental initiatives, tend to flourish under these circumstances.

Whatever the reasons may be, the traditional viewpoint is a relatively weak viewpoint within the public at this time, but it is still the viewpoint closest to current policy. Hence the situation is unstable, and the environmental viewpoints are not likely to go away. The situation, in short, is ripe for leadership.

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[52] Ibid.

[53] *The Energy Daily*, Vol. 20 (January 10, 1992).

Opportunities for Leadership

In the conclusion to Chapter 1 of this report, a case was made that leadership on behalf of the non-conventional alternatives -- a decentralized energy strategy and the more general preferences, beliefs, and loyalties associated with it -- can be justified on grounds of more rational decisions, and a more democratic decision process, in response to the threat of global climate change. In the global change context, a decentralized energy strategy is a field-tested step toward curbing CO_2 emissions that contribute to global warming, and toward developing local and regional capacities to cope with the geographically diverse impacts of global warming, if it occurs.

The results of this chapter suggest few obstacles and many opportunities to lead public opinion in this direction. Consider, for example, a promotional strategy based on themes represented by the following statements in the Q-sample. Apart from two exceptions, all of these statements are a matter of consensus within the sample as a whole and within the three shared viewpoints. The exceptions are two of the program initiatives, **[30]** and **[16]**, which are controversial among the TRs, who are on average slightly opposed by them. The task, therefore, is to reinforce and give direction to existing predispositions.

54. We should trust the government in Washington to direct and coordinate responses to global warming.
(-3.3 , -2.8, -4.1, -3.3)

04. We should think globally but act locally, relying on ourselves as citizens to protect the global climate.
(+2.7, +1.6, +3.3, +2.8)

57. Efficiency and conservation were the least costly and most effective responses to past energy crises.
(+1.3, +1.8, +0.4, +1.4)

30. I support programs to help families, firms, and localities cut back their fossil fuel consumption.
(+1.8, -0.2, +0.4, +2.5)

16. I support modest trial programs to discover what can and should be done about global warming.
(+1.5, -0.9, +2.1, +1.9)

10. I support research and development to make better use of renewable resources, like solar, hydro, and wind.
(+3.1, +1.9, +3.2, +3.4)

44. We must learn sustainable ways of living that recognize and respect nature's limits.
(+3.2, +2.6, +3.1, +3.4)

46. People will eventually have to acquire a sense of stewardship for the earth and all life on it.
(+3.2, +1.3, +2.4, +3.6)

The rather intense distrust of the government in Washington to direct and coordinate responses to global warming [**54**] might be constructively channelled into support for local action [**04**], in which ordinary citizens and their local leaders, public and private, take the initiative. Paradoxically, leadership from Washington is necessary to promote such a decentralized strategy. Otherwise, a decentralized strategy would be unable to compete for attention and other forms of support -- both in Washington and around the country -- with the centralized alternatives that have preoccupied national attention. Reliance on localities for policies appropriate to their own circumstances is justified by the experience of the energy crisis of the 1970s. And this experience can be used to reinforce rather weak support for the idea that efficiency and conservation (which require local action) were the least costly and the most effective responses to past energy crises [**57**]. Evidently, the story of the energy crisis told in Chapter 2 has not yet been effectively told for the general public.

The program initiatives in a decentralized strategy might include, but are not limited to, conservation and efficiency programs to help families, firms, and localities cut back their fossil fuel consumption [**30**], modest trial programs at the local level to discover what can and should be done about global warming [**16**], and further research and development to make better use of renewable energy resources [**10**] as substitutes for fossil fuels. A decentralized strategy based on initiatives of this kind is procedurally rational. The point is to act in order to reduce uncertainties about the consequences of alternative programs and to clarify ambiguities in the preferences we use to evaluate consequences and select among the alternatives. There are many opportunities for this trial-and-error approach as there are localities. Failures could be limited to one locality; successes could be considered for adaptation to many localities. The national response to global warming need not presume that there is one comprehensive, centralized policy that can be discovered by the experts who advise the President and Congress, and can be enacted by these elected representatives of the public.

Finally, these program initiatives can be justified in terms of the need to learn sustainable ways of living that recognize and respect nature's limits [44], and to acquire a sense of stewardship for the earth and all life on it [46]. As noted in Chapter 3, "sustainability" and "stewardship" are key symbols of justification that have been used by environmentalists and by the Bush Administration in connection with global climate change. They also appear to be key symbols of justification accepted by the public. Like other key symbols, their function is to mobilize consensus on the basic aim or direction of policy and to provide a common basis for debating the merits and limitations of specific actions proposed to take the next steps in that direction.

There are many variations on this promotional strategy and many alternatives to it that could be developed from the results of this study. For example, there is a basis in the predispositions of the public for an effective promotional strategy against the present de facto, centralized strategy of non-action on global warming. Of course any promotional strategy, once implemented, tends to elicit a counter-strategy. And the resulting public debate contributes to rationality and democracy if the issue is important and the alternatives are significant.

Conclusion

A primary function of policy inquiry is the "discovery of the means by which all who participate in a policy-forming and policy-executing process can live up to their potential for sound judgment."[54] This chapter has attempted to clarify the means by which public officials can make a sound judgment on leadership of public opinion with respect to global climate change issues. There appear to be no significant obstacles in the predispositions of the public to taking the lead on behalf of the non-conventional alternatives. (Evidently, there must be obstacles of other kinds.) If potential leaders do in fact take the lead in this direction, we believe that

[54] Lasswell, 1971, pp. 62-63.

citizens will have better means of living up to their potential for sound judgment.

Appendix 4.1
Q-Sample:
Statements, Classification, and
Mean Scores (Sample, TR, EA, EI)

Power

Conventional

54. We should trust the government in Washington to direct and coordinate responses to global warming.
Goal (-3.3, -2.8, -4.1, -3.3)

24. Most Americans are uninterested, uninformed, and uninvolved in environmental politics.
Trend (+0.6, +1.6, +0.2, +0.8)

27. Global climate cannot be protected without international cooperation and regulations.
Condition (+2.4, +1.1, +1.7, +2.8)

13. Global warming will turn out to be like other scares, such as nuclear winter and oil costing $100 per barrel.
Projection (-2.0, +0.9, -0.3, -2.9)

15. The President and Congress should attend to more important problems than global climate change.
Alternative (-1.9, +0.0, -0.4, -2.7)

Non-Conventional

04. We should think globally but act locally, relying on ourselves as citizens to protect the global climate.
Goal (+2.7, +1.6, +3.3, +2.8)

53. National leaders have displayed an inability to debate and define issues like global warming.
Trend (+0.9, -0.2, +1.3, +1.1)

31. Environmentalists are virtually powerless against the combination of big business and big government.
Condition (-1.4, -2.3, -1.3, -1.5)

22. Political pressures from the growing ecological crisis will lead eventually to reforms or revolution.
Projection (-0.0, -0.9, -0.5, +0.3)

30. I support programs to help families, firms, and localities cut back their fossil fuel consumption.
Alternative (+1.8, -0.2, +0.4, +2.5)

Wealth

Conventional

18. Even if the Earth warms up, we should rely on individual consumers making choices in free markets.
Goal (-1.3, -0.6, +0.3, -1.8)

08. Global warming, like most other policy problems, is a matter of weighing benefits against costs.
Trend (-0.9, +2.2, -1.0, -1.4)

Non-Conventional

14. We must conceive and construct a world not centered primarily on human greed.
Goal (+1.7, -1.7, +0.6, +2.6)

48. Economic growth is partly an illusion because it fails to account for damage to nature.
Trend (+0.9, -2.0, -0.1, +1.6)

59. Only a strong economy can cover the high costs of cleaning up the environment.
Condition (-0.8, -0.2, -0.9, -0.9)

41. The costs of controlling the build-up of greenhouse gases would be high enough to cripple the economy.
Projection (-1.5, +0.4, -1.4, -1.9)

36. Spending large amounts of money to control the build-up of greenhouse gases is not justified at this time.
Alternative (-1.6, +1.0, -1.4, -2.1)

34. Economic growth as we know it cannot be sustained over the next several decades.
Condition (-0.0, -0.1, -0.4, +0.1)

23. The growth industries of the future will arise from demands for environmental protection.
Projection (+1.4, +0.4, +1.8, +1.5)

06. I believe that environmental deterioration is the one cost we cannot afford to pay indefinitely.
Alternative (+2.7, +1.6, +1.2, +3.5)

Enlightenment

Conventional

45. We need to develop a predictive model of the entire Earth system, which includes human interactions.
Goal (+0.7, +0.7, -0.8, +1.0)

49. Scientific findings on global climate change are independent of any ethical or political position.
Trend (-0.6, -0.9, +0.6, -0.8)

43. Better scientific understanding is required before making major policy decisions on global climate change.
Condition (+0.6, +2.2, +2.8, -0.2)

58. We will be able to predict the regional impacts of global climate change within a decade or two.
Projection (-0.6, -0.6, -1.5, -0.5)

03. I support investing about $1 billion a year to monitor the global climate and develop better scientific models.
Alternative (+0.0, -2.4, -1.0, +0.6)

Non-Conventional

44. We must learn sustainable ways of living that recognize and respect nature's limits.
Goal (+3.2, +2.6, +3.1, +3.4)

29. The atmosphere and biosphere are too complex for accurate, precise predictions beyond the short-term.
Trend (-0.7, -0.9, +0.0, -0.8)

09. Sound policy on global warming depends on the integration of science, morals, and politics.
Condition (+2.2, +1.7, +1.4, +2.5)

25. Rational policy-making will depend upon continuing political debate over global warming issues.
Projection (+0.2, -0.3, +0.0, +0.3)

16. I support modest trial programs to discover what can and should be done about global warming.
Alternative (+1.5, -0.9, +2.1, +1.9)

Skill

Conventional

38. We should rely on advances in technology to meet such challenges as global climate change.
Goal (-0.7, +0.9, -2.0, -0.6)

42. If we can put a man on the moon, we can also limit global warming, or adjust to it if necessary.
Trend (+0.6, +1.2, +0.8, +0.4)

01. Only the large-scale, advanced technologies can be effective in responding to global climate change.
Condition (-2.0, -1.8, -1.5, -2.3)

35. Genetic engineering and other technologies will ensure adequate food supplies even if the Earth warms up.
Projection (-1.4, -0.8, -1.2, -1.6)

19. I support policies that would expand the production and use of nuclear power.
Alternative (-1.2, +1.0, -2.0, -1.3)

Non-Conventional

52. We must learn how to limit climate change or how to prepare for its disruptive impacts on society.
Goal (+1.9, +0.1, +1.9, +2.1)

57. Efficiency and conservation were the least costly and most effective responses to past energy crises.
Trend (+1.3, +1.8, +0.4, +1.4)

56. Small-scale technologies can be adapted to different localities without major environmental impacts.
Condition (-0.0, -0.1, +0.3, -0.0)

47. Science-based technology will not shield us from the disruptive effects of global climate change.
Projection (-0.1, -0.8, -1.3, +0.2)

10. I support research and development to make better use of renewable resources, like solar, hydro, and wind.
Alternative (+3.1, +1.9, +3.2, +3.4)

Well-Being

Conventional

26. We must protect the quality of life in America from those seeking limits to growth.
Goal (-0.5, +1.8, +0.8, -1.2)

39. Recycling is just one of many time-consuming inconveniences inspired by environmentalists.
Trend (-3.1, -1.6, -2.2, -3.7)

12. Environmental protection is another burden on the weak and poor in the United States and abroad.
Condition (-2.1, -0.1, -2.4, -2.5)

Non-Conventional

21. We must leave future generations with as many opportunities to meet their needs as we have had.
Goal (+2.3, +1.3, +1.8, +2.7)

37. More frequent and severe tornados, floods, and droughts are indicators of global warming.
Trend (+0.1, -1.4, +0.1, +0.4)

07. The burning of forests and fossil fuels produces "greenhouse gases" that warm the Earth's climate.
Condition (+1.8, +0.7, +0.5, +2.1)

55. With enough time, Western standards of living can be achieved throughout the Third World.
Projection (-1.0, -0.8, -0.6, -1.1)

17. I oppose federal regulations to force manufacturers to build more fuel-efficient cars.
Alternative (-2.5, -0.2, -1.8, -3.0)

02. The Earth's average temperature will increase between 2 to 9 degrees Fahrenheit over the next half century.
Projection (-0.3, -1.9, -0.2, -0.1)

50. I support national taxes on fossil fuel consumption to reduce emissions of greenhouse gases.
Alternative (-0.0, -3.4, +0.3, +0.6)

Morality

Conventional

20. We must respect the Western religious tradition that gives man the right to dominate nature.
Goal (-2.6, +0.4, -1.6, -3.3)

28. Progress is the continued development of the world's natural resources for human purposes.
Trend (-1.3, +0.9, -0.8, -1.8)

60. Our way of life depends upon continued long-term growth and development of the economy.
Condition (+0.1, +1.4, +1.7, -0.5)

32. The world has the carrying capacity to support an ever-increasing human population.
Projection (-3.0, -0.3, -1.3, -4.0)

33. I have confidence in the values and institutions that have guided our progress over the last two centuries or more.
Alternative (-2.0, +0.2, -1.8, -2.7)

Non-Conventional

05. We need moral constraints on uses of science and technology that threaten the global environment.
Goal (+1.4, -0.1, +0.8, +1.7)

40. The threat of global climate change is not appreciated by self-centered or short-sighted people.
Trend (+0.7, +0.2, -0.8, +1.1)

51. The belief that humans can exploit nature without limit is the root cause of the growing ecological crisis.
Condition (+1.5, -1.1, +1.2, +2.1)

46. People eventually will have to acquire a sense of stewardship for the Earth and all life on it.
Projection (+3.2, +1.3, +2.4, +3.6)

11. I support those leaders who are willing to question the values and beliefs that guided industrialization.
Alternative (+1.4, -0.4, +1.3, +2.0)

Appendix 4.2
Sample of Respondents

Traditionalist (TR)

C	Ag	S	M	Occup	R	Ed	Field	Prt	Ide	E	R	Rel	News	Trs	Inc
05	45	M	Y	Nurse	W	MA	Geography	Ind	Con	M	N	Prot	Coll	Sci	50+
27	37	M	Y	Unemploy	W	BA	Accountng	Rep	Con	Y	Y	-----	TV	None	20+
16	45	M	Y	Salesman	W	BA	Eng/Mgt	Rep	Con	N	N	-----	Pap	None	---
50	31	M	Y	Metrlgst	W	MA	Meteorlgy	Rep	Mod	Y	Y	Cath	Jrn	Sci	---
54	31	M	N	Accountnt	W	BA	Accountng	Rep	Con	Y	Y	Quakr	Pap	Sci	30+
72	30	M	N	Accts Mgr	W	BA	Accountng	Rep	Con	Y	N	-----	Comb	Comb	30+
09	27	F	Y	Secretary	B	HS	---------	Dem	Con	Y	Y	Ath	TV	Sci	---
48	39	M	Y	DataProc	H	AS	Voc Agr	Ind	Mod	Y	Y	Cath	Pap	Sci	20+
24	79	F	N	Retired	W	HS	---------	Dem	Con	Y	Y	Bapt	TV	None	10-

Environmental Activist (EA)

C	Ag	S	M	Occup	R	Ed	Field	Prt	Ide	E	R	Rel	News	Trs	Inc
63	35	M	Y	Salesman	W	BA	LibArts	Ind	Mod	Y	N	-----	Pap	Sci	---
64	23	M	N	Paralegal	W	BA	English	Ind	Con	N	N	-----	Work	Sci	75+
02	41	M	Y	ElecTech	W	AS	Computers	Rep	Con	N	Y	Luth	Comb	None	30+
14	65	F	Y	Nurse/ret	W	AS	Nursing	Ind	Con	Y	Y	SDAdv	Mag	Rel	---
51	35	F	N	CreditMgr	W	AS	Business	Ind	Mod	Y	Y	Cath	TV	Env	10+
69	35	M	N	CabintMkr	B	AS	Mechanics	Dem	Mod	Y	Y	Bapts	TV	Sci	20+
57	63	M	N	Lawn Care	H	HS	---------	Dem	Con	N	Y	Cath	TV	Sci	10+
67	34	M	Y	Postman	W	HS	---------	Rep	Con	N	Y	Chrst	TV	Sci	30+
32	37	F	Y	Housewife	W	HS	---------	Rep	Con	N	Y	LDSts	Pap	Sci	---
61	34	F	Y	Nurse	B	HS	---------	Dem	Con	N	N	-----	TV	Sci	20+
33	22	M	Y	Banker	W	BA	Music	Rep	Mod	Y	Y	Chrst	TV	Env	10+
15	33	F	N	Dry Clean	B	HS	---------	Dem	Mod	N	Y	Bapts	TV	Env	10+

Environmental Idealist (EI)

C	Ag	S	M	Occup	R	Ed	Field	Prt	Ide	E	R	Rel	News	Trs	Inc
41	33	F	Y	Accountnt	W	AS	CompSci	Rep	Lib	Y	Y	Chrst	Mag	Env	50+
62	40	M	Y	Plumber	W	HS	---------	Dem	Con	Y	Y	Chrst	TV	None	30+
66	63	M	Y	TravelAgt	W	HS	---------	Ind	Mod	N	N	-----	TV	Sci	30+
45	69	F	Y	Retired	W	HS	---------	Rep	Con	Y	Y	Meth	TV	Env	20+
03	35	M	N	Salesman	W	DP	---------	Ind	Mod	Y	N	-----	Pap	Env	20+
28	43	F	Y	Disct Mgr	W	HS	---------	Dem	Lib	Y	Y	unorg	Husb	Env	30+
12	60	F	Y	Homemaker	W	BA	Soc/Chem	Ind	Mod	Y	Y	unorg	Pap	Env	---
13	67	M	Y	H2Orights	W	MA	Business	Ind	---	N	N	-----	Mag	Sci	---
21	65	M	Y	Tchr/Post	W	BA	Soc Stud	Dem	Mod	Y	Y	Luth	TV	Sci	10-
23	51	M	Y	Mktg Mgr	W	MA	Mass Comm	Ind	Mod	Y	Y	Scien	Mag	Sci	50+
35	29	F	N	Attorney	W	JD	Law	Ind	Con	Y	N	Prot	Rad	Sci	20+
01	38	F	Y	Legal Sec	W	HS	---------	Ind	Lib	Y	Y	-----	IG	Env	30+
20	60	M	N	Engineer	W	BA	Elec Eng	Rep	Con	N	N	-----	TV	Sci	10-
07	38	F	Y	Word Proc	W	AS	Dent Asst	Dem	Mod	Y	Y	Cath	Mag	Env	---
52	31	F	Y	Student	W	AS	Sci/Med	Ind	Mod	Y	Y	Cath	TV	Sci	30+
70	37	F	Y	Receptnst	W	HS	---------	Ind	Con	Y	N	-----	TV	Env	10+
10	43	F	Y	Tchr/Elem	W	BA	Education	Rep	Mod	Y	Y	unorg	Mag	Edu	30+
11	63	F	Y	Admin/ret	W	BA	Eng Lit	Rep	Con	Y	Y	unorg	TV	Sci	---
31	58	F	N	Secretary	W	BA	Eng/Bus	Ind	Mod	N	Y	Chrst	Pap	Env	10+

59	35	M	N	CarpetCln	W	AS	Business	Rep	Mod	N	Y	Chrst	Rad	Sci	30+
29	40	F	Y	Tchr Aide	W	BA	Psych	Dem	Lib	Y	Y	Univ	Ppl	Env	75+
22	57	F	N	Homemaker	W	HS	---------	Dem	Con	Y	Y	Cath	TV	Sci	---
56	38	M	Y	Post Off	W	HS	---------	Ind	Con	N	Y	Cath	Rad	Sci	20+
39	35	M	Y	Contracts	W	AS	CompSci	Ind	Con	Y	N	-----	TV	Env	75+
65	34	M	Y	Mechanic	B	AS	IndstTech	Dem	Lib	N	N	-----	TV	Env	20+
30	28	F	Y	Homemaker	W	HS	---------	Rep	Con	Y	Y	Cath	Pap	Sci	30+
34	75	F	N	Retired	W	HS	---------	Rep	Mod	Y	N	unorg	TV	Env	10+
19	27	F	N	Engrg Ast	W	HS	---------	Dem	Con	N	Y	Cath	Mag	Sci	20+
08	22	M	Y	Mgr Sears	W	DP	---------	Dem	Con	Y	Y	SDAdv	Pap	Env	10+
44	31	F	N	LegalSec	I	HS	---------	Rep	Mod	N	Y	Epis	Pap	Env	10+
47	19	M	N	Retail	W	HS	---------	Ind	Lib	Y	N	-----	Mag	Env	10+
68	34	M	Y	Homemaker	B	BA	Busmgt/FA	Ind	Con	Y	Y	Chrst	TV	Sci	20+
17	34	F	Y	Accountnt	W	HS	---------	Rep	Con	Y	Y	Chrst	TV	Sci	30+
42	40	F	N	Hostess	W	HS	---------	Ind	Lib	Y	N	-----	Pap	Sci	20+
37	29	F	Y	GraphArts	W	BA	Journ	Dem	Mod	N	Y	Cath	TV	Sci	50+
49	32	F	Y	Homemaker	W	AS	Psych	Rep	Lib	Y	N	-----	IG	Env	20+
04	45	F	Y	Plan IBM	W	BA	Education	Ind	Mod	Y	Y	Meth	Mag	Env	50+
53	53	M	Y	Engineer	W	MA	Bus Adm	Ind	Lib	N	N	-----	Mag	Sci	30+
18	27	F	N	Tchr Pre	W	BA	ComHealth	Ind	Lib	Y	Y	Cath	Mag	Env	10+
40	30	F	N	GraphArts	W	BA	Art	Dem	Lib	Y	Y	unorg	Pap	Env	---
06	21	M	N	Student	W	AS	Education	---	Mod	Y	Y	Meth	Mag	Env	10-
46	74	F	Y	Tchr/ret	W	MA	Couseling	Rep	Con	Y	N	-----	Pap	Sci	30+
55	38	F	N	ComArtist	W	HS	---------	Ind	Lib	Y	N	-----	Mag	Sci	10+
58	36	F	N	Leasing	W	AS	Med Asst	Ind	Mod	Y	N	-----	Pap	Env	20+
38	36	M	Y	Teacher	W	BA	Biology	Dem	Lib	Y	N	-----	Mag	Sci	50+
43	41	M	N	Productn	H	BA	Education	Dem	Lib	Y	Y	Cath	Pap	Comb	50+
25	42	M	Y	AeroSpEng	W	BA	Industry	Dem	Lib	Y	Y	Luth	Mag	Sci	75+
26	35	M	Y	InstallAC	W	BA	Elect Eng	Ind	Mod	Y	N	-----	Pap	Sci	30+
36	22	M	N	Student	W	HS	---------	Dem	Lib	Y	N	Jew	Pap	Sci	30+

C# = Case Number Ag = Age S = Sex (M = Male; F = Female) **M = Married** (Y = Yes; N = No)
Occup = Occupation (Accts Mgr = Accounts Manager; Data Proc = Data Processor; Distct Mgr = District Manager; H20rights = Water rights; Tchr/Post = Teacher/Postal worker; Mktg Mgr = Marketing Manager; CarpetCln = Carpet Cleaner; Post Off = Post Office; Engrg Ast = Engineering Assistant; Mgr Sears = Manager Sears; GraphArts = Graphics Artist; ComArtist = Commercial Artist; AeroSpEng = Aerospace Engineering; InstallAC = Air Conditioner Installer; Metrlgst = Meteorologist; ret = retired; CreditMgr = Credit Manager; CabintMkr = Cabinet Maker; ElecTech = Electronics Technician)
R = Race (W = White; B = Black; I = Native American; H = Hispanic)
Ed = Education (DP = Dropout; HS = High School; AS = Associates; BA = Bachelors; MA = Masters; JD = Juris Doctor)
Field (Eng = Engineering; Mgt = Management; Voc Agr = Vocational Agriculture)
Prt = Party (Rep = Republican; Ind = Independent; Dem = Democrat)
Ide = Ideology (Con = Conservative; Mod = Moderate; Lib = Liberal)
E = Do you consider yourself an environmentalist? (Y = Yes; N = No)
R = Do you consider yourself to be religious? (Y = Yes; N = No)
Rel = Religion (Chrst = Christian; Meth = Methodist; unorg = unorganized; Luth = Lutheran; Scien = Scientology; Prot = Protestant; Cath = Catholic; Univ = Universalist; SDAdv = Seventh Day Adventist; Epis = Episcopalean; Quakr = Quaker; Ath = Atheist; Bapt = Baptist; LDSts = Latter Day Saints)
News = Main News Source (Mag = Magazines; TV = Television; Pap = Newspapers; Husb = Husband; Rad = Radio; IG = Interest groups; Ppl = People; Coll = College; Jrn = Journals; Comb = Combination)
Trs = Who do you find most credible or trustworthy on this issue? (Env = Environmentalists; Sci = Scientists; Edu = Educators; Comb = Combination; Rel = Religious Leaders)
Inc = Income (Thousands of dollars)