Ten suggestions for policymakers
Guidelines from an international social science assessment of human choice and climate change

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HUMAN CHOICE AND CLIMATE CHANGE

"Ten suggestions for policymakers" is a version of the final chapter in Human choice and climate change, a four-volume assessment of the social science research relevant to global climate change. The assessment takes as its starting point social conditions around the world. In approaching the climate change issue from a social science viewpoint, the assessment provides an important vantage point for scholars and policymakers alike. For the first three volumes, an international team of authors has reviewed the range of social science research, including what is currently known, uncertain, and unknown about global climate change. Within each topic area, the authors have reported these findings within diverse interdisciplinary frameworks and related the results to policy issues and problems. Volume 4 summarizes and comments on the research results in terms of themes and directions for the social sciences and for policymaking.

Human choice and climate change, volume 1: the societal framework begins the assessment firmly within the context of Earth's social, cultural, political, and economic systems. Climate change is occurring in a complex and rapidly changing framework of human choices that shapes people's perception of it and the opportunities for human response. The social context of climate change and knowledge about it is usually taken for granted. Subjecting it to social science analysis reveals the extent to which our understanding of the science, diagnoses of underlying causes, and views of appropriate action are not merely technical judgments, but embody deep-seated social commitments that provide the context for response options.

Human choice and climate change, volume 2: resources and technology anchors both the climate change issue and social science approaches to it in the context of the Earth's resources: climate, land, water, energy sources, and materials used in technologies. Climate change is the result of fundamental human choices about the conversion of energy and human occupation of the earth's surface. These activities have been identified as both the proximate causes of greenhouse-related emissions and the sites of primary impacts on human activity.

Human choice and climate change, volume 3: the tools for policy analysis describes the existing toolkit of rational analysis and planning techniques available to scientific researchers and political elites. The authors explain and assess the mainstream tools of economic analysis, games and simulations, decision analysis, and integrated assessment. In so doing, the volume reveals a series of important shortcomings of the toolkit in the case of large complex problems facing multiple stakeholders over inter-generational timeframes.

Human choice and climate change, volume 4: what have we learned? provides an editorial overview of the first three, reflexively focusing on the challenges that climate change issues present to the intellectual organization of social science, the lessons that the social sciences can bring to understanding climate change issues, and the implications of all of this for policymakers.

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What can public and private decisionmakers learn from a wide-ranging look at the social sciences and the issue of human choice and climate change that illuminates the evaluation of policy goals, implementation strategies, and choices about paths forward? At present, proposed policies are heavily focused on the development and implementation of intergovernmental agreements on immediate emissions reductions. In the spirit of cognitive and analytic pluralism that has guided the creation of *Human choice and climate change*, we look beyond the present policy priorities to see if there are adjustments, or even wholesale changes, to the present course that could be made on the basis of a social science perspective. To this end we offer ten suggestions to complement and challenge existing approaches to public and private sector decisionmaking:

- View the issue of climate change holistically, not just as the problem of emissions reductions.
- Recognize that, for climate policymaking, institutional limits to global sustainability are at least as important as environmental limits.
- Prepare for the likelihood that social, economic, and technological change will be more rapid and have greater direct impacts on human populations than climate change.
- Recognize the limits of rational planning.
- Employ the full range of analytic perspectives and decision aids from the natural and social sciences and the humanities in climate change policymaking.
- Design policy instruments for real world conditions rather than try to make the world conform to a particular policy model.
- Incorporate climate change concerns into other more immediate issues, such as employment, defense, economic development, and public health.
- Take a regional and local approach to climate policymaking and implementation.
- Direct resources into identifying vulnerability and promoting resilience, especially where the impacts will be largest.
- Use a pluralistic approach to decisionmaking.

We begin with the current focus of climate change policy research and practice on emissions reductions.
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View the issue of climate change holistically, not just as the problem of emissions reductions

A re-examination of the present policy path seems particularly pertinent at the time Human choice and climate change is going to press. The overwhelming priority placed on emissions reduction since emissions reduction goals of 20 percent by 2005 were proposed at the 1988 Toronto Conference on Climate Change has almost entirely displaced attention to the evaluation and development of adaptive policy responses (and entirely eliminated consideration of any possibilities of geengineering responses). Since the Toronto conference the additional radiative forcing effect of greenhouse-related gases on the planet’s surface has risen by a little more than half a watt per m², about one-fifth of the total increase in the forcing effect from the beginning of the Industrial Revolution up to 1990. Concentrations of carbon dioxide have risen about five times the historical average for the decades between the onset of the Industrial Revolution and 1988. Emissions have fallen substantially in some countries, but only because of economic collapse that has added to the sum of human misery. Of the economically healthy countries that have set themselves voluntary emissions reduction targets of returning to 1990 emission levels, only Britain and Germany have succeeded, but for reasons unconnected to climate change. A Conservative British government broke the political power of the National Union of Mineworkers by switching from coal to nuclear electricity generation and natural gas (the so-called dash for gas); Germany reaped the unintended consequences of the restructuring of the economy of the former German Democratic Republic.

An emissions limitation strategy has the distinct advantage that it is reasonably easy to get one’s arms around conceptually. The justification of such measures is that they represent at least a start down the right road. However, in practice, the 20 percent level of emissions reductions currently under discussion for the industrialized countries has little, if any, basis in the levels actually required for stabilization of atmospheric concentrations of greenhouse-related gases. The target is entirely a negotiating construct based on the participants’ assessment of what is achievable politically.

The targets and timetables approach has also proven to be extremely divisive in the United States, which is presently the largest total and per capita emitter. Such division is likely to endure so long as people with a broad cross-section of worldviews and economic interests lack compelling evidence that emissions reductions would be cost effective. There is also a likelihood that emissions reductions at levels that fail to provide the environmental benefits sought will give rise to a backlash against such policies. Such a backlash could be exacerbated in countries that make economic sacrifices to meet targets if other
countries appear to be making less effort or improving their competitiveness thereby.

The direct approach to mitigation through targets and timetables sidesteps other pressing issues of human welfare. Social science research indicates that the people who are most likely to suffer serious impacts from climate change are future generations of poor people living in vulnerable parts of the tropics. Is incurring greenhouse gas mitigation costs necessarily the best or even the most equitable way to help future victims if it leaves their parents and grandparents enmeshed in the quagmire of poverty and resource degradation? Why do we seem to be so deeply concerned about future generations of poor people in developing countries while we seem so indifferent to those who are alive today? Might not decisive global action to tackle destitution and resource impoverishment be a more effective allocation of global resources than forcibly accelerating the demise of fossil fuels? In the present negotiating environment, such questions cannot even be posed because of the hegemonic grip that the emissions reduction strategy has on the policy discourse.

The voices most loudly demanding prompt action on climate change almost invariably equate action with immediate emissions reductions on the part of industrialized countries. Other components of a response strategy, such as a focus on developing nonfossil energy technologies to displace fossil fuels whenever new generating capacity is added, have often been hastily dismissed as stalling tactics. Denunciation has been swift for analysts who have dared even to question the cost-effectiveness of the proposed timing of reductions in defiance of the oft-repeated, but unproven assertion that reductions should be made as early as possible because the costs of mitigation will rise over time. But surely, emissions reductions, especially in any particular pattern, are not an end but a means. From a social perspective—which may differ from an eccentric one—the end must be securing and improving the overall quality of human life.

The thirst for a simple answer to a simple problem may represent a significant obstacle to humanity’s ability to deal with the complex realities of climate change, albeit perhaps in a less directed, even less rational, way. At the very least, the debate about climate policy must be broadened beyond the issue of mitigation by emissions reductions, even if only because our past emissions of greenhouse gases and the timescale for any plausible emissions reduction program leaves the planet with an unavoidable commitment to some appreciable degree of climate change impact. Humanity can no longer indulge those who refuse to discuss adaptation with the same fervor that the religious right refuses to countenance sex education, out of fear that it will only encourage dangerous experimentation. For better or worse, we are already pregnant.

To be sure, we are not arguing that emissions should not be reduced. Obviously, present trends, continued indefinitely, will inflict consequential damage
on the Earth's ecosystems and economies. But, whatever emissions reductions goals are established, the findings of Human choice and climate change suggest that they should be based on the best available scientific information as well as on assumptions about what is politically tolerable. They should also be established in such a way as to allow countries the maximum flexibility in how, where, and when they pursue reductions, and finally, they should be subject to continuous reassessment in the light of new information.

It is even worth questioning whether targets and timetables are the best way to achieve emissions reductions at all. Essentially they represent the end-of-pipe or pollutant-by-pollutant approach at the global scale. This approach is increasingly recognized as obsolete for environmental management at local and national levels. Why then does it remain the favored tool for global environmental governance? At the global level, policymakers have the opportunity to leapfrog the end-of-pipe phase.

Accumulating some experience with adaptation could provide a complementary, even perhaps an alternative, model for pursuing emissions reductions. In contrast to governments setting national targets for top-down implementation, there may be some merit in exploring ways in which people—in homes, factories, and fields, and on the roads—can be empowered institutionally and technologically to change the way they do their business in accordance with their individual self interest and collective values and at the same time contribute to substantial emission reductions without formal targets and timetables.

In other words, policymakers should at least ask whether there is anything to be learned from adaptation that would assist the process of actual emissions reductions (as distinct from the formal process of agreeing national targets). The perspectives on social capital and self-organizing systems discussed in Human choice and climate change suggest that there might be. This learning might take the form of developing social and technological strategies focused on institutional arrangements whose routine operations would encourage the production of environmental goods rather than bads. In other words, decisionmakers should encourage the generation of social capital and accompanying capabilities to exercise community responsibility and accelerate the dematerialization of industrial processes, without aiming at a particular goal or explicit target for emissions reductions.

Approaching the climate issue from the other end, from that of assessing human vulnerability and social adaptation, may be far less amenable to concerted rational action by national governments than implementing emissions reduction targets. But it also may be more directly relevant to stakeholders. Adaptation is by nature a variegated response. An adaptation measure designed to protect a coastal community from sea-level rise may have no feature or characteristic in common with measures designed to stem desertification.
RECOGNIZE INSTITUTIONAL LIMITS

That is to say, adaptation is a bottom-up strategy that starts with changes and pressures experienced in people’s daily lives. This is in marked contrast with the top-down characteristic of national targets for emissions reductions. The connections between emissions targets and people’s everyday behavior and responsibilities seem less direct, even abstract. Designing adaptation strategies may be more sensitive to the real tradeoffs made by real people in a way that top-down emissions reduction strategies may not be.

An almost exclusive emphasis on emissions reductions simplifies and bounds climate change as a distinct problem. In so doing it domesticates a large, complex, and unruly set of life’s circumstances as being capable of solution through applying of rational analysis, goal setting, and policy implementation by technocratic elites. Questioning the policy emphasis on emissions not only calls into question whether the emphasis is the right one, but whether such an exclusively rational technocratic approach to policymaking is appropriate at all.

Recognize that institutional limits to global sustainability are at least as important for climate policymaking as environmental limits

The technocratic worldview sees nature as presenting decisionmakers with hard constraints, whereas social arrangements are somehow soft and malleable through public information, regulation, price adjustments, or the exercise of a somewhat elusive force referred to as political will. Human choice and climate change suggests that institutional arrangements are much harder to change than the technocratic worldview suggests. They may also be more important to human welfare than natural resources or events.

Among geophysical agents, weather events are by far the most lethal to humankind worldwide. Together floods, hurricanes, and droughts account for 75 percent of the world’s natural disasters. Only earthquakes exact a comparable toll. Human choice and climate change puts such hazards in perspective by noting that losses of life during the twentieth century have been overwhelmingly the result of war, civil strife, and famine—the latter sometimes related to but not simply caused by drought—rather than geophysical events.

The elements that are omitted when climate impacts are treated as wholly climatic are those characteristics of societies, individuals, groups, places, systems, and activities that cause them to lose or gain to differing degrees from particular climate anomalies. Knowing the physical attributes of a climatic variation or change is never adequate for understanding or predicting its consequences for human society. Such is the case for climate hazards; it may reasonably be assumed by analogy to be the case for global climate change. The
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Intense concentration of research effort to date on projecting the physical attributes of a climate change thus scants an equally essential task—that of clarifying what those attributes mean and for whom.

Tackling emissions is recognized as attacking the proximate cause. Analysts and policymakers identify three underlying causes: overpopulation, overconsumption, and inappropriate technology choice attributable to poor pricing and allocation of property rights. Without necessarily buying into the $=PAT$ equation criticized in Human choice and climate change, policymakers have generally centered discussions around these three elements, which dominate the search for solutions.

Population control won't provide the answer to climate change. Although major factors in fertility reduction are known, these play out differently in different cultures, so that success or failure of population control programs cannot be predicted. Where such programs are effective, they may result in age distributions so skewed as to raise other societal problems (e.g., the consequences of the one-child policy in China). Even if family planning becomes more widely practiced, it is likely to contribute to better spacing of children and better child health than to a drastic change in projected population rates. In any case, projections show population growth set to level off at a globally supportable level, although certainly not one that would be supportable at the current per capita emissions rate of the industrialized world. The real population issues are regional ones associated with the combination of density and poverty. And although intuition may suggest that fewer people would emit lower levels of greenhouse gases, in fact a smaller and richer population may emit higher per capita and higher overall levels.

Voluntary frugality also seems an unlikely prospect—at least on the scale required to achieve emissions cuts sufficient to stabilize atmospheric concentrations of greenhouse-related gases. It would require a voluntary change (many would say sacrifice) on the part of the population of the industrialized world and by the sizeable and powerful elites and professional classes of the less industrialized and industrializing world. It would also require unprecedented restraint on the part of the population already living at humble levels, for them not to take advantage of opportunities to improve their level of comfort. Human choice and climate change teaches us that regulating consumption is not just a matter of tinkering with tastes. Patterns of spending, even over time, show how, but not why, people make choices in the goods they acquire.

Of course, there are historical precedents for frugality—but none on a large scale that would be compatible with democratic values. Examples abound from anthropology and the history and sociology of religion. But these depend on close personal monitoring by the community to ensure that members do not stray outside of the norms.
Recognize Institutional Limits

Does technology offer a way out? Some think so. Americans in particular are often criticized in European debates for not looking seriously at significant lifestyle changes (although this remains largely talk and little visible action in Europe). If decisionmakers cannot reduce the number of people or the level of goods and satisfaction that people expect, can they not change the way we satisfy demand?

Bottom-up modelers in particular (but not exclusively) point to technology improvements waiting to be taken up, if only the prices were right or some institutional obstacle (e.g., an inconvenient property-right allocation) were not in the way. Unidimensional models such as $1=$$PAT act as if reducing environmental impacts were a strictly linear matter; in fact, the factors that give rise to environmental stress are interrelated in ways that are incompletely understood.

Taken in the aggregate, the Earth's resources can maintain a total population far larger than we presently have or are likely to see in the next century. Similarly, as recounted in *Human choice and climate change*, the technical potential for energy conservation measures is often calculated as very large, and the potential contribution of new technologies to the energy mix is high. The problem is not one of sheer numbers of people relative to the total resource base or available technology, but one of institutional opportunities and constraints, for example, where population is concentrated in environmentally fragile areas or the allocation of resources and entrenched arrangements that favor energy inefficiency and fossil fuels. Both efficiency and fairness play the causal roles in the energy efficiency gap, as they do in poverty and famine.

How governments and other institutions allocate resources is an equity issue. Proposals for theoretically efficient emissions reduction protocols often founder because they are fair only in the sense that they cost least at the macro level. The explicit basis for national and international actions is maximizing utility in macro terms; increasing GNP is not about making the Joneses better off but about making the country as a whole better off, whether or not that means making poor people worse off relative to the rich. Predictably, some people object that they will be disadvantaged disproportionately, and attempts are made to provide resource transfers (financial payments) to compensate such groups.

But equity is not just about how societies distribute resources. It is also the basis for generating social capital—necessary, alongside economic, natural, and intellectual capital, for sustainability. *Human choice and climate change* reminds us that the demand for fairness arises out of the establishment of publicly shared expectations for the conduct of community relations. Fairness is integral to the establishment and maintenance of social relations at every level from the micro to the macro, from the local to the global. Because there are differences among the ways in which communities and other institutions organize their social
relations, there are differences among the expectations of fairness that people use for judging policy processes and outcomes. In turn, because people everywhere buttress their arguments about what is right by invoking ideas of what is natural, they also exhibit important and sometimes irreconcilable differences in their attitudes to nature as being fragile or robust and in their judgments of vulnerability. Thus, the distribution of ideas of fairness and of nature represent important institutional constraints on the perceived urgency of climate policies as well as of their efficacy and acceptability.

In this way, climate change also provides an arena for debating a wide variety of social, economic, and political issues that society finds difficult to address directly. These include the unequal distribution of wealth within and among nations and the tension between the imperatives of independence and interdependence at all levels of social organization. Much of the debate about equity in climate change mitigation is an extension of the broader debate about international economic development and political empowerment. Clearly, there is a social benefit to be obtained from the existence of an arena in which potential changes in the socioeconomic and political status quo can be explored as deriving from natural imperatives rather than human agency. This enables parties to advance agendas for change without directly and immediately threatening deeply entrenched political and financial interests.

But the situation also presents potential dangers for human society. On the one hand, it is plausible that the opportunity costs of debating significant social and economic change in a surrogate arena may reduce society’s capacity to make desirable changes. For example, if policymakers allocate significant economic and political resources to mitigating climate change as a way of enhancing the development of less industrialized countries, they may be reducing the level of resources actually available to fight poverty, hunger, and ignorance. On the other hand, reservations about using the opportunity that a potential natural crisis provides for social and economic reform may lead decisionmakers to ignore or override signals from the natural system that nature is, indeed, about to use its veto over human behavior. It seems that these important questions cannot be addressed directly by policymakers engaged in the climate change discourse as it is currently framed.
Prepare for the likelihood that social, economic, and technological change will be more rapid and have greater direct impacts on human populations than climate change.

Climate change is unlikely to determine the fate of human society as a whole. In fact, much of the world's population, technological, economic, social, and political change is likely to occur at a rate that changes in the global climate regime of the order anticipated by the Intergovernmental Panel on Climate Change (IPCC) will be barely noticeable. In such a rapidly changing world, long-term environmental issues will find it hard to compete for attention with immediate socioeconomic and political problems and opportunities.

For creating future scenarios, researchers often extrapolate from the present to posit a future that is more of the same. The future world of the IPCC First and Second Assessment Reports is essentially today's world, but more so: more people, more economic growth, and more technology (although largely of the same sort). However, a social-historical perspective suggests that such linear assumptions about global development are highly unrealistic. Looking back, the past century reveals an accelerating rate of social and technical change. An analyst or decisionmaker in 1897 would have been hard pressed to envisage even the broad outlines of the changes in technological capacity and its distribution over the succeeding 100 years. For example, consider the scale and rapidity of succeeding change in what we now call telecommunications. Commercial telegraphy was introduced in 1844, the telephone in 1878, broadcast radio in 1920, television in 1936, video cameras and recorders, personal computer, cellular phones, and the Internet have all become commonplace in only the past 20 years. The ubiquity of the motor car, the extent of electrification, and popular air travel are all technological developments that were inconceivable to policymakers at the turn of the century. Indeed, Hansard records the concern of a late nineteenth-century British parliamentarian that, at the prevailing rate of emissions, London would be buried several feet deep in horse manure by the 1950s.

Politically, the world at the end of the twentieth century would also have been unrecognizable to a decisionmaker at its birth. The great empires of Britain and France directly dominated Africa and much of Asia, the Austrian Empire remained intact in Europe, and the Russian Empire dominated Europe's eastern edge and northern Asia. Even 50 years ago, the Soviet successors to the Russian imperial mantle seemed unshakably enconced in the Kremlin, having expanded their influence across all of eastern and central Europe. Economically, the United States had yet to reveal itself as the country that would dominate global markets in the second half of the century. Britain retained its premier position as a world economic leader and as a political force. Socially, women
were universally excluded from the popular franchise, where such a franchise existed at all. Slavery had only been abolished in the United States 45 years earlier. Educational opportunities remained limited, even in the richest countries. All of these things have changed in ways that no one could foresee.

But who can doubt that the paths that humanity will take during the next 100 years will be at least as unpredictable to us now as the past 100 years were even to the most creative minds of the day? While the rate of change is accelerating, the actual direction and specifics of socioeconomic and technical change are inherently unpredictable, severely limiting the usefulness of models and well-understood analogies, if any can be found. In the words attributed to St Paul “whether there be knowledge, it shall vanish away. For we know in part, and we prophesy in part.” (1 Corinthians 13)

The rapid rate of socioeconomic and technical change relative to climate change contrasts with the slower background rate of change of the natural world. Ecologists frequently warn that it is not so much the amount of climate change that is dangerous but that it will occur faster than the rate at which ecosystems can adapt. On the other hand, society itself is changing at an accelerating rate. The implications of the rate of climate change for society may therefore be quite different from its implications for unmanaged ecosystems. Not only may societies adapt to climate impacts, but technological change may lead to a more rapid displacement of fossil fuels than is conceivable today. The problem is that there is no way of telling today whether this will prove to be a saving grace or yet another factor compounding the challenge of global environmental governance.

In the best of all possible worlds, decisionmakers responding to the pressures of rapid societal transformation would be able to improve humanity’s institutional and technical capacity to deal with slower climate change, at each step along an accelerating path of opportunity. In the worst of worlds, the rapid pace of societal change would distract the attention of decisionmakers from inexorable environmental and resource degradation. To ask, “What is the most likely scenario between these extremes?” is to misunderstand the inherent unpredictability of complex systems over long timescales. We simply cannot predict the future in such a fashion. The authors of Human choice and climate change point out that the analysts who build integrated assessment models that run for a hundred years are the first to warn that they should not be seen as predictive truth machines.

If decisionmakers cannot predict the unpredictable, how can society face the prospect of profound change occurring at an accelerating pace? To be sure, the answer is not just “Hang on and enjoy or suffer through the ride, depending on your luck.” The answer is to build responsive institutional arrangements that monitor change and maximize the flexibility of human populations to respond
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dependently and constructively to it. However, as we have already seen and will discuss further below, people disagree about what kinds of institutional arrangements are capable of providing such societal resilience.

Recognize the limits of rational planning

The rate and direction of global socioeconomic and technical change over the period in which climate change may be felt is by no means the only significant source of uncertainty affecting public and private sector decisionmakers. Uncertainty is a pervasive condition of policy and decisionmaking. For example, uncertainties predominate in assessing the effects of forestry policy on carbon dioxide emissions and carbon sequestration. Carbon yields in forest plantations vary according to region, species, soil type, precipitation, and management practices. Even in the United States, where land and timber markets are perhaps closer to the economists' ideal market than elsewhere in the world, it is difficult to predict how landowners will respond to various carbon sequestration programs. Finally, the nature of the programmatic and political uncertainty inherent in the development of a carbon sequestration program suggests that models that examine only general policy instruments—taxes and subsidies, allowances and offsets—may not capture some important factors that will determine the effects of the program. Scientific, behavioral, and programmatic uncertainty create a very complex analytic problem. In some cases the uncertainty applies even to the direction of expected change in both the costs of carbon sequestration and the potential accomplishments of the policy. These conditions, more properly characterized as indeterminacy, exacerbate the challenges of designing and implementing appropriate policy options.

As this example illustrates, we do not have a robust description of our own world. We have inaccurate and conflicting theories about how and why people make choices, for themselves and in societies. We model markets well, but non-markets only poorly. This is one of the most important limitations on an otherwise very powerful rational tool—cost-benefit analysis. Economists like to evaluate the relative efficacy of many decisions, including decisions on how to manage the environment, in terms of their costs and benefits. Human choice and climate change illustrates how modern cost-benefit analysis reaches beyond the traditional bounds of simple project analysis to investigate optimal provisions of public goods, the efficient level of ambient air and water quality, and other complex environmental issues. Cost-benefit analysis can point to allocations of resources that equate marginal costs with marginal benefits, just like a competitive market; and so promises welfare improvements if not maximization.
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However, problems arise when cost–benefit analysis is applied in situations where established and well-behaved markets are not available to provide input values to the calculus (e.g., in the valuation of human life or of unique ecosystems). Like other tools for rational decisionmaking, cost–benefit analysis is widely understood to be valid under a fairly restrictive set of assumptions. These are summarized in *Human choice and climate change* as a unique decisionmaker faced by a limited number of alternatives which can be compared by an unambiguous quantitative criterion. Provided that violations are minor, decision analysis may still provide a solution that is close to the optimal outcome desired by a rational actor. What is less generally agreed upon is how to distinguish which violations are minor and which are major, as well as what level of cumulative minor violations synergize to invalidate the approach.

For climate change, there are significant violations. In particular, there is no single decisionmaker. Differences in values and objectives prevent collectives of decisionmakers from using the same selection criterion for decision alternatives—so decision analysis cannot yield a universally preferred solution. Moreover, uncertainties in climate change are so pervasive and far reaching that the tools for handling uncertainty provided by decision analysis are no longer sufficient.

Cost–benefit analysis is also subject to dispute on the part of stakeholders who do not subscribe to the value of efficiency that underpins it. The focus of economists over the past 10 years has been on efficient policy instruments to affect prices and encourage more ecologically sustainable choices. These analyses and recommendations are presented as purely technical contributions to rational decisionmaking. However, they are more than mere technical exercises. Ultimately they rely on their persuasiveness on their commitment to efficiency as an underlying driving value. But cost–benefit analyses have met with dogged political resistance from stakeholders committed to values other than efficiency which were not taken into account in the analysis. The limitations of rational analysis and planning are often hard to accept in the face of three centuries of commitment to the "... absolute belief that the solution to our problems must be a more determined application of rationally organized expertise." (Saul 1992: 8)

Currently there is strong interest among policy analysts in stimulating appropriate technology. Again, this raises fundamental problems of indeterminacy for policymakers. Governments cannot call desirable technologies into being or maturity by legislation. Incentives and constraints (including regulation) do have effects, but governments cannot gauge their content and timing. In addition, governments have little knowledge of technological possibilities; they act on the basis of technological promises. This leads to a control problem: in principle, governments have the greatest influence over technological
choices when they know the least about the impacts and desirability of the technology; when the technology is fully developed and widely used, it is extremely difficult to control it (because of vested interests and high adjustment costs).

This dilemma of knowledge and control applies to all actors involved in technological development. Indeed, technology is continually shaped by actors who exert themselves to domesticate and control the technology, with varying degrees of success. Technology is not out of control, but the complex dynamics of attempts to rationally steer technological change often do not lead to expected or acceptable outcomes. Again the limitations on rational analysis and planning are revealed. But this does not mean that a worthwhile technology policy is beyond our grasp, merely that it cannot be based solely on rational prediction and the assessment of cost-benefit efficiency. The recognition that greenhouse gas emissions result from myriad interactions among population, consumption, and technology can lead to different approaches to managing climate change. Each element, far from being a driving factor to be controlled with a policy lever, is a different entrance point from which to view a landscape of interwoven actions; each is a different dimension of the same complex set of conditions, and none by itself has the potential to transform human society.

As we draw on fundamental understanding of processes of technological development, we can identify and define opportunities for productive intervention in the process. Human choice and climate change suggests that we should view policy intervention as the modulation rather than the direction of technological development. Government intervention should therefore be oriented toward the strategic interactions among the different actors, rather than laying down functional requirements. Government should intervene to change the processes involved in technology development: facilitating communication, broadening the scope of inquiry, supporting participants that might not otherwise be heard, providing resources for research unlikely to yield short-term results, and stimulating cooperative activities in a novelty-seeking business environment. For example, government can secure a future market for a new product. Or in the case of technological controversies, government can facilitate discussions among interested parties, to generate better understanding of the issues, and guide technology developers in their decisions. Thus, the role of the government is that of facilitator seeking to align other actors in the process of change rather than that of a regulator directing technology choices.

For climate change, it is as important to shift the hydrocarbon-based energy regime as it is to develop particular new technologies and systems. Just as technological trajectories branch and shift, so can policymakers think of a transition path toward a new regime and apply themselves to bring this about. Technologies grow in niches—protected spaces for further evolution without the full force of selection being felt. Policymakers can actively create such niches and
managing the process so as to reduce the extent of protection gradually. Positive feedback through interactive learning and institutional adaptation occurs and, by creating a little irreversibility in the right direction, the transition process is pushed forward.

As a policy instrument, strategic niche management promotes technical change in directions that offer both short-term and long-term benefits. But, success is not guaranteed; strategic niche management is an example of a heuristic approach, exploiting points of attachment in an evolving sociotechnical landscape. On the other hand, by drawing on our understanding of the nature and dynamics of technological development, it definitely is a realistic approach.

What, then, can policymakers do? They can search for points of intervention—various points of end-use, energy production, extraction, for example—instead of designing grand solutions. In the words of the protagonist of Graham Swift’s novel Waterland (1983: 336):

It’s progress if you can stop the world slipping away. My humble model for progress is the reclamation of land. Which is repeatedly, never-endingly retrieving what is lost. A dogged vigilant business. A dull yet valuable business. A hard inglorious business. But you shouldn’t go mistaking the reclamation of land for the building of empires.

Policymakers can encourage niches, protect them for a while, allow competition while preserving alternative paths. They can perform such nonmarket roles as engaging interest in new technologies, sponsoring focused R&D, and encouraging information exchange. They can work indirectly to build and strengthen resilience. They can resist the temptation to be linear and direct in their desire to manage problems. This approach, admittedly incrementalist, is sometimes dismissed as lacking understanding of root causes—but we have seen that appeals to root causes (such as population growth or overconsumption) are most usually rhetorical rallying cries of particular cultural or interest groups and that, in any case, consensus on causes is not a precondition for effective collective action.

Employ the full range of analytic perspectives and decision aids from the natural and social sciences and the humanities in climate change policymaking

Despite the early and concerted efforts of some leading natural scientists to broaden the range of tools used to understand climate change issues, climate
change decisionmaking has been dominated by natural science and macro-
economic perspectives. The social science viewpoint brings into focus impor-
tant issues; that is, policymakers can literally see things differently, things that
are invisible or pushed into the background when viewed from a natural science
standpoint. The social sciences focus on human systems that allow and con-
strain choices, systems that bound what people can do about climate change and
other global changes. From this viewpoint, the physical processes are in the
background, although their importance remains. The trick to master is seeing
both perspectives and finding paths forward that account for both environ-
mental and social constraints and opportunities.

In the late 1980s there was much rending of garments about the compatibility
of natural and social science research on global environmental change. How-
ever, Human choice and climate change finds that they are able to accommodate
each other rather comfortably, albeit in a limited fashion, by exchanging informa-
tion between natural and social science assessments of the stocks and flows
of goods and materials represented by the boxes and arrows of flow charts and
systems diagrams. The harder challenge is integrating this kind of social science
with another kind of social science, the interpretive tradition, which is histori-
ically and methodologically closer to the humanities.

We have demonstrated in Human choice and climate change that incorporation
of the insights of the interpretive social sciences can greatly expand under-
standing of the human dimensions of climate change and decisionmaking,
-ranging from the production and evaluation of scientific knowledge to the
negotiation and implementation of policy at international, national, and local
levels.

For example, social studies of science can help both natural scientists and
decisionmakers (the rest of us) in evaluating climate change science by bringing
the social processes by which science is produced out of the black box. This pro-
cess is not congenial to some scientists, who are sensitive to any suggestion that
social factors shape their theories, methods, data, or results. Some social scien-
tists have deliberately steered social science research programs away from look-
ing at the process of creating climate science, for fear of offending potential
collaborators from the natural sciences. But concern that social science studies
of knowledge production are somehow antisocial is misguided. We should
neither pretend that any body of knowledge is value free, nor that we can dis-
miss that knowledge merely by exposing its assumptions and value framework.
Similarly, studying the social processes involved in forming a scientific con-
sensus and extending that consensus to affect social decisionmaking does not
invalidate the science. Such studies can help policymakers to avoid overstating
scientific findings (and thus avoid backlash) and to see what is needed to estab-
lish scientific knowledge as a basis for institutional action.
In fact, in relation to the most important scientific assessment of climate change science, that of the IPCC, social science analysis suggests that despite some valid criticisms related to participation of less industrialized countries and representation of a sufficiently broad spectrum of social science, the principal findings of the IPCC may be regarded as robust. Interpretive social science therefore offers little comfort either to those who would dismiss scientific warnings about changing climate or to those who would prefer to preserve science from public scrutiny. With respect to public scrutiny, the openness of the IPCC to nongovernmental organizations (NGOs) represents a significant step in the direction of creating at the international level the kind of vernacular, civic, or postnormal science envisaged by the authors of various contributions to Human choice and climate change.

Nevertheless, social scientists should beware of the immigration effect by which the most recent group to establish itself in a new country seeks to bar the door behind it and exclude the next in line. In addition to philosophical perspectives on what is right, what is natural, and what is beautiful, the humanities also offer potentially valuable input to decision processes and opportunities for cultural learning, the creation, transmission, and interpretation of new meanings of nature and society, and of the relationships between them. What societies celebrate in literature, art, and performance publicly expresses and communicates shared hopes, fears, and expectations about the world in which climate change is experienced. Storytelling is one of the most important ways that humans construct their individual and collective identities. Hence, history and mythology can tell us much about ourselves, our values, and our behavior in relation to climate, lifestyle, and human development. Bridging the gap between descriptive and interpretive social sciences potentially reunites the full range of human capabilities that were rent asunder by the Enlightenment. To cope with global challenges, such as climate change, the greatest and least of decisionmakers will be better armed by accessing their full range of capabilities for understanding and choosing.

This kind of analytic capability requires a complex balance among disciplinary, multidisciplinary, and interdisciplinary activities. Disciplinary researchers are spinners who weave intellectual threads for interdisciplinary weavers who make them into whole cloth. Neither can exist without the other. But the appropriate balance of disciplinary, multidisciplinary, and interdisciplinary research cannot be achieved and sustained by the research community without the support of public and private sector decisionmakers and evidence that the multiple perspectives provided by the full range of research perspectives are used and valued in decisionmaking.

Even interdisciplinary research and analysis remains the province of intellectual elites. There is a further step beyond interdisciplinarity that should be
considered, that is, to expand traditional concepts of expertise by developing institutions of civic science that combine universal scientific expertise with the local expertise and craft skills of stakeholders in decisionmaking. Embracing a broad range of expertise in this way takes analysis and decisionmaking beyond the traditional expert/lay dichotomy which in any case obscures significant variation in the perceptions and preferences of both. It also obscures the fact that real people are not consistently experts or lay people. There are no universal experts and, in the civic arena, even the most modest lay person has some relevant expertise. Relevant knowledge brought to bear in the climate discourses is not composed solely of scientific facts about climate chemistry, dynamics, and impacts, but also derives from various experiences of social change and societal responses to natural change.

The expert/lay dichotomy also structures communication as a unidirectional process in which expert knowledge is passed to the public either to alleviate its ignorance or redress its misperceptions. In this mode, decisionmakers are often stopped in their tracks by recalcitrant populations who rightly insist that they have not been heard and that their expertise (what anthropologists call local knowledge) has been ignored. The suggestion in Human choice and climate change, that expert discourses are structured by the same elements of social organization as lay discourses, redirects efforts at communication from simply overcoming ignorance to creating shared frames of reference and opportunities for shared action. Public information campaigns, which assume that discrepancies between lay and expert accounts of climate change are simply attributable to knowledge deficiencies, are bound to fail. Effective communication about climate change issues requires understanding of the frames of reference being used by all participants.

*Design policy instruments for real world conditions rather than try to make the world conform to a particular policy model*

The model most used by social scientists and policymakers to account for the difficulty of changing human behavior is that of barriers to information. The idea can be conveyed by a hydraulic metaphor in which water (information or technology) runs down a mountain (diffuses or is disseminated). If a channel is blocked, water backs up or is diverted. If the barrier is removed, water (information) flows freely. People make bad choices because of poor price signals (lack of information or misinformation that blocks true information). If prices signal the true costs, then the barrier to behavioral change is removed and people will do the right thing. Although this model works nicely in well-
behaved markets with many traders having access to full information, it does not provide useful guidance for communication and policy implementation under many of the conditions that influence emissions-related behavior and opportunities for adaptation.

The hydrologic model of information flows comes under critical scrutiny in several chapters of *Human choice and climate change*. The model lacks the required focus on meaning. Its continued use obscures the difficulties of creating a global-scale framework for changing human relationships to the environment (and of necessity with each other). It also obscures the availability of opportunities that can be found beyond the rational actor paradigm, presuming that, if the implementation process is not going according to plan, the fault must be in user distortions that can be fixed. The model masquerades as facilitative when it is really prescriptive. Instead of trying to make the world conform to the normative tenets of the rational choice model, we should attempt to understand how decisions really are made (outside of well-behaved markets) and shape information pertinent to decisionmakers and their available options.

With respect to policy implementation, most analyses focus on the impact of emissions reductions policies on the energy sectors of industrialized countries. The bounding conditions for such analyses bear some reasonable resemblance to the idealized models of economic theory. For the most part, fossil energy fuels are fungible and, especially for stationary energy uses, they are highly substitutable for one another. They are consumed in reliable and predictable ways. Especially in the industrialized countries, they are widely traded in well-established markets, where information is plentiful and prices are responsive to fairly uniform trading opportunities.

Even under these conditions, industrialized countries exhibit significant variation in the presence of those characteristics that could be considered ideal for the successful application of climate policy instruments such as regulations, taxes, and information programs. These attributes include:

- a well-developed institutional infrastructure to implement regulation
- an economy likely to respond well to fiscal policy instruments because it possesses certain characteristics of economic models of the free market
- a highly developed information industry and mass communications infrastructure, for educating, advertising, and jawboning
- a vast combined private and public annual R&D budget for reducing uncertainties and establishing pilot programs.

To the extent that these close-to-ideal institutional conditions for conventional policy implementation are missing, policymakers may expect to encounter further obstacles to the effectiveness of policy instruments. This situation is exacerbated in the case of policies addressing land and water use, which are key not only to carbon sequestration policies but also to most adaptive strategies
such as migration, crop switching, and changes in the design of buildings and human settlements.

It is much more difficult to analyze the effects of policy instruments in circumstances where these close-to-ideal circumstances do not pertain:

- where emissions information is less reliable, such as in the forestry sector
- where market conditions are much less ideal or even nonexistent, as in important segments of the economies of less industrialized countries
- where political conditions give rise to uncertainty over the sustainability of the policy program
- where policies focus on highly uncertain adaptation strategies rather than on emissions.

Less industrialized countries often have poor infrastructures to begin with, a problem exacerbated by a lack of human, financial, and technological resources. In addition, these countries are likely to be focused on more basic and fundamental considerations of nation building and economic development. Environmental issues can be low on their scale of priorities.

The harsh reality is that many less industrialized countries face a serious problem of scarce resources to carry out the most elementary functions of government. Competition among state agencies for whatever resources are available inevitably leaves environmental protection and natural resource management agencies without the necessary investment to establish effective monitoring and implementation programs. The shortage of program resources is exacerbated by pressures to exploit natural resources to earn foreign income, increasing demands of the population for energy, and pressures to convert forest land to agriculture and human habitation. Under the combined weight of all these factors, the issue of optimizing across regulations, taxes, permits, education, and demonstration projects becomes academic.

Lack of implementation infrastructure may be the largest single obstacle to effective policies, especially under the frontier conditions of Amazonia and other areas of tropical deforestation. These are situations where prior claims of indigenous populations are nonexistent or disregarded, and where the ability to monitor behavior, settle disputes, and enforce rules and contracts lies with individuals and groups possessing the power to coerce. Unfortunately, conventional development approaches tend to dismiss these characteristics of the society as mere details of implementation when, in fact, they represent fundamental structural differences between frontier societies and those where the institutions of civil society, essential to the functioning of regulatory regimes or efficient markets, are either severely curtailed or altogether absent.

In principle, the economic conditions of less industrialized countries also present opportunities to achieve emissions reductions at lower absolute cost than in the industrialized nations that have already made capital intensive
commitments to fossil fuel technologies and may lack the land resources available for carbon sequestration programs. The solution is to design information to fit the frameworks of meaning that are relevant to stakeholders and to design policy instruments to suit specific conditions. "One-size-fits-all" seldom fits at all.

**Incorporate climate change concerns into other, more immediate issues such as employment, defense, economic development, and public health**

Wherever climate policies are pursued, effective actions designed to mitigate or respond opportunistically or adaptively to climate change are likely to be those that are most fully integrated into more general policy strategies for economic and social development. The more that climate change issues are routinized as part of the planning perspective at the appropriate level of implementation (e.g., the firm or the community), the more likely they are to achieve desired goals. Climate policies as such are bound to be hard to implement. This conclusion recasts the issue of compliance and implementation in important and challenging ways. As analysis moves beyond the idea of a rational instrumental framework of evaluation, decision, and implementation to a continuous framework of interactive negotiation, policy explicitly becomes the formalization of actions being undertaken by participating parties.

However, mere piggybacking of climate change onto an existing political agenda as another stick to wave at political opponents is unlikely to succeed. Likewise, dressing up climate change measures as the means to pursue higher taxation or welfare expenditure is also likely to run into substantial opposition. There are no easy answers, as true win-win solutions continue to prove elusive. So far, it must be said that no country has seriously addressed the reduction of its greenhouse gases as a matter of genuine commitment. Those that have tried to do so (e.g., Denmark, Norway, and the Netherlands) have encountered serious impediments in the economic lobbies of industry and transportation—so much so that even these environmentally motivated countries have had to back off. Unless and until climate change is perceived as a real economic threat with major consequences for the stability of future trading partners, and until there is a collective will to map a common trajectory to agreed limits, then climate change will produce plenty of rhetorical hot air, but little concerted action.

Without a major policy stimulus (such as a significant carbon tax) or an unmistakable signal that climate change is real and threatening, any country is likely to delay the kinds of behavioral changes that would be necessary to arrest
the process. *Human choice and climate change* indicates that issues that are perceived by governments to be on the policy periphery, such as climate change, are not easily factored into consideration of issues at the policy core such as national economic policy or corporate manufacturing strategy. In addition, policies such as carbon taxes, explicitly formulated to address issues on the policy periphery, are likely to be carefully scrutinized for potential adverse effects on the policy core by its institutional stewards. For example, the issue networks and policy communities around environmental ministries in most countries have been shown to be weak relative to those around economic and defense ministries. In no case has climate change been perceived within the powerful ministries and their policy communities as sufficiently threatening to their departmental interests to disrupt their existing policy agendas.

Clearly, climate change either has to be shown to be a compelling threat that overshadows other policy demands, or it has to be integrated into the routinized decisionmaking frameworks of government organizations and agencies whose primary policy concerns (such as finance and energy) are widely recognized as compelling. The appropriate response therefore is to incorporate climate concerns into the everyday concerns of people at the local level and the big concerns of policymakers at the national level. At the moment the research agendas of either the natural or social sciences provide little help or guidance for this. A combination of the focus on emissions (rather than, say, vulnerability) with the speaking-truth-to-power model of analysis and policymaking is producing least knowledge where it could do most good, that is at the levels of households, firms, and communities. Once again, the need identified in *Human choice and climate change*—for a new model of cooperative action by scientists, policymakers, and other stakeholders—would be appropriate.

Joining climate change issues to issues of societal resilience opens the agenda to a broad range of focus areas, including economic development, institutional restructuring, provision of multiple strategies, fostering civil society, and strengthening indigenous arrangements (e.g., land tenure) that are working. Resilience encompasses not just preservation from harm (where this is possible) but also strengthening or establishing alternative economic activities (both market and nonmarket) and social structures.

*Take a regional and local approach to climate policymaking and implementation*

Although national politics are important, they may obscure another fundamental reason why, even when a climate policy is accepted (as in the Netherlands),
it nevertheless proves to be remarkably ineffective. Analysts and policymakers continue to focus their attention at the level of the nation state, whether their focus is on the ability of states to develop solidarity with one another or to create appropriate frameworks of political and economic solidarity to implement their policy goals domestically. However, in most cases, the state is actually very far removed from the sources of emissions. The policy levers of the state therefore, have to be very long to reach the locus of desired action. All too often, especially, although by no means exclusively, in the less industrialized world, the levers of state power are not connected to anything at the local level, where policies must be implemented by ordinary people living in face-to-face communities.

There is much variation around the world in the relationship of national to provincial and local governments. However, in the day-to-day lives of most people in the world, local government is the more salient political actor. It delivers or withholds essential services; it mediates between the citizen and the nation state through local officials, such as police officers, who may have to monitor vehicle emissions, or building inspectors, responsible for seeing that new construction meets energy efficiency standards. Furthermore, over 50 percent of the world's population now live in urban areas, contributing a significant portion of global emissions of greenhouse gases. The density, mixture, and physical layout of residential and commercial neighborhoods all influence the energy intensity of the community. Yet many of these factors are more directly under the control of community governments than of national ministries.

Already cities around the world are networking with one another at the level of municipal administrations and citizen activists, and without the intermediation of national authorities. For example, urban leaders met at the Municipal Leaders' Summit for Climate Change in New York in 1993 to establish the Cities For Climate Protection program. This program was an extension of an earlier initiative linking 14 cities in the United States, Canada, Europe, and Turkey, designed to strengthen local commitment to reduce urban greenhouse gas emissions, to research and develop best practices in pilot communities, to share planning tools and experiences, and to enhance ties among municipalities across national boundaries, especially between those in industrialized and less industrialized countries.

*Human choice and climate change* argues that the bulk of climate change politics may have to devolve to the local level, if policies are to become effective in the informal institutional dynamics of individuals and households. The rise of informal networks of cooperation is an important development here, spurred on via schools and colleges, various social groupings, and local businesses. Whether policy innovation and behavioral change are led locally or nationally, they will be marked by a process of institutional learning that either moves current peripheral concerns about climate change to the core of people's daily
concerns or, at least, palpably and convincingly links climate policies to these everyday concerns.

A significant problem is that almost all of the climate change policy research and analysis is aimed at high-level policymakers. Funding agencies tend to be those of national governments or of NGOs seeking to influence government policy or international negotiations. Although this research is important, it is not very helpful to a city manager, the general manager of an aluminum smelter, the operator of a regional reservoir system, or a household seeking guidance on how to do the right thing for the climate at the same time as doing the best for citizens, stockholders and employees, consumers, or family members.

Direct resources to identifying vulnerability and promoting resilience, especially where the impacts will be largest

Whatever the level at which decisions are made, sustainability is about being nimble, not about being right. Policymakers should balance their current emphasis on linear goal-setting and implementation by paying more attention to promoting societal resilience through enhanced capability for strategy switching. This is particularly urgent where populations are vulnerable to the early impacts of climate change.

Central problems in this high-minded endeavor are to define vulnerability and resilience and to identify relevant markers or indicators of each. For example, industrialized countries seem to be vulnerable to violent storms in terms of physical infrastructure but not in terms of human lives, whereas the opposite vulnerabilities characterize less industrialized countries. The IPCC methodology for assessing vulnerability in coastal zones focused on people, land, and infrastructure at risk, arriving at quantitative estimates for each. Vulnerability is defined by negative impacts of a climate event on particular societies; included in the vulnerability assessment are political and economic systems, and other institutional arrangements. Changes in regional patterns of habitability would exacerbate existing problems for poor populations living in environmentally vulnerable areas, such as low-lying tropical regions. Here we may anticipate that more poor people will go hungry, get sick, and die young.

Human activities and groups are sensitive to climate to the degree that they can be affected by it, vulnerable to the degree that they can be harmed. A resilient system, activity, or population is one with low vulnerability; either resistant to hazard effects or readily capable of coping with and recovering from them. Vulnerability should be distinguished from hazards—defined as events threatening people and things that they value, or the probability of the occurrence of such events. Impacts are the actual consequences (losses or, conceivably, gains)
resulting from a biophysical event. Negative impacts are the product of hazard events and vulnerability. A focus on vulnerability, then, is a partial one that addresses the sensitivity of human systems only to the threats, and not also to the opportunities, presented by particular climatic anomalies and by the human activities with which they interact. There are few studies of gains from climate variation and of human activities vulnerable to climate that compare the losses to the overall gains from the activity. Yet "the use of resources of a hazardous area almost always leads to social benefits as well as social costs. It is essential to identify the tradeoffs between the benefits and the costs in the broadest sense" (Burton et al. 1993: 188).

The vulnerability of populations and activities is the most widely used umbrella concept for those factors that mediate between geophysical events and human losses. Because vulnerability and its causes play an essential role in determining impacts, understanding the dynamics of vulnerability is as important as monitoring and predicting climate change and interannual variation. Vulnerability draws attention to the amplifiers or attenuators of the impacts of climate change and channels them toward certain groups, certain institutions, and certain places. It also emphasizes the degree to which the risks of climate catastrophe can be cushioned or ameliorated by adaptive actions that are or can be brought within the reach of populations at risk.

In comparing the vulnerability of populations, researchers distinguish between differences in physical exposure to the hazardous agent and different abilities to cope with its impacts. The former are closely associated with biophysical, and the latter with socioeconomic, differentiation. Aspects of the biophysical environment may be important sources of coping ability, for instance, and differences in exposure to hazards may be the consequence of socioeconomic differences. No standard framework exists for identifying different sources of vulnerability, but clearly they are many and complex. Poverty is generally recognized as one of the most important correlates of vulnerability to hazard, but it is neither necessary nor sufficient for it. The very young and the old are often identified as especially vulnerable. Other categories widely invoked are differences in health, gender, ethnicity, education, and experience with the hazard in question. Empirical local-level studies reveal such complex mosaics of vulnerability as to cast doubt upon attempts to describe patterns and estimate trends at the global or even the regional scale. Vulnerability to global climate change is likely to be as complex.

The IPCC Second Assessment Report has made a preliminary identification of regions and societies where climate change impacts are likely to be most severe, for example, coastal zones and areas that are already warm and dry. Natural science indicates that the impacts will be felt in regions that are geographically exposed (e.g., low-lying tropical regions).
USE A PLURALISTIC APPROACH TO DECISIONMAKING

However, policymakers should be wary of comparable vulnerability league tables and broad pronouncements. Some researchers argue that the industrialized world is more vulnerable because of increasing interdependencies and rigidities in the industrial system and its supporting infrastructures. Other researchers have argued that the vulnerability of the less industrialized world is greater because of its immediate dependence on agriculture. The emphasis should be on collaborations wherever gains can be made in increasing the capacities of societies to deal with problems that may result from climate change and other environmental changes (e.g., water and air pollution, overfishing). When all is said and done, building both the social and financial capital of the poor may be their best defense.

Use a pluralistic approach to decisionmaking

The Framework Convention on Climate Change (FCCC) provides an important symbolic framework expressive of worldwide concern about climate and about the persistent issues of global development that are inextricably bound up with it. However, Human choice and climate change suggests that smaller, often less formal, agreements among states, states and firms, and firms, NAPs, and communities may provide the vehicle for effective climate change responses. This process may appear to be irrational and conflictual, but the potential exists to make the most of diversity and the variety of decision strategies that diversity offers to decisionmakers.

At the international level, governments are presently keeping a tight grip on their prerogatives to represent their respective national interests in climate negotiations, whereas domestically the interests that are represented as national are shaped by the interaction of policy networks, including bureaucracies, businesses, and citizen groups. At this level, institutionalized patterns of behavior currently tend to give the business sector a privileged position; other interest groups may find they are deflected from the locus of decision-making by their inability to penetrate institutionalized patterns of consultation and representation. Still other demands—those made by the Deep Greens, for example—may simply go unheard because they are not considered legitimate or appropriate by network gatekeepers.

However, although it is undoubtedly true that the institutional structure is biased in favor of some groups (and that others may be effectively prevented from entering the political arena and even prevented from articulating their concerns by acts of conscious and unconscious exclusion), it would be quite wrong to portray institutionalized patterns of domination as being immutable.
Even the weakest and most disenfranchised can find the means to influence the activities of the strong.

Policymakers must look across several different dimensions simultaneously. For example, Figure 4.1 encapsulates:

- timescale: short, medium, and long terms
- spatial scale: local, national/regional, and global
- institutional actor: markets, governments, and civil society.

Most research efforts, and indeed most policymaking efforts, focus on a single element from each dimension. Presently, climate change policy activity is concentrated in only a small part of the three-dimensional space that defines potential policy activities. For example, the FCCC focuses on immediate goals to reduce emissions at the global (and, to some extent, national) levels within the formal institutions of a market-oriented worldview. (In contrast, most recycling efforts are short-term local programs using networks within a market orientation.) However, there is little or no articulation or linkage among different timescales, levels, worldview, and institutional structures. To connect these elements (which, after all, is the implementation task) requires two explicit recognitions:

- Articulation from global to local levels and from formal to informal institutional structures is mediated by codes, standards (including scientific standards), rules of thumb, and professional and indigenous practice (see Shapiro 1997).

**Figure 4.1** Policy opportunities are multidimensional.
CONCLUSION

- The design of policy must include implementation paths that accommodate different worldviews, institutional structures, levels, and timescales. Policy making that links the local and global levels requires extension of civic life, both as civic science (linking scientific and technical knowledge with local knowledge and craft skills) and civic society (associational links outside of governments and markets) at all levels to complement the market and government. It also requires extending integrated assessment analysis and inquiry, specifically scientific efforts to provide information useful to decision makers at all levels—not only global and national, but also firms, NGOs, and households.

Conclusion

The authors of Human choice and climate change have suggested that public and private sector decision makers adjust their approaches to climate policy in some important respects. We have advocated for increased attention to adaptation strategies. We have called for a stronger focus on institutional constraints affecting both the implementation of adaptation and mitigation policies. We have argued for shifting the balance of climate change policies from optimizing approaches to mitigation toward building resilience and flexibility into societies. We have spoken in favor of analytic and decisionmaking approaches that focus on integrating climate change concerns into existing sectoral and local priorities. We have argued that special attention should be paid to understanding vulnerability, especially among the poor and already vulnerable. In so doing we have consistently stressed a participatory approach in which decisions emanate from as low down the political hierarchy as possible. Among these mechanisms, the call for civic science has been recurrent.

But we recognize that making this kind of high-minded advice operational is beset with difficulties. Not least among these is that, in putting this advice into practice, public and private sector decision makers are likely to encounter stakeholders who advocate other approaches or who interpret the approaches advocated here in different ways. Among the first group, one can expect to find the precautionary coalition that currently directs the policy focus on targets and timetables for emissions reductions. It is important to recognize that strong champions of targeted mitigation are not the enemies of our suggested approach, but part of it. They play an essential role in continually drawing the attention of an inattentive society to the issues of climate change. Their somewhat inflexible approach to emissions reduction highlights the importance of weaning the world away from a hydrocarbon economy. Our approach differs from theirs in that we place a counterbalancing weight on the pressing social
welfare issues that, from a climate policy viewpoint, seem to be forever getting in the way of radical action.

We also expect significant differences in interpretation and operational priorities among those who embrace our agenda. For example, we have just discussed important differences of opinion about how to determine and measure or rank vulnerability. We know that people operating with different myths of nature and society as fragile, robust, or resilient within limits are likely to have very different interpretations of both vulnerability and what constitutes resilience in the face of vulnerability. In these situations, to ask which view is right is already to miss the point. The first essential for policy in a complex world is to resist the urge to declare one viewpoint true and to reject others. Resisting this temptation is not mindless relativism that says one idea is just as good as any other. That would be a recipe for passivity and the abdication of choice. If all paths are equally good or bad, why choose at all? Our view could not be further from this. But where there is contestation about either the way the world (natural and social) actually works or about the way the world ought to work, policymakers are likely to find themselves facing competing partial truths. To commit oneself, one's family, firm, community, or nation to just one of these viewpoints is to gamble that it will turn out to be right and the others wrong. It is far more likely that all will be partly right and all will be partly wrong. Recognizing this and stewarding the kind of institutional pluralism necessary to maintain multiple viewpoints and a rich repertoire of policy strategies from which to choose is what promoting societal resilience, sustainable development, and climate change governance is all about.

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