

THE CASE FOR A SUSTAINABLE CLIMATE POLICY: WHY COSTS AND BENEFITS MUST BE TEMPORALLY BALANCED

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How much longer do you think it will take before [the nation's climate researchers] are able to hone [their] conclusions down to some very simple recommendations, on tangible, specific action programs that are rational and sensible and cost effective for us to take . . . [and] justified by what we already know?¹

Clearly, it's time for some radical ideas about solving global warming. But where's radical realism when we need it?²

The question of what actions on climate change make sense in the short term—raised in the quotes above—remains largely unanswered. Until we better organize the climate science and technology enterprise to focus on policy options for the short term, the climate debate is likely to remain in its present gridlock. Policies that address climate change—including both mitigation and adaptation—have both long-term and short-term effects. To date, climate policy has focused primarily on the long term, and so too has the research intended to inform that policy. As a consequence, too little attention is paid to policy options and technological alternatives that might make sense in the short term. One reason for the short term being overlooked is the intellectual gerrymandering of the climate change issue at the international level, which has maintained a narrow focus on greenhouses gases (GHGs) and their effects. Billions of dollars of public investments in climate science and technology might be reoriented to better serve the needs of decision makers grappling with climate change, which will be a policy issue for decades to come, by focusing on policies that make sense in both the short and long terms.

This Article presents a series of seven assertions. First, human-caused climate change is real and requires attention by policy makers

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¹ *U.S. Global Change Research Program: Hearing Before the Subcomm. on the Environment of the H. Comm. on Science, Space, and Technology*, 102d Cong. 88 (1992) (statement of Rep. James H. Scheuer).

² Kathleen Ellison, *Turned Off by Global Warming*, N.Y. TIMES, May 20, 2006, at A13.

to both mitigation and adaptation—but there is no quick fix. The issue will be with us for decades and longer. Second, any conceivable emissions reductions policies, even if successful, cannot have a perceptible impact on the climate for many decades. Third, costs (whatever they may be) are consequently borne in the near term, while climate-related benefits are achieved in the distant future. Fourth, many policies that result in a reduction in emissions also provide benefits in the short term which are unrelated to climate change. Fifth, adaptation policies can similarly provide immediate benefits. Sixth, climate policy, particularly international climate policy under the United Nations Framework Convention on Climate Change (UNFCCC),³ has been structured so as to keep policy related to long-term climate change distinct from policies related to shorter-term issues of energy policy and adaptation. Seventh, research agendas have followed the political organization of international climate change policy and have emphasized the long term, meaning that relatively little attention is paid to developing specific policy options or near-term technologies that might be put into place with both short-term and long-term benefits. The climate debate may have slowly begun to reflect these realities, but the research and development community has not yet focused much attention on research to develop policy and technological options that might be politically viable, cost effective, and practically feasible.

I. NO QUICK FIX FOR CLIMATE CHANGE

This Article begins by underscoring the scientific consensus presented in assessment of climate change science provided by Working Group I of the Intergovernmental Panel on Climate Change (IPCC).⁴ The IPCC has concluded that GHG emissions resulting from human activity are an important driver of changes in climate. On this basis alone, it makes sense to take action to limit GHG emissions. Of course, the answer to the question of what action should be taken is not at all straightforward, and involves a number of considerations (e.g., on what time scale, at what costs, with what consequences, with what foregone opportunities, etc.). One of the important messages of the IPCC is that there is no quick fix to issues of climate change. In its

³ See generally United Nations Framework Convention on Climate Change [UNFCCC], <http://unfccc.int/2860.php> (last visited May 1, 2007).

⁴ See generally Intergovernmental Panel on Climate Change [IPCC], <http://www.ipcc.ch> (last visited May 1, 2007).

third assessment report, the IPCC concluded that “[a]nthropogenic climate change will persist for many centuries.”⁵ More recent research has concluded that, even assuming a hypothetical instantaneous curtailment of emissions, the world will continue to experience some degree of climate change into the future.

Throughout this Article, I use the phrase “climate change” to mean:

a statistically significant variation in either the mean state of the climate or in its variability, persisting for an extended period (typically decades or longer). Climate change may be due to natural internal processes or external forcings, or to persistent anthropogenic changes in the composition of the atmosphere or in land use.⁶

I will further use “climate variability” to mean:

variations in the mean state and other statistics (such as standard deviations, the occurrence of extremes, etc.) of the climate on all temporal and spatial scales beyond that of individual weather events. Variability may be due to natural internal processes within the climate system (*internal variability*), or to variations in natural or anthropogenic external forcing (*external variability*).⁷

Under the IPCC definitions, both climate change and climate variability have human and non-human elements, and the human element goes beyond GHGs to include other sources of human influences on the climate system. Clearly explicating these definitions is important because the FCCC uses a different and much narrower definition of climate change that is focused only on the marginal effects of GHG emissions on the climate system.⁸ The different definitions profoundly affect climate policy and its relationship to research and policy, which I will discuss in Part VI.

II. SUCCESSFUL POLICIES WILL HAVE A DELAYED IMPACT

At a 2005 Senate hearing on climate change science and economics, James Hurrell of the United States National Center for Atmospheric Research made a very important observation about the time scale of the benefits of mitigation policies for altering climate behavior: “it should be recognized that mitigation actions taken now mainly

⁵ INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, WORKING GROUP I, CLIMATE CHANGE 2001: THE SCIENTIFIC BASIS 17 (J.T. Houghton et al. eds., 2001).

⁶ *Id.* at 787.

⁷ *Id.* at 789.

⁸ *See infra* Part VI.

have benefits 50 years and beyond now.”⁹ *Science* magazine further reported in 2005 that “the wheels of global climate change are in motion, and there is little we can do to stop them, at least in the short-term.”¹⁰ That the long lead time until mitigation can have a perceptible effect on climate systems seems to be well appreciated by many scientists and policy analysts, but seems to be less well appreciated in public and political debates over climate policy.

Scientists sometimes tend to skirt around this important point by talking about “scenarios” for future emissions rather than actual policies that lead to particular scenarios. Such scenarios have an important role in shaping thinking and research on the range of possible futures. At the same time, it is quite easy to postulate various alternative scenarios for future emissions that lead to discernible changes in global temperature. It is, of course, similarly easy to discuss various “rosy” scenarios for global poverty, democracy in Iraq, or the future state of the deficit. What matters for real-world outcomes are not scenarios of the future, but the concrete, practical policy actions that lead to outcomes that are distinguishable from outcomes that result from the implementation of alternative policy actions.

From this perspective, despite all of the bluster about the Kyoto Protocol, its implementation is more about symbolism and preparation for future policy action than about any significant effect on the climate system. In 2006, economist William Nordhaus of Yale University wrote that

[t]he Kyoto Protocol is widely seen as somewhere between troubled and terminal. . . . Even if the current Protocol is extended, models indicate that it will have little impact on global temperature change. Unless there is a dramatic breakthrough or a new design, the Protocol threatens to be seen as a monument to institutional overreach.¹¹

According to Oxford’s Steve Rayner, the focus on Kyoto has distracted attention from other possible approaches:

⁹ *Climate Change: Hearings Before the S. Comm. on Energy and Natural Res.*, 109th Cong. 42 (2005) (statement of James W. Hurrell, Director, Climate and Global Dynamics Div., Nat’l Ctr. for Atmospheric Research).

¹⁰ Kathy Wren, No Turning Back From Climate Change, Mar. 18, 2005, <http://www.aaas.org/news/releases/2005/0318scipak.shtml>. See Gerard A. Meehl et al., *How Much More Global Warming and Sea Level Rise?*, 307 *SCIENCE* 1766 (2005); T.M.L. Wigley, *The Climate Change Commitment*, 307 *SCIENCE* 1766 (2005).

¹¹ William D. Nordhaus, *After Kyoto: Alternative Mechanisms to Control Global Warming 1* (Int’l Relations Ctr., Foreign Policy in Focus Discussion Paper, 2006), available at <http://www.fpiif.org/pdf/papers/0603afterkyoto.pdf>.

Unfortunately, support for Kyoto has become a litmus test for determining those who take the threat of climate change seriously. Between Kyoto's supporters and those who scoff at the dangers of leaving greenhouse gas emissions unchecked, there has been a tiny minority of commentators and analysts convinced of the urgency of the problem while remaining profoundly sceptical of the proposed solution. But their voices have largely gone unheard.¹²

Nordhaus would seem to agree on this point: "Nations are now beginning to consider the structure of climate-change policies for the period after 2008-2012. Some countries, states, cities, companies, and even universities are adopting their own climate-change policies."¹³ Nordhaus then asks: "Are there in fact alternatives to the scheme of tradable emissions permit [sic] embodied in the Protocol? The fact is that alternative approaches have not had a serious hearing among natural scientists or among policymakers."¹⁴

Experience with the actual practice of emissions reductions indicates that even those countries expressing strong support for reductions face difficulties achieving them in practice. Tim Dyson from the London School of Economics has offered a sobering view of such climate realism:

[I]n the last decade or so virtually all countries have continued to burn greater amounts of fossil fuel. This also applies to those that have arguably been most prominent in supporting the Kyoto process—notably Canada, Japan and those of the [EU]. Many of these countries are unlikely to meet their CO₂ reduction targets agreed under the Kyoto treaty (which finally came into force in 2005). Thus comparing 1990 and 2002, it is estimated that Canada's emissions increased by 22% and Japan's by 13. While the CO₂ emissions of the 15 countries that comprised the EU before 2004 (i.e. the EU15) remained roughly constant, this was mainly due to reductions in Germany and Britain—both of which gained fortuitously from a move away from coal towards natural gas (which emits less CO₂ per unit of energy). Of the remaining countries in the EU(15), only Sweden—which relies heavily on hydro and nuclear—registered a fall in CO₂ emissions Of the 36 "Annex B" countries of the Kyoto treaty (i.e. the industrialized countries, including former eastern bloc nations), only 12 experienced declines in emissions: the three in the EU(15), plus nine former eastern bloc nations. If one excludes these, then CO₂ emissions among the remaining 24 Annex B countries rose by 13% during 1990-2002. Of course, the United States,

¹² Memorandum from Steve Rayner, Dir., James Martin Inst., Univ. of Oxford, to the Envtl. Audit Comm. of the House of Commons (Nov. 24, 2007), *available at* <http://sciencepolicy.colorado.edu/prometheus/archives/EAC%20memo%20fin.doc>.

¹³ Nordhaus, *supra* note 11, at 1.

¹⁴ *Id.*

the world's largest emitter of CO₂, is not a signatory to the Kyoto treaty. And, to complete the list of [predictable social reactions], the "Kyoto process" . . . [has] involved no shortage of recrimination between representatives of the US, the EU, and other countries.¹⁵

The bottom line is that, with respect to modulating the behavior of the climate system, current GHG mitigation policies (whether proposed or implemented) are more symbolic than substantive. A focus on such policies has been recognized by a number of observers as limiting the scope of discussions about alternative policies that might result in greater substantive outcomes. The limited discussion of alternatives has been restricted by advocates for action with assertions that, despite their flaws, current approaches are merely first steps and that a discussion of options might diminish political momentum for action. Of course, opponents to action do not wish to discuss policy options in the first place. As discussed in Part VI, action on adaptation has been a victim of the institutionalization of climate policy, which demonstrates a strong bias in favor of mitigation over adaptation. But even with a pace of emissions reductions that seems practically, if not politically, inconceivable today, such reductions would have little or no perceptible effect on the climate system for decades.

As a result, more than ever, discussions of new and creative policy options on climate change that make sense in the short term are needed in political debate over climate change.

III. NEAR-TERM COSTS AND DISTANT-FUTURE BENEFITS

The reality of the time lag between costs and benefits illustrates the disingenuousness of using current climate events to justify mitigation action. Even if society takes immediate and drastic action on emissions, there can be no scientifically valid argument that such actions will lead to a perceptibly better climate in our lifetime. For the coming decades, the most effective policy responses to climate-related impacts (such as hurricanes and other disasters or diseases like malaria) will necessarily be adaptive.

¹⁵ Tim Dyson, *On Development, Demography and Climate Change: The End of the World as We Know It?*, 27 POPULATION & ENV'T 117, 132-33 (2005) (citations omitted); cf. Pekka E. Kauppi, *The United Nations Climate Convention: Unattainable or Irrelevant*, 270 SCIENCE 1454, 1454 (1995) (stating presciently that the goal of the UNFCCC to "prevent dangerous . . . interference with the climate system" was either "unattainable or irrelevant" and that if climate model "projections are right, the climate will change, there will be dangerous effects, and the Convention objective will be unattainable").

The point of this analysis is not to suggest that we throw up our hands and do nothing to mitigate the effects of climate change. But the asymmetry in costs and benefits suggests that if meaningful action is to occur in mitigation, we must think about different strategies and, in particular, policy options that have greater symmetry between the timing of costs and benefits.

I fully intend that this perspective be viewed as an alternative to the two-sided debate that has been caricatured as climate skeptics against climate alarmists. Perhaps those holding this third position might be characterized as climate realists.

IV. EMISSIONS-REDUCING POLICIES ALSO PROVIDE SHORT-TERM BENEFITS UNRELATED TO CLIMATE CHANGE

Observers of climate policy have long recognized that mitigation actions can provide benefits that extend beyond their effects on the long-term behavior of the climate system. In 2001, the IPCC Working Group III on Mitigation argued:

The effectiveness of climate change mitigation can be enhanced when climate policies are integrated with the non-climate objectives of national and sectorial policy development and be turned into broad transition strategies to achieve the long-term social and technological changes required by both sustainable development and climate change mitigation. Just as climate policies can yield ancillary benefits that improve wellbeing, non-climate policies may produce climate benefits. It may be possible to significantly reduce greenhouse gas emissions by pursuing climate objectives through general socio-economic policies.¹⁶

Empirical research on communities in the United States that are taking action to mitigate GHG emissions supports this conclusion. Consider the following extended excerpt from a study of local initiatives on climate change:

The experience of CCP [Cities for Climate Protection (CCP) campaign sponsored by the International Council for Local Environmental Initiatives] communities indicates that global climate change is most likely to be reframed as a local issue when city officials recognise that actions to control GHG emissions also address other local concerns already on their agendas. Localisation requires the prior existence of a local hook on which to hang the issue of global climate change.

Localising global climate change is an important first step in develop-

¹⁶ IPCC, WORKING GROUP III, CLIMATE CHANGE 2001: MITIGATION 12 (Bert Metz et al. eds., 2001) (emphasis omitted).

ing a municipal response to global warming; it helps generate political support for reducing local GHG emissions. However, not all communities are able to move from reframing to policy action. There are several institutional barriers that make it difficult for cities to develop and implement policies and programmes for mitigating climate change: the issue does not fit the way most city governments organise themselves; many city governments lack the administrative capacity to monitor their GHG emissions; and there are often budgetary constraints that make it difficult to invest in emissions reduction activities.

Ultimately, motivating local action to mitigate global climate change calls for an indirect strategy, focused on the ways in which emissions-producing activities are embedded in broader community concerns. The primary benefit of an indirect approach is that it avoids many of the political debates about climate change science that have plagued international efforts to address this issue. Several officials noted that it really does not matter whether global climate change science is credible. Since the emphasis is on how reducing GHG emissions can help the city address other (more pressing) problems, questions of the scientific basis for climate change rarely come up. When and if they do, city officials can easily reply that these are actions they should take anyway.¹⁷

When it comes to effective substantive action on mitigation, research and experience show quite clearly that progress is far more likely when such actions align a short-term aim with long-term concerns. In practice, this typically means focusing action on the short term, with the long-term goals taking on secondary importance. Examples of such short-term issues related to mitigation include the costs of energy, the benefits of reducing reliance on fossil fuels from the Middle East, the innovation and job-creating possibilities of alternative energy technologies, particulate air pollution, transportation efficiencies, and so on. This approach to climate change is contrary to the dominant approach, in which costs and benefits are temporally mismatched.¹⁸

V. THE EFFECTIVENESS OF ADAPTIVE POLICIES

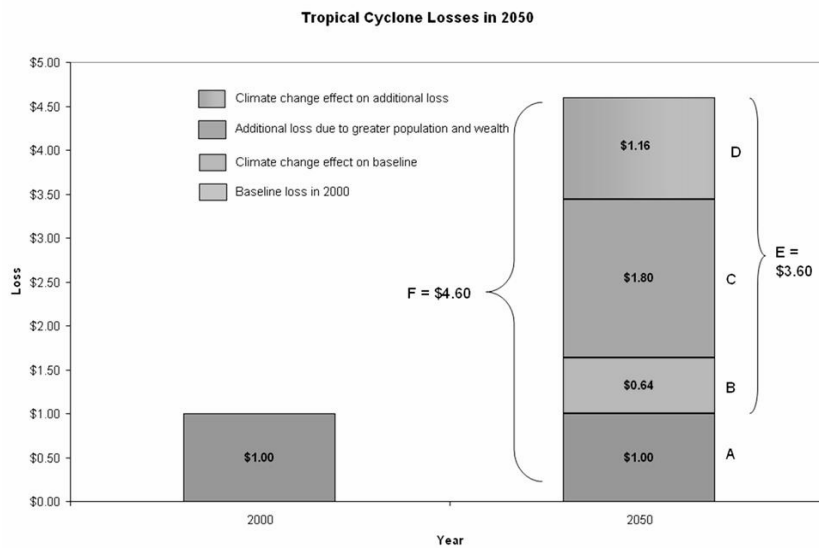
In the coming decades, the only policies that can effectively be used to manage the immediate effects of climate variability and change will be adaptive. This conclusion inescapably results from the fact that any realistic GHG mitigation policies will have no perceptible

¹⁷ Michele M. Betsill, *Mitigating Climate Change in US Cities: Opportunities and Obstacles*, 6 LOCAL ENV'T 393, 404 (2001) (citations omitted), available at <http://www.colostate.edu/Depts/PoliSci/fac/mb/Local%20Environment.pdf>.

¹⁸ See *infra* Part VI.

impact on climate behavior for decades and longer.¹⁹ This conclusion is illustrated in the following Figure, which comes from research on the relative contributions of societal changes (e.g., population growth and development) and resultant climate changes on future tropical cyclone damage around the world.²⁰

The Figure below illustrates how one dollar in global tropical cyclone damage today will increase by 2050 under one set of assumptions about changing hurricane intensity, societal development, and the relationship between intensity changes and damage.²¹



Segment F indicates that for each \$1.00 of impact today (segment A) there will be an increase in damages of \$0.64 due to the increased

¹⁹ See *supra* Part II.

²⁰ Note that the more general term for a hurricane is a "tropical cyclone." See Atlantic Oceanographic and Meteorological Laboratory, FAQ: Hurricanes, Typhoons, and Tropical Cyclones, <http://www.aoml.noaa.gov/hrd/tcfaq/A1.html> (last visited May 1, 2007).

²¹ The Figure assumes that by 2050 all hurricanes will increase in intensity by 18%, that population and wealth will increase by a combined 2.5% per year, and that hurricane damage increases are proportional to the cube of the increase in wind speed. The full analysis can be found in Roger A. Pielke, Jr., *Future Economic Damage from Tropical Cyclones: Sensitivities to Societal and Climate Changes*, PHIL. TRANSACTIONS ROYAL SOC'Y A. (forthcoming 2007), available at http://sciencepolicy.colorado.edu/admin/publication_files/resource-2517-2007.14.pdf.

intensity (segment B), \$1.80 due to more exposed people and wealth in coastal locations (segment C), and \$1.16 due to the effects of the increased intensity on the additional people and exposed property (segment D) in the year 2050. Adding these increments together ($\$1.00 + \$0.64 + \$1.80 + \1.16) results in total damages in 2050 of \$4.60 for every \$1.00 today.

Several additional assumptions are required to evaluate the relative potential for mitigation and adaptation to reduce this damage. If we assume that GHG reductions have an instantaneous (i.e., contemporary with the reductions) and a proportional (e.g., a 50% decrease in emissions results in a 50% decrease in the increase in intensity) effect on tropical cyclone intensity,²² then under these assumptions, the *maximum potential effectiveness* of a 10% reduction in GHG emissions through 2050 for reducing future global tropical cyclone damage is \$0.18 (that is, 10% of \$1.80) and the maximum potential effectiveness of adaptation is about twenty-six times greater, or \$4.60.²³ These conclusions are qualitatively insensitive to the magnitude of the projected increase in tropical cyclone intensity or population scenarios.

To emphasize: this is not an argument against mitigation. Instead, this simple analysis under the most favorable assumptions for mitigation indicates that any realistically achievable mitigation policies can have at best only an imperceptible effect on global tropical cyclone damage in the short term (decades into the future). The same conclusion holds for other extreme events, and, I would hypothesize, for the vast majority of society-climate interactions. In fact, I am not aware of a single study that suggests that there will be significant short-term benefits of climate mitigation for climate impacts.

This reality explains why adaptation necessarily must be at the center of climate policy. It also helps to explain why mitigation policies in the short term necessarily must be justified by their nonclimate benefits.

²² Of course, the real climate system does not work this way and the effects of mitigation on tropical cyclone behavior remains poorly understood, but the effects are certainly less direct than in the oversimplification offered here.

²³ The maximum potential effectiveness of adaptation is equal to the total costs. If atmospheric concentrations of greenhouse gases could instantly be held constant such that there would be no effect of human-caused climate change on hurricanes, then the maximum effectiveness of mitigation in this case would be \$1.80. In reality, this number is substantially smaller, given the general global commitment to climate change and the time lag of emissions-reduction effects on the climate system. Of course, the desirability of particular courses of action will also depend upon a comparison of costs and benefits.

VI. ARBITRARY DISTINCTIONS IN CLIMATE POLICY

The climate issue suffers from a bizarre sort of intellectual gerrymandering that has little basis in science or policy. The UNFCCC, which focuses on international policy, and the IPCC, which focuses on scientific assessments, use different definitions of climate change. Understanding the effects of the two definitions on the politics of the climate issue helps one to understand better the current international stalemate on climate policy—a stalemate that matters because climate change is real and actions are needed to improve energy policies and to reduce the vulnerability of people and ecosystems to climate effects.

Part I of this Article explained that Working Group I of the IPCC has a very broad definition of climate change that includes changes occurring for any reason.²⁴ By contrast, the FCCC focuses narrowly on GHG emissions and their consequences. Taken literally, the focus of the FCCC would necessarily limit attention to the long-term consequences of climate change and the extent to which GHG emissions drive those consequences. This focus creates a bias against adaptation, because it creates a cost-benefit calculus in which adaptation has only costs and no benefits.²⁵ The FCCC definition also encourages the waging of political battles through science, as evidence for the detection and attribution of climate change (and whether it will exceed a threshold of “dangerous interference” in the climate system under FCCC Article 2) is necessary as a prerequisite for action under the FCCC.

Numerous participants and analysts have sought to overcome this fundamental flaw in the structure of the FCCC by emphasizing the relationships between climate policy and sustainable development.²⁶ Some involved in the IPCC have also recognized the importance of integrating issues of climate change and sustainable development, and a chapter on the subject is to be included in the next assessment re-

²⁴ By contrast, Working Groups II and III often utilize the FCCC definition of climate change. For further discussion, see Roger A. Pielke, Jr., *Misdefining “Climate Change”: Consequences for Science and Action*, 8 ENVTL. SCI. & POL’Y 548, 555-56 (2005).

²⁵ The logic behind costs without benefits is that without the marginal influence of GHG-induced effects on the climate system, such adaptation would be, by definition, unnecessary.

²⁶ See, e.g., Richard J.T. Klein et al., *Integrating Mitigation and Adaptation into Climate and Development Policy: Three Research Questions*, 8 ENVTL. SCI. & POL’Y 579, 588 (2005).

port in 2007.²⁷ Nonetheless, I remain skeptical that such efforts will do much to alter the generally narrow intellectual approach to the FCCC, which is reflected throughout the IPCC.²⁸

The narrow focus of the FCCC helps to explain why we see so many supposedly scientific debates related to the detection of climate changes and attribution of those changes to anthropogenic GHGs, such as the ongoing battle over the infamous “hockey stick” graph.²⁹ Given the emphasis placed upon detection and attribution, it is not too much of an exaggeration to observe that many proponents of action on emissions reductions want to characterize every climate event or trend as the result of human-caused climate change, whereas opponents of action on emissions reductions want to cast as much doubt as possible on such claims. We have seen a perfect example of this dynamic in public debates over hurricanes and climate change over the past few years as the science of hurricanes became almost instantaneously caught up in the politics of the global warming debate.

The effect of the intense politicization of climate change has been to preclude most reasoned discussion of innovative or new policy options on climate change. Most of the focus instead is on empty exhortations of support for “action” or claims of “too much uncertainty.” Such expressions may be emotionally satisfying, but do little to move the political debate forward in any meaningful way. With strong public support for action on climate change, the lack of meaningful alternatives continuously set forth in public debate sets the stage for what Tim Dyson has called a recipe for only marginal action:

[T]he prospects for an enforceable international agreement that will bring about a sustained and significant reduction in annual global CO₂ emissions are very poor. While it may be in the interest of the world as a whole to restrict the burning of fossil fuels, it is in the interest of individual countries to avoid making such changes Moreover, the enormous complexities involved . . . will also hinder agreement. Doubtless there will be gains in energy use efficiency, shifts towards less carbon in-

²⁷ REPORT OF THE JOINT IPCC WORKING GROUP II & III EXPERT MEETING ON THE INTEGRATION OF ADAPTATION, MITIGATION AND SUSTAINABLE DEVELOPMENT INTO THE 4TH IPCC ASSESSMENT REPORT (2005), *available at* <http://www.ipcc.ch/am-sd.pdf>.

²⁸ As a practical matter, discourse on climate policy reinforces the intellectual gerymandering through new concepts, such as “mainstreaming,” which preserve rather than move beyond the status quo. *See* Roger A. Pielke, Jr. et al., *Climate Change 2007: Lifting the Taboo on Adaptation*, 445 NATURE 597 (2007).

²⁹ For differing opinions on this issue, see Real Climate, <http://www.realclimate.org> (last visited May 1, 2007), and Climate Audit, <http://climateaudit.org> (last visited May 1, 2007).

tensive fuels, and greater use of renewable energy sources (e.g. solar, biomass, wind and tidal power). But except for a massive shift towards nuclear . . . there are limits to what such changes could possibly achieve in terms of CO₂ reduction. Other technological ideas—like the extraction of CO₂ from coal and its sequestration underground . . . or, still more, the development of the so-called “hydrogen economy”—are remote, ideas as large scale and significant solutions to the problem Indeed, such notions can themselves be regarded as providing some basis of avoidance inasmuch as they suggest that something is being done. Understandably, poor countries are unlikely to put great effort into constraining their CO₂ emissions—especially in the face of massive discrepancies between themselves and the rich.

In sum, . . . for the foreseeable future the basic response to global warming will be one of avoidance and, at most, marginal change.³⁰

A 2006 *National Journal* poll on the perspectives of members of Congress on climate science and policy supports focusing on short-term policy issues to reduce GHG emissions.³¹ The poll asked, “Do you think it’s been proven beyond a reasonable doubt that the Earth is warming because of man-made pollution?” Interestingly, 98% of Democrats replied “Yes,” while only 23% of Republicans replied “Yes.”³² But it should not be overlooked that, even with the party divisions, a clear majority of members of the Republican-led 109th Congress believed that global warming is real and is caused by humans. If the poll numbers accurately reflected Congressional perspectives in the 109th Congress, then 55 members of the Senate and 251 members of the House believed that “it’s been proven beyond a reasonable doubt that the Earth is warming because of man-made pollution.”³³ With the political change in the leadership of the 110th Congress, there seems to be evidence that there is exceedingly little value left in continuing to argue the science of this particular question. Clearly, there are other factors at play here beyond “skepticism” that shape how decision makers act on climate change. Efforts to educate Con-

³⁰ Dyson, *supra* note 15, at 133-34.

³¹ *Inside Washington: Congressional Insiders Poll*, NAT’L J., Apr. 1, 2006, at 5-6.

³² *Id.* at 5. Interestingly, as has been found in many areas, the views of members of Congress are more ideologically determined by their party membership than those of the general population. In opinion polls of the public asking a similar question, neither Democrats nor Republicans show such unanimity of opinion. Gallup Org., *Americans Still Not Highly Concerned About Global Warming*, GALLUP POLL, Apr. 7, 2006, available at <http://poll.gallup.com/content/?ci=22291>. This may be a consequence of the effects of the gerrymandering of Congressional districts, which has often been criticized as generating a legislature that is more ideological than its constituents.

³³ *Inside Washington*, *supra* note 31, at 5.

gress on the reality of climate change are, in my view, completely wasted on a majority of the convinced.

The 2006 *National Journal* poll asks a second question: “Which of these actions to reduce pollution could you possibly support?” The answers included five options—mandatory limits on carbon dioxide emissions, increased spending on alternative fuels, greater reliance on nuclear energy, higher fuel-efficiency standards for automobiles, and a higher gasoline tax.³⁴ For each of these issues, except a gasoline tax (which is not favored by members of either party), there is far more agreement in support of action than there is on the question of science.³⁵ And, in each case, there is evidence of enough support to suggest that bipartisan agreement might be reached on particular policy options. The devil is, of course, in the details, but this poll shows that debate on climate policy might advance more quickly if framed in terms of policy options, and not science. There is ample evidence that there is room for compromise across partisan boundaries, without turning Republicans into Democrats or vice versa.

The nation awaits politically creative policy options that can navigate the complicated set of interests of 535 members of Congress. All of the precursors for such action are in place, except for the politically creative options. Efforts to debate the science are simply misplaced in such a context. Die-hard partisans will no doubt come up with a range of excuses as to why they cannot compromise, and will gravitate back to the science as a comfortable home for maintaining the present debate. Such partisans typically point the finger of blame at their political opponents, though they should be looking in the mirror.

VII. OVEREMPHASIS BY THE RESEARCH COMMUNITY ON THE LONG TERM AND THE NEED TO FOCUS ON PRACTICAL POLICIES

In 1994, I argued that the U.S. Global Change Research Program (USGCRP) was “likely [to] produce ‘good science,’” but would be unlikely to deliver “usable information” to policy makers, as had been called for in the legislation that created the program.³⁶ I wrote that instead of having a long-term focus on large-scale climate change, the USGCRP could “distill[] the practical significance of scientific information, and at the same time develop a wide range of action alterna-

³⁴ *Id.* at 6.

³⁵ *Id.*

³⁶ Roger A. Pielke, Jr., *Scientific Information and Global Change Policymaking*, 28 CLIMATIC CHANGE 315, 315 (1994).

tives to address the range of problems.”³⁷ The USGCRP and its successor, the Climate Change Science Program, have never placed the needs of decision makers at the center of their mission, focusing instead on advancing scientific understanding. Part of the explanation for this situation lies in the fact that the scientific community has benefited immensely from the current approach, and an emphasis on short-term policy and technological options would necessarily imply a different approach to climate science and technology policy priorities.³⁸

I am convinced that as people begin to see the limited performance of existing approaches to emissions reductions, and as the toll of climate-related disasters grows due to ever-increasing vulnerabilities, there will be a shift to a more short-term-focused approach to climate mitigation and adaptation. However, given the institutional and political momentum that currently characterizes the climate issue, there is a substantial risk that the issue will continue to be dominated by sound and fury with most action being symbolic or simply ineffectual. The question is whether we can organize our intellectual infrastructure to invent and bring forward policy and technological options that will satisfy both the short-term and long-term facets of this incredibly complex issue. Through oversight of the Climate Change Science Program and Climate Change Technology Program, Congress might motivate the evolution of these programs to focus more explicitly on the needs of decision makers. Until this is done, we should expect climate policy to simply muddle along.

³⁷ *Id.* at 317. For an early evaluation of USGCRP, see Roger A. Pielke, Jr., *Usable Information for Policy: An Appraisal of the U.S. Global Change Research Program*, 28 POLY SCI. 39 (1995).

³⁸ See Roger A. Pielke, Jr. & Daniel Sarewitz, *Wanted: Scientific Leadership on Climate*, ISSUES IN SCI. & TECH., Winter 2003, at 27-28 (“The situation persists not only because the current research-based approach supports those happy with the present political gridlock, but more uncomfortably, because the primary beneficiaries of this situation include scientists themselves.”).