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Wanted: Scientific Leadership on Climate

What happens when the scientific community's responsibility to society conflicts with its professional self interest? In the case of research related to climate change the answer is clear: Self interest trumps responsibility. In 1989, Senator Al Gore provided this justification for the U.S. Global Change Research Program (USGCRP): "More research and better research and better targeted research is absolutely essential if we are to eliminate the remaining areas of uncertainty and build the broader and stronger political consensus." Over the next 13 years, the nation spent more than \$20 billion on research under the USGCRP, with the promise that new fundamental knowledge about the climate system was a crucial prerequisite for effective policymaking. During this time, the politics of climate change have become more intractable, and the

Effective action on climate change depends on the willingness of the climate science community to support new research priorities.

path toward scientific certainty much more challenging.

Given this track record, two questions have become unavoidable: First, has research focused on "reducing uncertainty" provided information needed by decisionmakers? Second, is it possible that such research has actually impeded effective policymaking?

Now is precisely the time to confront these uncomfortable questions. Having declined to participate in the Kyoto Protocol, the Bush administration has refocused attention on climate change re-

search with the recent release of the draft strategic plan for its Climate Change Science Program (CCSP), the new umbrella structure for the USGCRP and the year-old Climate Change Science Initiative. The strategic plan will be finalized in April 2003, after an exhaustive process of public and expert input, including a three-day workshop last December, attended by more than 1,000 people (mostly government and academic scientists), and a formal review by the National Research Council (NRC). As in the USGCRP in 1989, the focus of the draft plan is on reducing uncertainty as the basis for action on climate change.

Our position, based on the experience of the past 13 years, is that although the current and proposed climate research agenda has little potential to meet the information needs of decisionmakers, it has a significant potential to reinforce a political situation characterized, above all, by continued lack of action. 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 ben-

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eficiaries of this situation include scientists themselves. Things are unlikely to change for the better unless the climate research community adopts a leadership role that places societal responsibility above professional self-interest.

No one should deny that the decade-plus public investment in climate science has delivered continual progress in deepening our understanding of the earth and its climate, including major advances in areas such as abrupt climate change, coupled ocean-land-atmosphere dynamics, and year-to-year variability. This research agenda has directly reflected the priorities of the science community, especially as reflected by the recommendations of NRC committees. Fully half of the climate research budget has been devoted to space-based observation hardware, which on the one hand creates its own constituency in the space community, and on the other generates a data stream that reinforces the existing research agenda. In contrast, the needs and capabilities of decisionmakers who must deal with climate change have played little part in guiding research priorities.

The new CCSP Strategic Plan does take a small step in recognizing decisionmakers' needs by focusing some attention on "decision support resources," but it has no mechanism for reconciling decisionmaker needs with research priorities, assuming instead that the research proposed is that which decisionmakers must need. Given the experience of the past 13 years, it would seem appropriate for the plan to examine not only the claim that uncertainty can in fact be reduced, but also the belief that such

a reduction is necessary for effective policy. Instead, the plan labors under the false assumption that policymakers require reduced uncertainty in order to take action.

This assumption arises from political expediency, not good science policy. In the late 1980s, policymakers figured out that the way to survive the intense political battle over climate change was to accept the idea that science could resolve policy uncertainties about the future and thus obviate the need for action in the present. This explains why in 1990 President George H. W. Bush joined a Democratic Congress in support of the legislation forming the USGCRP. For politicians, research itself served as action.

At the time, proponents and opponents of hydrocarbon emission reductions joined together in support of the research program, as each wagered that more research would strengthen their respective positions. Surprise: They were both right! The tens of billions of dollars in research devoted to date to the USGCRP have provided considerable grist for advocates who support action, but also have produced enough scientific surprises and complexities to sustain the opposition as well.

So, after nearly a decade and a half, the context for the president's new CCSP is changed only in its details. In the Kyoto Protocol, proponents and opponents of action now have a specific vehicle to champion or oppose, but the calculus remains the same. Science continues to flourish because of the intense politics of climate change. The scientific community continues to promise politicians

that they will provide the basis for climate change decisionmaking by reducing uncertainties and generating plausible projections about the future climate. Politicians gladly pass off the responsibility to the scientists, and advocates of all stripes accept science as the turf on which the political battle over climate policy should be waged. Not surprisingly, the CCSP and its promoters in the Bush administration continue to chant the familiar mantra, emphasizing the need to reduce uncertainties and improve projections as the basis for improved decisionmaking.

How decisions are really made

Somehow missed in this political logrolling have been two facts. First, even full implementation of the Kyoto Protocol, which is probably politically, if not technically, impossible, will have no discernible effect on the impact of climate on society and the environment. Second, better decisions about people and ecosystems in the context of climate depend very little—if at all—on reduced uncertainty or plausible projections about climate change. In the face of fundamental uncertainties, decisions are made routinely on equally complex and far-reaching issues, such as economic policy, foreign policy, and national security. In such arenas, policymakers accept lack of certainty as a condition of life, and although they may call upon scientific research and technological innovation, it is not to reduce uncertainties to some theoretical point that would resolve political dispute. On the contrary, our own research on the role of prediction in deci-

sionmaking in a wide range of science issues suggests that policy-makers need research to increase the range of plausible choices available to them in the present. As a member of Congress asked more than a decade ago: "How much longer do you think it will take before [the USGCRP is] able to hone [its] conclusions down to some very simple recommendations, on tangible, specific action programs that are rational and sensible and cost effective for us to take . . . justified by what we already know?" The organization of the current CCSP offers the following answer: Forever.

Given the legitimating political role conferred on science and scientists in the climate change arena, the scientific community is in a position to motivate change. If scientists are serious about wanting to do research that supports decisionmaker needs, then they could insist on a systematic and rigorous assessment of such needs as primary input to setting research priorities and then modify priorities accordingly. And for scientists who believe that the current state of knowledge is already sufficient to justify particular policy actions, a provocative strategy would be to follow the example of those in the Cold War physics community who believed the nation did not need additional weapons of mass destruction and therefore opposed the funding of research intended to support weapons' development. Today's scientists could oppose research whose funding is predicated on the claim that action depends on further reduction of uncertainties. The effect in both cases would be to remove science as a cause of

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gridlock and to make viable new lines of research that would better support the needs of society.

Such a quixotic response is of course unlikely, not simply because it would require scientists to argue against their own professional self-interest, but also because it would reveal the amazing incoherence of our current approach to connecting climate policy and science. Put simply: The types of knowledge we have been emphasizing for the past decade or so, despite their significant scientific value, are not those we will most need in dealing with the challenge of climate change. It's as if the National Institutes of Health focused its research on making better projections of when people will die, rather than seeking practical ways to increase health and life expectancy.

A new focus

Some readers of this commentary may protest that the science of climate change is quite good enough to justify action, and we agree. But the question is: What action? The answer to this question, and a starting point for a CCSP more directly

relevant to the needs of decision-makers, comes from those who deal with climate-related effects on a daily basis. For example, the recent declaration resulting from the Delhi meeting under the Framework Convention on Climate Change concluded that "actions are required to diversify energy supply by developing advanced, cleaner, more efficient, affordable and cost-effective energy technologies" and also that "adaptation requires urgent attention and action on the part of all countries." Conspicuous by omission was any mention of action predicated on reduced uncertainty or better projections.

The actions called for in the Delhi meeting reflect the simple reality that climate change must be confronted along two parallel paths. First, over the long term, reducing the anthropogenic contribution to climate change will require decarbonization of our energy system. At the same time, no matter how energy policies evolve, we have every reason to expect that humanity's ability to control the behavior of climate will remain quite limited. So, second, society will have to reduce its growing vulnerability by improving its capacity to prepare for and respond to climate events and their effects. Motivating politicians and policymakers to improve energy policies and reduce vulnerability to climate effects may be challenging, but it does not require a reduction in uncertainty about the future climate. However, it does require a realignment of research priorities.

Public and private investment in energy R&D has declined by al-

most two-thirds in real dollars since the late 1970s. In a recent article in *Science*, Martin Hoffert and colleagues conclude that significant reduction of carbon emissions, even if politically accepted, faces significant technological hurdles that cannot be overcome without considerably more attention to advanced energy research. The logic of the current approach is based on the assumption that a reduction in uncertainty about the future will create the political will necessary to implement a global regime of emissions reductions and limitations, which in turn will force greater attention to advanced energy research. The experience of the past decade or more suggests quite the opposite. We believe that progress on developing cost-effective carbon-free energy sources will be more quickly stimulated through direct investments in energy research and technology justified for their own sake. If nothing else, the focus on climate uncertainty has distracted us from the fact that there are plenty of reasons to improve energy policy, not least of which are the national security benefits gained from energy independence, the environmental and health benefits of cleaner fuels, and the long-term economic efficiencies that can be delivered by renewable energy sources.

At the same time, a large body of research on natural hazards, adaptive ecosystem management, and decisionmaking in the context of climate variability tells us that understanding and reducing vulnerability is the locus of knowledge with the most value for decisionmakers seeking to increase societal and environmental re-

silience to future changes in climate. Ironically, up until a year or so ago, the strategic planning process for the nation's climate change research program showed signs of moving in this direction. Early drafts of a USGCRP strategic plan focused on the need to support research to characterize societal and environmental vulnerability to climate effects and to develop options for enhancing resilience. A true commitment to such a plan would have demanded a significant realignment of science priorities. But these themes have all but disappeared from the draft CCSP plan that is now under consideration, and research related to vulnerability remains at best a minor focus.

The return to a focus on science to reduce uncertainty cannot be attributed entirely to the change in administrations, though no doubt this has played a part. Politicians are able to substitute research for other action because a large portion of the climate science community, particularly those focused on global and regional climate modeling and the earth and space-based platforms to provide data for such models, continue to claim that more of their research will indeed lead to the reduced uncertainties allegedly necessary for policymaking. If scientists blew the whistle on this claim, its political viability would vanish.

We support a robust, well-funded basic research effort on the global earth system to provide a long-term base of understanding. But there should be no pretending that such research will be directly policy relevant, except in the obstructionist sense demonstrated during the past decade. To move

beyond the gridlock that continues to characterize climate policy will require leadership, ultimately of policymakers, but first from scientists who, having benefited from the current approach, are willing to publicly confront its obvious political and social failures.

One way to exercise this leadership and make the CCSP more useful to decisionmakers would be to involve policymakers, in whose name the program is justified, in structuring, implementing, and evaluating the program's research. Practically, this would mean sharing control over resource-allocation decisions with the mission agencies, such as the Federal Emergency Management Agency and the Departments of Agriculture, Interior, Energy, Transportation, and Health and Human Services, whose day-to-day business actually involves decisions related to climate. Another way would be to conduct serious research on the information needs of relevant decisionmakers at the local and regional level—farmers, emergency managers, city and regional planners, natural resource and energy supply managers, to name a few—as a basis for determining areas of research that are most likely to provide support for effective actions. We recognize that these approaches would represent a fundamental shift in the science and policy of climate and would likely result in a significant change in scientific and budgetary priorities for climate research. But if the public, rather than the scientific community, is to be the primary beneficiary of the nation's commitment to climate research, then this is the direction in which we must move.