

ISSUE BRIEF

Adapting to Climate Change: The Public Policy Response

Reforming Institutions and Managing Extremes

WORKSHOP PROCEEDINGS

Daniel F. Morris, Molly Macauley, Raymond J. Kopp,
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Resources for the Future

Resources for the Future is an independent, nonpartisan think tank that, through its social science research, enables policymakers and stakeholders to make better, more informed decisions about energy, environmental, natural resource, and public health issues. Headquartered in Washington, DC, its research scope comprises programs in nations around the world.



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As defined by the Intergovernmental Panel on Climate Change, adaptation includes a set of actions to moderate harm or exploit beneficial opportunities in response to climate change. To date, little research has addressed public policy options to frame the nation's approach to adapt to a changing climate. In light of scientific evidence of extreme and unpredictable climate change, prudent policy requires consideration of what to do if markets and people fail to anticipate these changes, or are constrained in their ability to react. This issue brief summarizes the discussion and proceedings of a June 2010 workshop, hosted by Resources for the Future (RFF), for federal officials to highlight the findings of the second phase of a two-year research project on potential U.S. federal policy actions to respond to domestic climate change impacts. The event agenda and participants are included as an appendix to this brief. The workshop, Adapting to Climate Change: The Public Policy Response, is part of RFF's Domestic Adaptation Project, an initiative of RFF's Center for Climate and Electricity Policy. The project seeks to broaden understanding of the national implications of a changing climate. This research was supported by a grant from the Smith-Richardson Foundation.

The goal of Resources for the Future's Domestic Adaptation Project is to help federal policymakers better understand the challenges the country faces in adapting to climate change

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and to provide an outside perspective that will help them determine adaptation priorities and ways to move forward with effective policy. The project seeks to broaden understanding of the national implications of a changing climate. Adaptation has not yet attracted in-depth research and thoughtful consideration to the same degree that mitigation activities (including reducing greenhouse gas emissions) have from academics and government researchers. The lack of policy research and discussion may indicate a presumption that climate change is gradual rather than abrupt, that variability of day-to-day or seasonal effects is predictable, and that households and businesses may be able to adapt readily. Sound policy, however, requires consideration of what to do if markets and people fail to anticipate these changes or are constrained in their ability to react.

This project offers specific recommendations for federal actions to address the challenges of climate impacts. The project has proceeded in two phases. Phase I consisted of in-depth reports on the impacts of climate change in the United States and focused on six sectors that the Intergovernmental Panel on Climate Change has established as particularly salient—public infrastructure, agriculture, coastal and marine resources, public health, freshwater resources, and terrestrial resources. From these reports, RFF researchers identified three major findings:

1. With some exceptions, many climate impacts are not new, but are challenges society has previously faced, often at a small scale.
2. Public and private institutions have had mixed success in addressing existing challenges.
3. While uncertainty still exists, future climate impacts will be more intense and more frequent than current impacts.

These findings framed the design of research in Phase II and led to a set of specific policy recommendations for discussion at the June workshop. The recommendations span several themes:

- Reforming Institutions: Getting Incentives Right
- Reforming Institutions: Improving Regulation and Management
- Providing Information and Managing Extremes

Representatives from several federal agencies provided comments on the recommendations. This paper summarizes the policy recommendations and workshop discussion.



Reforming Institutions: Getting Incentives Right

Anticipatory *ex ante* adaptation may occur in many sectors of U.S. society, but in order to be most effective, incentives for human action must accurately reflect changes that are occurring in natural and human systems as a result of climate change. For example, current subsidy and pricing structures resulting from public policies (state and federal) were established under climatic conditions that were presumed to remain static. As climate shifts, these price and subsidy incentives need to be flexible enough to reflect new levels of scarcity for certain resources. Getting incentives right is one of the most immediate and effective ways to encourage efficient adaptation practices. The first session of the workshop focused on approaches to ensure that policy-driven incentives are accurately reflecting real world conditions in economic sectors including insurance, agriculture, and public utilities such as electricity and water.

INSURANCE

Expansive development of coastal areas has exposed property owners to substantial flood risk due in part to shifting and unpredictable climate patterns. Florida, for example, could incur up to an estimated \$2.5 trillion in potential damages from coastal flooding. Putting such extensive and expensive real estate resources at risk of flood damage—likely to be exacerbated by rising seas and changing climate patterns—may lead to a new era of catastrophe. Many property owners, though, lack incentives to fully respond to these risks and so tend to take inadequate actions to mitigate them. Property owners often adopt overly short-term, myopic investment horizons, expect disaster relief assistance when storm damage occurs, and lack capital to purchase long-term insurance.

A possible solution is to create long-term contracts under the National Flood Insurance Program (NFIP). Long-Term Flood Insurance (LTFI) tied to property rather than a property owner would address the problem of homeowner risk myopia. The program could also offer home improvement loans to help property owners prepare for changing flood patterns. NFIP is uniquely suited for the challenge of addressing these problems, as the federal government is the only issuer of the insurance. The program can marshal federal resources to generate better flood maps, which may result in risk-based pricing and lead homeowners to maintain their policies rather than cancelling them after a number of years without major flooding.

Models suggest that including consideration of climate adaptation in insurance design, incentives, and pricing could significantly reduce losses during floods when compared to not incorporating adaptive measures. Next steps to further this approach could include consideration of questions such as whether NFIP is a good place to start. What kind of policy instruments can make long-term insurance feasible to private actors? What scientific data about expected extreme climatic events is required in insurance markets?



AGRICULTURE

The historical ability of the agriculture sector to adapt to changing conditions and variable prices is well documented. Some previous research suggests that the net effects of climate change on U.S. agriculture may be positive, but experience may reflect the capacity of agriculture to adapt to changing weather in the presence of relatively static climate systems. The challenge that lies ahead is adapting agriculture, and all the policy-driven incentives built into the system over decades, to a (perhaps rapidly) changing climate and large variation in weather patterns.

In many cases, the challenge is related to the reform of incentives tied to agricultural policy. For example, agricultural subsidy and trade policies encourage producers to maintain their existing means of production and reduce incentives to actively respond to economic and environmental changes. At the same time, popular production and income insurance policies and disaster assistance provide some protection against climate variability and extreme events, which may also reduce farmers' and ranchers' incentives to take adaptive actions. Similarly, soil and water conservation policies and ecosystem services protect water quality and enhance ecosystem services such as wildlife habitat, but also may reduce flexibility to respond to climate change by reducing the ability to adapt land use and respond to extreme events. Thus, the proper public policy response related to adaptation in agriculture likely begins with a process of intensive policy review and reform.

Incentives play a huge role in guiding adaptation, but are not the only factor. Information driven by the public sector and new knowledge can also be important, especially with regard to a few areas in particular: new climate-resilient crop and livestock varieties; the impact of climate change on pests, weeds, and diseases and their management; resilient waste-management technologies for livestock; adapting confined livestock and poultry processes to climate change and extremes; the effects of adaptation strategies on ecosystem services; public information on long-term climate trends; and implications of energy policies and greenhouse gas mitigation policies for agriculture and the food sector.

REFORMING UTILITY PRICING

A longstanding concern of economists and other analysts has been the lack of sound pricing policy for basic services ranging from electricity to water. Uncertainty about climate impacts and continued growth in demand for these services will further worsen the problem of their misallocation. In the face of a drought, demand for water is likely to increase even if supplies remain the same or decrease. Similarly, rising temperatures increase demand for air conditioning and the electricity necessary to run them.



The upshot to these realities is that pricing and capacity decisions must be coordinated, and reflect the fundamental uncertainties in our understanding of climate change. Otherwise, some services may come up short for some consumers and decisionmakers will be faced with the question of whose demand wins out over others. Rules for rationing may become necessary and how they are determined is likely to be quite controversial.

The results of adaptive actions will be manifest on many fronts. For example, changing the relative prices of water and electricity supplies could alter incentives to take other actions, such as investment in renewable energy. Anticipatory adaptation actions may influence how much is invested in nonfossil and low carbon fuels or the demand for domestic and international actions to offset emissions. Moreover, in some situations the “default” anticipatory adaptation policy is to build capacity, even if it’s not efficient or rational.

Reforming Institutions: Improving Regulation and Management

Current regulatory and management practices have a mixed record of effectively addressing environmental and resources problems, even in the best of times. The effects of climate change will present new and significant challenges to resource management and governance. The workshop focused on several innovative options to improve many of the country’s regulations and management systems for resources including water, land, infrastructure, and public health.

IMPACT ASSESSMENT

A possible step toward improved management would be greater incorporation of climate change science into government decisions through a National Adaptation Planning Act (NAPA). The basic framework of NAPA, modeled after the existing National Environmental Policy Act (NEPA), would require that new policy initiatives take into account the role of climate adaptation. NAPA would also set up a framework under which existing programs go through a review process that accounts for the role of adaptation policy. This structure could potentially help better inform the private sector of the effects of climate change and increase understanding of the role government can play in adaptation.

Ultimately, the goal for NAPA is to establish a streamlined process that easily integrates with existing agency decision processes. Often, NEPA is seen as burdensome whereas an advantage of NAPA would be its seamless fit into existing decisionmaking structures. For example, NEPA only requires an assessment by the time a final policy decision is made; as a result the assessment functions less as a part of the process and more like a hurdle to clear before completion. A new NAPA program could require periodic reevaluation in response to a changing climate.

NAPA could also create a system for synthesizing and archiving reports. NEPA is presently limited in that environmental impact assessment documents can be difficult to obtain, both online and



off. Some documents can be found on an agency's website, but it often requires a great deal of digging through the sites to find them. The NAPA system could provide better archiving and storage of important documents. Finally, the NAPA process could lead to better treatment of uncertainty of climate impacts in agency actions. Agencies could be required to engage in scenario planning and consider multiple outcomes.

INFRASTRUCTURE

Better integration of climate impacts in planning—including updating of standards, retrofitting, and innovating infrastructure design—is a main theme in discussion of adaptation policy. Events such as the 2007 collapse of the I-35W Bridge in Minneapolis are reminders of the challenge of maintaining infrastructure even in the absence of climate effects.

Adaptation planning in the case of infrastructure might best be cast as formal asset management, whereby one considers the full life-cycle cost of infrastructure investments in the presence of climate change and the associated uncertainty. For example, public infrastructure, roads and bridges for example, typically has long service lives. If infrastructure is designed and constructed without due regard to changing environmental conditions, however, the maintenance and repair costs due to climate change can considerably increase the full life-cycle cost of the investment. In the presence of climate uncertainty, an alternative approach might be to design and construct infrastructure with shorter service lives giving rise to more rapid capital turnovers and the ability to more cost-effectively adapt to changing climatic conditions.

An asset management approach will require better and more extensive information about climate variability and infrastructure, and a new way of thinking on the part of infrastructure planners that embraces climate uncertainty. Planners will require projections and probabilistic forecasts of near- and long-term climatic variation and will need such information in a well-defined, geospatial context.

COASTAL AND MARINE RESOURCES

The Phase I report on coastal and marine resources identified five main threats: climate change, habitat loss and degradation, land and marine pollution, overfishing, and invasive species. The longstanding and unique challenge for marine resource managers is the lack of well-defined property and resource rights. Ambiguous rights lead to well-known “commons” problems such as overfishing and conflicts among people using the resources.

Coastal and marine resource managers are politically and financially limited in actions they can take to adapt to climate change and its stresses on natural resources. Adaptation could involve steps to reduce the detrimental impacts on marine resources from sources unrelated to climate, simply to enhance the resiliency of these marine environments. Limiting other harms, however,



typically involves traditional problems of property rights and the inadequacy of existing regulatory structure. In the case of marine resources, managers could take steps toward this goal by instituting a two-tiered plan for zoning ocean rights.

- Tier I: Develop standards and definitions for dominant-use zones based on ecological studies. Allocate resources across “zones” delineated by geographic regions and time. Offer variances and special permits to allow flexibility over time.
- Tier II: Develop user rights within dominant use zones.

WATER

Although some plans have long been in place for short-term management of water shortages and floods, the challenge lies in incorporating these approaches in long-term planning scenarios and encouraging proactive efforts.

Moving forward, resource planners can view long-term freshwater issues through several frames. Insurance is potentially a helpful one. For example, understanding is limited of the long-term effect of hurricanes on watersheds and inland water. The chain of events resulting from hurricane landfall may affect inland precipitation and, in turn, groundwater recharge. We have limited information on how these dynamics may manifest in patterns of droughts and floods.

Much of the water resources research and planning at present is spread without coordination across universities and agencies working on place-specific water resource problems. Providing the means for better coordination and sharing lessons learned among researchers and planners could be a useful role for federal and state agencies. Visualization and use of scenarios to see the effects of long-term climate changes in shifting precipitation and flow patterns at both regional and small watershed scales could be a particularly effective means of illustrating future effects of climate.

Watershed governance is especially complex because the physical hydrology of the natural landscape and the political borders of municipalities, counties, and districts are not aligned. Moreover, accountability is a unique challenge since watersheds often span several political jurisdictions. Unfortunately, there does not appear to be a one-size-fits-all approach to involve states, interstate entities, and the federal government, although some examples offer lessons learned.

- Delaware River Basin Commission (DRBC): Formed in the 1960s, the commission consists of Delaware, New Jersey, Pennsylvania, New York, and a federal representative. The DRBC carries out programs to manage the Delaware River, including water quality protection, water supply allocation, and watershed planning. The DRBC cannot compel federal agencies to engage in specific activities but can



prevent them from taking unapproved action. The DRBC is seen by many regional water managers as having successfully met or measurably moved toward its goals without sacrificing public accountability.

- CALFED: Formed to address increasing salinity in the San Francisco Bay Delta due to massive water withdrawals, CALFED involves both state and federal agencies, including the U.S. Environmental Protection Agency (EPA). The agency sought to negotiate a compromise between water use and water quality. In 1994, the parties involved reached an agreement that allowed the state to use less stringent salinity standards and, in turn, water users to accept lower withdrawals for more future certainty. Initially viewed as a success, CALFED has been unable to design a governance structure to maintain long-term achievement.
- Chesapeake Bay Program (CBP): Formed in 1992 to combat decreasing ecosystem quality in the Chesapeake Bay, the CBP includes Virginia, Maryland, Pennsylvania, the District of Columbia, EPA and the Chesapeake Bay Commission. The CBP set out to reduce nutrient loading by 40 percent by 2000. The program has no enforcement mechanism and must rely on good faith actions taken by signatories. Despite some initial successes in the 1990s, water and ecosystem quality have declined significantly over the 2000s and EPA is currently taking a more aggressive role in regulating the Bay by setting timetables and deadlines for state action, a departure from a half-century of state-level accountability.

PUBLIC HEALTH

Impacts on public health when viewed through the lens of climate change are not new or novel and involve both direct and indirect pathways. For example, temperature and its effects on human health are direct, flooding and disease that result from changes in temperature and precipitation more indirect. Adaptation of health-response systems must be robust enough to address both pathways. Major concerns for climate-related health problems include:

- Heat waves: Modeling suggests climate change may lead to increases in the number and intensity of heat waves. If so, these would be likely to increase cases of acute mortality and morbidity, especially in urban areas.
- Infectious disease: Modeling also suggests alterations in vectors to spread diseases into broader areas as a possible result of temperature and moisture shifts. Malaria is the leading example of concern, but opinions as to its climate-induced severity differ widely.
- Aeroallergens: More allergens due to changes in plant life could exacerbate effects of allergies on those who have them. Secondary considerations, such as greater



demand for air conditioning, could lead to lower ambient air quality due to energy generation and use.

- Social interruptions and displacement: Major shifts in climate that lead to extreme droughts and sea-level rise could disrupt existing societal structures and undermine the reliability of health care delivery systems.

Adaptive responses to many of these possible impacts includes use of public health surveillance systems to help ensure that communities can respond effectively to climate and weather related health crises. Strategies to adapt should involve continuing to maintain and reform current warning and response systems, but with some attention to the changing context that climate change brings. Systems need to be, and remain, comprehensive.

Delivering cooling options to populations that are particularly susceptible to heat waves, such as the elderly and the poor, should be a priority. Adaptation efforts should also include increased awareness among those responsible for caring for patients at particular risk of problems associated with changing pollen and allergen patterns. Surveillance should be a primary aspect of public health adaptation, with an emphasis that heat is the most salient risk for morbidity and mortality.

PUBLIC LANDS

Federal public lands, including national parks, national forests, and U.S. Bureau of Land Management lands, generally operate with and are responsive to significant public input (although the specific traditions and histories of each of the managing agencies vary). Additionally, the agencies are constrained by a host of laws and regulations that limit their actions. As they begin to adapt to shifting climatic conditions, federal land agencies will need to continue to respond to public input and the balancing of existing rules, but will likely find that effective adaptive management strategies may be restricted by existing rules and public reaction to altered management practices.

Public land management agencies typically plan for the long-term and this could make it easier to bring climate adaptation into decisionmaking. For example, planning in the U.S. Forest Service regularly incorporates generational concerns. Challenges arise, however, with stakeholder expectations. The Forest Service can report the expected impacts of climate change and management sub-units such as the Tahoe National Forest can give honest assessments about the risks it faces, but the public may react against any actual change in land use. Adaptive management is talked about in many facets, but it is not practiced due to concerns about public reaction; as a result, public lands sometimes remain a static landscape.



Adaptive management has worked in some cases; examples include the successful reintroduction of wolves to Yellowstone, experimental flows of the Colorado River down the Grand Canyon, and elk culling in Rocky Mountain National Park. However, altering the permitted uses of specifically designated public lands (national parks, forests, and so on) as they are currently established has a high political threshold and will need good data and solid political will before changes are allowed. Permits handed down through generations are very difficult to alter, and robust data must be presented to justify changes. Even then, advocacy and public interest groups may not easily allow agencies to take action.

Managing public lands has implications for managing other resources as well, including water, recreation areas, and wildlife. Here management can be both fragmented and overlapping at times. Additionally, managers lack the capacity (tools, data, and modeling) to fully know all of the links, interactions, and other relationships among these resources on any given parcel of public lands. Furthermore, approaches not typically embraced by federal agencies, such as concerted efforts to properly price common goods and using that knowledge to buy out traditional uses, will improve the agencies' ability to respond to threats from climate change.

Providing Information and Managing Extremes

Common across the sectors of public health, infrastructure, water and marine resources, and public lands, is the role of government in monitoring and providing information about the effects of climate on these resources. Provision of information about weather has long been a traditional role of government and the provision of climate-related information seems a natural extension of that role. Particularly because monitoring climate, much like monitoring weather, requires global infrastructure in the form of satellites, buoys, aircraft, and ground-based systems, funding this infrastructure and providing information are likely to continue to be largely the responsibility of the government.

The large body of literature on the value of information has demonstrated that not all information has value, and that perfect or complete information—reducing all uncertainty to zero—is usually not worth the costs of acquisition. In other words, decisionmakers ultimately have to take actions without full information. The government will have to find the balance between the cost of collecting information and its value in the decisionmaking process. Ascertaining specifically what information is of highest value is complicated by the fact that the value of information derives from the value of the decisions it informs. For many reasons, we lack good understanding of the costs and benefits of different choices related to managing natural resources in an adaptive way, compounding the challenge in discerning costs and benefits of the information to aide management decisions.



Climate change presents a vexing challenge because it changes the baseline conditions under which resource management takes place. As the climate baseline shifts, events that were once considered extreme and rare are expected to occur with greater frequency and stronger intensity. As a result, formerly reliable buffers against severe events like hurricanes, floods, and droughts will become less effective, whether the buffers are physical, economic (such as pricing and insurance), or institutional. Similarly, historical benchmarks are likely to provide less useful guidance for adjustment by at-risk communities and resources. These concerns point to the desirability of preparing for extreme events partly by considering what information is required and how it can best be used.

FAT TAILS

Modeling of global climate systems suggests a greater likelihood of increased extreme weather events as a consequence of climate change. Furthermore these patterns may be fat-tailed, which means there is a higher probability that the events will be much more damaging and severe than the historically largest extreme events. The critical implication for policymakers is that current averages are not the same as future averages and designing policies around standard averages is no longer sufficient.

As an illustration, if the damages from Hurricane Katrina cost about \$100 billion, what's the probability that the next event will cost more than twice the cost of Katrina? If the probability were thin-tailed, the likelihood of such an outcome would get closer to zero as the potential damage grows. Given that the probability distribution under climate change is likely fat-tailed, the likelihood does not shrink.

The problem is further complicated by the notion of microcorrelations, small correlations between events; often these are thought not to be related because they occur in different parts of the world or at different points in time. A closer look, however, illustrates a much bigger problem. As we aggregate microcorrelated events, the aggregates become tail-dependent, and the shape of the tails has more influence over the intensity of the correlated impacts.

In many cases, events caused by changes in climate might be thought to be insurable, with insurance providing the cushion for protecting against loss. Fat tails and microcorrelated events, however, can strain the capacity of the insurance sector. Questions arise as to which risks are realistically insurable if predicted losses are too large, correlated with other damages, or mostly unpredictable. Reasons for agreeing to insure against climate-related damage may include adequate capacity to adjust to damage, a reliable availability of reinsurance, and the use of innovative financial instruments to spread risk. Questions that remain unanswered include whether tail risks can be insured at market prices; what role government should play in insuring against climate-related occurrences; whether the government should be the reinsurer of last



resort or a guarantor of state bonds; and whether government, through regulation or other means, can reduce overall exposure to risk.

MEGADISASTERS AND GOVERNANCE

Federal agencies are generally poorly equipped for quick responses to mega disasters, as demonstrated during the days following Hurricane Katrina and recently with the oil spill in the Gulf. To address some of the organizational deficiencies in federal disaster response, a possible step could be identification of a new “mega disaster coordinator” or “Officer in Charge (OIC).” The OIC could be appointed by the president when a certain damage threshold is reached via a mechanism and process already adopted and deployed.

The OIC would be responsible not only for the initial response, but for the long-term recovery after a mega disaster as well. A major and vital function of the OIC would be to coordinate various authorities and streamline decisions to facilitate more effective responses.

Discussion

One of the primary goals of the workshop was discussion of the role of the federal government from the perspective of representatives of key agencies. Around 30 federal officials from a number of agencies were invited to react to our recommendations, both as respondents to the panelists and through the discussions that followed each panel. Represented agencies included the Environmental Protection Agency (EPA), the National Oceanic and Atmospheric Administration (NOAA), the National Aeronautics and Space Administration (NASA), the US Department of Agriculture (USDA), the Congressional Budget Office (CBO) and the Department of Energy (DOE).

Several common themes emerged from the agencies’ perspectives. Many officials emphasized that they had not yet structured their agencies to respond to the challenge of climate adaptation and welcomed guidance. Adaptation policy transcends the stovepipes of federal agency organization, so coordinated and comprehensive approaches will be particularly complex.

Concerns were also expressed about the link between adaptation and other issues such as urban development, land use, and mitigation of greenhouse gas emissions. When would focus on one area adversely affect others? Are there complimentary policies? How can adaptation be used as a complement to policies, rather than becoming a deterrent to emissions mitigation?

Discussion also included consideration of resource management issues that loom even without climate change and what impetus is added by climate adaptation policy. These issues include reforming the National Flood Insurance Program, incorporating adaptive management techniques into current practices, and better using scientific knowledge to make decisions – all of



which are ‘no regrets’ policy options that should be done without the additional stressor of climate change. Adaptation, however, presents a new opportunity to revisit this “old business” and engender new urgency to reform all practices.

Discussants were nearly all in agreement that they will need better information to understand ways to handle risk and uncertainty related to climate impacts. As risk and uncertainty grow, the value of useful climate-related information grows as well. Most of the officials participating in the workshop emphasized the need for more information and data of better quality. They also stressed the importance of ways to effectively disseminate information, so that it can reach those on-the-ground responders need it most.

When relevant climate information reaches decisionmakers, they may find they are limited in how they can use that information due to the regulations and norms that define their jobs. Adaptive management was the primary example cited by workshop participants as providing such flexibility, but challenges remain in implementing it in concert with existing regulations and public expectations. Current agency mandates were designed under the assumption that climatic conditions were not changing. Rigid management regimes may be already responding to resource problems suboptimally and the additional stressors of climate change impacts require more flexibility, not less.

Finally, concerns about equity and social justice were expressed by a number of discussants. Social vulnerability and the possible severity of adverse climate impacts will likely be closely associated, as vulnerable communities generally have less capacity and resources to respond to adverse climatic conditions. The government officials commented specifically on vulnerabilities of those with low income, the elderly, and those with disabilities and the possible complementarity of policies to strengthen the role of existing efforts to improve education, health services, and employment opportunities. Moving forward, federal policymakers will need improved ways to measure whether their adaptation actions are having their intended effects in these and other actions.

Other Perspectives

Federal adaptation policy will set the stage for how the nation will respond to impacts from climate change, but it will be state, local, and private actors who will actually be responsible for implementing on-the-ground actions. The last panel of the workshop included representatives from state government and private industry.

A theme expressed from both groups was “political realism.” Many local governments are currently experiencing budget and financial crises. Federal policy intervention involving unfunded mandates will be less effective than intervention backed with appropriate cost sharing.



Coordination between state and federal actions will be necessary, and federal agencies should also engage private industry in policy discussions. In some economic sectors, private actors will likely be among the first to undertake adaptation projects and can provide useful lessons from the challenges they face. Coordination with federal agencies may generate an avenue through which policymakers can learn important lessons and private firms can be empowered to take risks to learn what kind of adaptations are more effective.



Appendix: Workshop Agenda and Participants List

Adapting to Climate Change: The Public Policy Response

*An RFF Workshop on Understanding and Designing Public Policy Options
for Adapting to Climate Change Impacts in the United States*

Monday, June 21, 2010

**Resources for the Future
First Floor Conference Room
1616 P St. NW
Washington DC 20036**

This workshop is the culmination of a two-year study to identify federal policy recommendations for the nation in adapting to a changing climate. Together with scholars drawn from across the United States, we offer recommendations to address effects of climate change on terrestrial ecosystems, marine ecosystems, fresh water resources, agriculture, human health, and built infrastructure. Our recommendations include guidance for reforming regulation, managing for extremes, and establishing information services. For further information, contact: Ray Kopp (kopp@rff.org), Molly Macauley (macauley@rff.org), Dick Morgenstern (morgenstern@rff.org), and Danny Morris (morris@rff.org). More about the project is at: http://www.rff.org/News/ClimateAdaptation/Pages/domestic_home.aspx.

AGENDA

8:00 **Breakfast and Registration**

8:30 **Welcome and Overview of Project**

9:00 **Panel One – Reforming Institutions: Getting Prices Right** (Moderator: Ray Kopp)

Panelists:

Howard Kunreuther, Wharton School, University of Pennsylvania

John Antle, Oregon State University

Kerry Smith, Arizona State University

Discussants: Terry Dinan, Congressional Budget Office; William Hohenstein, U.S. Department of Agriculture; Catherine Allen, U.S. Environmental Protection Agency

10:30 **Break**

10:45 **Panel Two – Reforming Institutions: Improving Regulations and Managing Extremes** (Moderator: Molly Macauley)

Panelists:

Jim Neumann, Industrial Economics, Inc.

Dan Farber, University of California, Berkeley



Marc Landy, Boston College
Roger Cooke, Resources for the Future

Discussants: Jim Titus, U.S. Environmental Protection Agency; Lawrence Friedl, National Aeronautics and Space Administration; Rob Verchick, U.S. Environmental Protection Agency

12:30 Lunch with Presentation on Interagency Adaptation Process

Speaker:

Jason Bordoff, Associate Director for Energy and Climate Change, White House Council on Environmental Quality

13:30 Panel Three – Reforming Institutions: Improving Management (Moderator: Dick Morgenstern)

Panelists:

Jim Sanchirico, University of California, Davis
Alan Covich, University of Georgia
Jonathan Samet, University of Southern California
Bill Travis, University of Colorado, Boulder

Discussants: Mark Nechodom, USDA Office of Environmental Markets; Mike Shapiro, EPA

15:00 Break

15:15 Panel Four – Private and State Responses (Moderator: Morgenstern)

Panelists:

Carol Couch, University of Georgia
Charles Rossmann, Southern Company

Discussants: Tom Armstrong, U.S. Geological Survey; Chad McNutt, National Oceanic and Atmospheric Administration

16:15 The View from the Hill – Adaptation in Legislation

Speaker:

Jean Flemma, Staff Director of House Subcommittee on Insular Affairs, Oceans and Wildlife

16:45 Policy Recommendations and Future Research (Moderators: Kopp, Macauley, Morgenstern)

17:30 End of Workshop

18:00 Reception and Dinner - Doubletree Washington DC Hotel, 1515 Rhode Island Ave NW

Speaker:

Rob Verchick, Deputy Associate Administrator, Office of Policy, Economics, and Innovation, U.S. Environmental Protection Agency



PARTICIPANTS

Catherine Allen
U.S. Environmental Protection Agency

Fred Anderson
McKenna Long & Aldridge, LLP

John Antle
Oregon State University

Tom Armstrong
U.S. Geological Survey

Jeff Arnold
U.S. Army Corps of Engineers

Peter Boice
U.S. Department of Defense

Jason Bordoff
White House Council on
Environmental Quality

Tiffany Clements
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Roger Cooke
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Carol Couch
University of Georgia

Alan Covich
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Terry Dinan
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Jean Flemma
U.S. House of Representatives

Lawrence Friedl
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Administration

Robert Hirsch
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Allan Hoffman
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