Western Governors' Association

Climate Adaptation Priorities for the Western States: Scoping Report

June 2010

WESTERN GOVERNORS' ASSOCIATION

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Across the western United States, we are already experiencing the adverse impacts of climate change on our environment, infrastructure, economies and communities. Clearly, we must implement new management strategies to build a resilient West.

Western governors recognize the need to work together to respond to these changes, which stand to greatly affect our quality of life. In 2009, the Western Governors' Association (WGA) adopted a policy resolution titled *Supporting the Integration of Climate Change Adaptation Science in the West*. This resolution represented the governors' interest in a coordinated response to climate change impacts and in including climate science in our policy and management activities.

The WGA created a Climate Adaptation Work Group, composed of western state experts in air, forests, water and wildlife to recommend next steps. The enclosed Scoping Report is the result of its work. The report contains important recommendations for building a West that is resilient in the face of challenges posed by a changing climate. We are grateful to the work group and all of the partners who contributed their time and expertise to this effort.

Western states will be on the front lines of climate response, and we are uniquely positioned to lead on this issue. We are pleased to share this report with you, and we urge continued and determined steps toward building state capacity to respond to climate change in the West.

Arnold Schwarzenegger
Governor of California

Bill Richardson
Governor of New Mexico

Western Governors' Association
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Introduction

The potential adverse consequences of climate change are many, including a reduction in water quality and quantity; degradation in air quality; loss of plant and animal species, forests, and rangeland; and the erosion of coastlines. Industries such as tourism, skiing, fishing, agriculture, and forestry will be affected. Especially hard hit will be those communities with limited resources to adapt to such changes.

Recognizing the need for Western-specific information on these potential impacts, the Western Governors' Association adopted the policy resolution, *Supporting the Integration of Climate Change Adaptation Science in the West* in 2009. The resolution recognizes that a changing climate could seriously impact state and regional economies, public lands, the environment and the health and security of people. Following adoption of this resolution the Governors established a Climate Adaptation Work Group to recommend ways climate science could help inform states' adaptation planning and related policies.

The work group's first task was to develop this scoping report in an effort to identify state and regional priorities for planning and adapting to a changing climate[1]. Three specific goals were identified for further discussion:

- foster coordination on adaptation activities, particularly between state and federal efforts;
- identify key science needs for Western states; and
- begin to share smart practices among states.

Achieving these goals will result in a coordinated regional response to climate adaptation.

Western Governors have a long track record of working together on issues of mutual concern that produce benefits for their own states and the region. Examples include transmission planning; wildlife management and protection; improved forest health and wildfire management; and drought preparedness and response.

The scope and challenge of adapting to climate change and protecting the region's vital resources is significant and coordinating this regional effort with those at the federal level will be essential. Federal agencies have already instituted a number of climate research and science programs, but states are already on the frontline of responding to climate change. It will be the states implementing many of the on-the-ground adaptation efforts, so it is important that states partner with new federal initiatives to provide opportunities to partner with states in adaptation planning and to secure necessary resources to implement adaptation strategies. By working together, Western states can identify collective priority resource areas and information needs, and ensure that new federal "climate services" are responsive to on-the-ground needs.

In this scoping report, Western Governors call for enhanced cooperation around climate adaptation. This will require sharing resources effectively to support climate science and to implement adaptation strategies. The Climate Adaptation Work Group will continue to engage partners to achieve these goals.

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[1] This report focuses on priority actions that could help states adequately plan for and improve resiliency to a changing climate. It does not address the causes of climate changes, nor does it make any recommendations regarding actions to mitigate changes in climate.

1. Smart Practices for Climate Adaptation

Issue:

The impacts of climate change that are already being observed in Western states are predicted to become more pronounced in the future. To build resilience to these impacts, the Western states will need to factor climate change into resource management plans and strategies. However, as discussed in the next section, the potential impacts of climate change are not always certain in terms of location, timing, or magnitude – particularly at the relevant scales for management decision making. This section identifies ways that Western states can begin to incorporate "smart" climate adaptation practices into resource management and decision making, given the inherent uncertainty in projections of future impacts.

Status:

Western states have been managing natural resources for decades through agencies that deal with fish and wildlife conservation, forest and wildland fire management, water quality and supply including drought response, and air quality. As part of their work, these agencies already plan for extreme events, variability, and change. Many of these existing resource management practices should help Western states prepare for and adapt to climate change. For example, state drought planning considers the potential for extended periods of low water availability and devises strategies to help water users and ecosystems withstand these events. This preparation will help states be more resilient to extended drought, whether it is part of the historic pattern, or attributed to a changing climate. This is also true of the forest management, wildlife conservation, and air-quality strategies that states currently employ. By planning for variability, these strategies help states respond to climate change.

While climate change represents an additional variable (or set of variables) to consider in existing resource management practice, it does not necessarily require a wholesale restructuring of these existing institutions. However, it does require states to consider how protocols, guidelines, regulations, and strategies rooted in historical data and trends may need to change in order to better prepare for the future. As Chips Barry, the former manager of Denver Water, observed, "climate change is shaking up our fundamental water planning assumptions."[2]

The National Research Council has elaborated on the challenge of planning for a potentially different future: "Many of (the) usual practices and decision rules – for building bridges, implementing zoning rules, using private motor vehicles, and so on – assume a stationary climate – a continuation of past climatic conditions, including similar patterns of variation and the same probabilities of extreme events. That assumption, fundamental to the ways people and organizations make their choice, is no longer valid."[3] In other words, the future is no longer reliably predicated upon the past.

Many Western states have begun to build on existing institutions to explicitly consider how climate change may alter or exacerbate resource management challenges. For example, four Western states – Alaska, California, Oregon and Washington – have undertaken extensive climate adaptation planning efforts, largely in response to current and projected impacts of

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[2] *Water Utility Climate Alliance, Press Release: "White Paper Presents Planning Methods to Address Climate Change Uncertainties," January 25, 2010.*

[3] *National Research Council, "Informing Decisions in a Changing Climate," 2009, p1.*

the rise in sea level. These plans not only build upon existing institutions and management strategies, but also incorporate new science to understand the potential impacts of climate change and devise innovative, robust, cross-sector strategies to respond to a different potential future. These planning processes can also enable the needed collaboration among agencies to effectively manage resources for climate change.

The West has strong institutions and a long track record of successful natural resource management. The question is how to best incorporate climate change, including inherent uncertainties, into a planning and management framework.

Smart Practices for Climate Adaptation:

Engage the Public, Resource Managers, and Leadership in Planning under Uncertainty: Planning under uncertainty will be a key skill for climate response. Climate models offer important insight into trends and ranges of potential future changes. However, because a number of important parameters can never be precisely known in advance, such as future greenhouse gas emissions, these models cannot tell us exactly what the future will be like. States (and others charged with resource management) will need to develop new ways of thinking about and responding to a range of future potential scenarios in resource management decision making. A report by the National Research Council, *Informing Decisions in a Changing Climate*[4], identifies six general principles for planning and decision making given climate uncertainty.

- **Begin with users' needs:** Climate response and decision support should focus on the needs of resource managers, property owners, and decision-makers, not on scientific research priorities. We need to identify the key decisions in the West that will be affected by climate change, and then develop information to allow informed responses.
- **Give priority to processes over products:** Effective climate response calls for establishing lasting processes to allow for interaction and learning, not simply finalizing a product or plan in response to a one-time event.
- **Link information producers and users:** Climate response requires networks and institutions to allow interaction between resource managers and scientists, to ensure decision-relevant information is developed and used.
- **Build connections across disciplines and organizations:** Good planning should seek to cross disciplines, silos, sectors, and scales in order to consider important interactions and opportunities to develop strategies that are effective across a range of management needs.
- **Seek institutional stability:** A stable institutional structure for climate adaptation will be preferred. This can be achieved in several ways, including the creation of new institutions, new priorities for existing institutions, or simple agency-level commitments to address climate adaptation.
- **Design for learning:** Climate response should be designed to allow flexibility and learning from experience, so states can strengthen practices over time.

Consider the Scale of the Impact: The appropriate scale for climate adaptation activities will need to be considered. As the National Research Council acknowledges, "distributed responses to climate are necessary and appropriate."[5] The state will be a critical planning level for many climate adaptation issues. In many cases, the states will be on the front lines of climate change response and on-the-ground adaptation efforts. However, many decisions and sectors may need to be addressed at the local level. There is a vital connection between states and

[4]*National Research Council. "Informing Decisions in a Changing Climate." National Academies Press (Washington, D.C.), 2009.*

[5]*National Research Council, p30.*

municipalities in achieving effective implementation, for example, in local land-use and planning regulation. Other decisions will require regional or multi-state coordination, such as river basin management or wildlife corridor protection. These efforts will require strong state-federal coordination. Many of these efforts can build on existing institutions and planning processes, while others may require a change of current local, state, and/or federal regulations and laws.

Identify and Evaluate Potential Barriers: In many cases, barriers may exist to exploring and promoting new policies and practices for climate adaptation. "Flood insurance policies, crop subsidies, water allocation schemes, building codes and land use planning are examples of government policies and programs that are often based solely on current climate risks and that may not even manage those current risks appropriately."[6] In other words, current laws and regulations (especially those that assume a stationary climate) may present obstacles. It is also important to note that some technically feasible adaptation efforts may not be politically viable due to public opinion, economic concerns, and other factors. States and others that are responding to climate change will need to identify these barriers and seek strategies to overcome them.

Use and Align Existing and Emerging Resources: States should seek out and leverage existing resources, partners, and expertise to assist with planning. As WGA resolution 09-2 states, "planning for climate change adaptation should be undertaken in a coordinated fashion at all levels of government with state expertise being fully utilized." In addition to the capacity and successful track record of existing state resource agencies, several existing and emerging programs can provide support for adaptation practice. These include several climate-focused initiatives that are intended to support decision making and foster partnerships. These groups include the state climatologists, Regional Climate Centers, Regional Integrated Sciences and Assessments, Landscape Conservation Cooperatives, and the NOAA Climate Service. The National Integrated Drought Information System developed from a successful partnership among federal agencies and Western states to deliver coordinated and actionable drought information to on-the-ground decision-makers. Further, there is a range of programs and partnerships among non-governmental organizations, local governments, universities, and the private sector that have formed to respond to changes in climate. Included in Appendix 1 is a list of resources that states can use in responding to climate change.

WGA Resolution 09-2 states, "Western Governors encourage Congress and the Administration to support the development of a National Climate Service to undertake, coordinate, and communicate necessary research and modeling with respect to climate change and adaptation." In the meantime, Western states can take advantage of existing resources – including climate adaptation plans and strategies that have already been developed by several Western states – as they begin to develop climate adaptation strategies.

Get Started with Strategies that Make Sense Now: Even given the uncertainties surrounding our future climate, some strategies are good management practice irrespective of climate change. Also, some impacts have such a high certainty or pose such a significant risk that they must be addressed. At the same time, many resource managers and planners are required to make decisions today that will likely be affected by climate change sometime in the future. The Water Utility Climate Alliance – a group of the largest water providers in the West and across the United States – acknowledges that, "in the meantime, many water utilities will have substantial decisions to make, with potentially significant financial, social and environmental impacts, which may be affected by climate change."[7] Whether establishing new

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[6] *Ibid Smith, p8.*

[7] *Water Utility Climate Alliance, "Decision Support Planning Methods: Incorporating Climate Change Uncertainties into Water Planning," January 2010, Preface.*

policies or responding to an immediate and necessary decision, the goal is to develop strategies that respond to the most significant threats and that are effective in a range of possible futures.

For example, in King County, Washington, officials used a projection of future sea levels to inventory wastewater treatment infrastructure located near the marine shoreline. For those inventories found to be within the range of future sea levels, design modifications have been planned and implemented to reduce the risk of saltwater intrusion. In California, the California Department of Water Resources has incorporated climate change response activities into its criteria for awarding funding to local integrated water management activities. Those projects that can anticipate and perform against a range of potential future climate scenarios are more likely to be successful candidates for state funding.

Establish Monitoring and Reporting Protocols: Whatever strategies are implemented as part of climate adaptation, states and agencies should monitor the results of activities and should adjust strategies as appropriate. This is a current and basic practice for resource management, and it should be applied in climate adaptation as well. To the extent feasible, streamlined and coordinated monitoring for climate adaptation strategies should be pursued. Monitoring feedback can then be used to adjust planning and implementation as appropriate.

Develop a Long-Term Institutional Framework: As discussed above, states must develop stable institutional mechanisms to respond to a potentially changing climate. States will need to address questions of "centralizing" vs. "mainstreaming" climate responses: should a state establish a central "Climate Office" or seek to integrate climate response into existing planning and management institutions? The preferred institutional structure for climate response may differ significantly among states. As Smith, et al. concluded, "We do not believe it is necessary to create a new department or agency to focus on adaptation. In fact, trying to separate adaptation from everything else that various government agencies do may undermine the objective to mainstream consideration of climate into government decision making. However, innovations in institutional structure may be necessary to address mainstreaming and coordination needs."[8] The best response may be a combination of approaches, with a new central mandate or planning approach to help coordinate and institutionalize the practices within existing agencies.

Examples of Smart Adaptation Planning:

Planning for Climate Adaptation. The state of Washington is planning for climate adaptation. In the spring of 2009, Governor Christine Gregoire signed legislation that included provisions for the formation of an "integrated climate change response strategy." The effort is directed by six state agencies and has engaged more than 100 stakeholders, including local governments, in the development of the strategy. Four advisory groups will guide the effort:

1. Built Environment, Infrastructure, and Communities;
2. Human Health and Security;
3. Ecosystems, Species, and Habitats; and
4. Natural Resources.

Each group will identify priority issues, summarize the state of the knowledge, identify short- and long-term strategies, and consider funding mechanisms. The process will encourage dialogue across advisory groups to identify cross-cutting strategies.

Responding to On-the-Ground Impacts. Alaska's efforts to respond to climate change exemplify many of the principles of smart climate adaptation. In Alaska, flooding and erosion have affected small remote villages, creating unprecedented threats to the safety of individuals,

[8]*Smith, Joel, Jason M. Vogel, and John E. Cromwell, "An Architecture for Government Action on Adaptation to Climate Change," Climatic Change, Volume 95, Numbers 1-2 / July, 2009 p5.*

the integrity of physical infrastructure in the communities, as well as to the communities themselves. A handful of the most imperiled villages have already begun relocation efforts. Even though these communities are small, moving them has presented considerable costs due to their remote locations and other factors. The State of Alaska's adaptation measures have included the formation of an interagency partnership, the Immediate Action Work Group (IAWG), to oversee and coordinate actions with regard to coastal and other vulnerable communities. Working closely with local communities at every step has been essential to the success of these efforts. Partnerships across local, state, and federal entities have allowed for flexibility, innovative partnerships, creative financing, and the effective leveraging of resources. Moving a community is no small feat and Alaska's access to land for relocation sites presents options that may not be readily available to other states. Nonetheless, this example provides a model for utilizing existing resources, developing useful institutional structures, and acting now to address high priority impacts[9].

Developing State-Federal Partnerships for Climate Services. The National Integrated Drought Information System (NIDIS) provides one example of how federal agencies can work together and with states to deliver climate-related services to end-users of information. The exceptionally dry years of 2000-2004 in the Colorado Basin and an extended drought since 1999 led the Western Governors to develop the pivotal report, "Creating a Drought Early Warning System for the United States (2004)." This report helped spur the NIDIS Act of 2006[10]. NIDIS was developed in partnership with the Western states, but is national in scope. The goal, as stated in the NIDIS Act, is to "*[e]nable the Nation to move from a reactive to a more proactive approach to managing drought risks and impacts.*" To meet this goal, the Act prescribes an interagency and multi-state approach led by NOAA. Several features of NIDIS stand out, including:

- Engages users, such as Western states, in development of drought services;
- Maintains a single internet portal (www.drought.gov) where information from a range of agencies is coordinated and is accessible to users;
- Leverages existing system infrastructure, data and decision-support tools; and
- Implements early warning systems to provide information services at specific regional and local scales.

Recently, the Western Governors' Association and Western States Water Council convened regional workshops to engage their constituents in improving the effectiveness of NIDIS. While NIDIS is not yet perfect – stakeholders are still working to improve the system – it demonstrates key elements of how federal agencies can work together and with states and other partners to deliver actionable information to the public and decision-makers. NIDIS offers the nation a prototype for achieving its climate service goals by developing a successful federal-state partnership that is an authoritative information source to support planning and management[11].

Recommendations:

- Existing state and regional institutions form the core of climate response in the West. Many climate adaptation decisions can now be made using existing institutions and authorities.

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[9]To learn more about Alaska's Immediate Action Work Group, visit: http://www.climatechange.alaska.gov/iaw.htm
For an example of a community in the process of relocating, please visit: http://www.commerce.state.ak.us/dca/planning/npg/Newtok_Planning_Group.htm
[10]Public Law 109-430.
[11]The NIDIS Implementation Plan, technical reports and newsletter can be found on the NIDIS US Drought Portal website www.drought.gov.

The states should seek to identify potential barriers to climate adaptation and ensure that their agencies, legal and regulatory frameworks, and institutions provide sufficient flexibility to address potential climate change impacts. To the extent practicable, Governors should encourage state agencies to plan for, and begin to integrate climate considerations into, decision making.

- Western states should conduct a workshop or series of workshops to engage researchers and practitioners in a dialogue on climate adaptation planning and implementation. States should identify key climate-sensitive decisions, gaps in existing information and services, and two to three priorities for multi-state collaboration (e.g. wildlife corridors). One product of this effort could be a clearinghouse of best practices that state agencies and managers could refer to when developing their state's adaptation efforts. The clearinghouse would be the foundation of an on-going process to communicate and coordinate climate adaptation planning priorities and activities among the Western states.
- Federal agencies should coordinate with each other and with state, tribal, and local agencies. The Western states should work with the federal agencies to establish a formal agreement, MOU, or other mutually acceptable arrangement to create a "Western States Climate Adaptation Support Team."[12] The agreement should identify who will participate in the group and what tasks the group could undertake.
- States should work with federal agencies and Congress to secure support for state climate adaptation planning and implementation. In addition, states should engage with universities, non-profits, and professional organizations to enhance state capacity to address climate change.

2. Climate Science to Support Adaptation

Issue:

It is difficult for states to make informed policy decisions about adaptation planning without access to robust, science-based information. WGA Resolution 09-2 urges additional investment in research to improve our understanding of the potential impacts of climate change at regional and global levels, system vulnerability, the risks to natural and man-made systems, and our capacity to make plans in the face of an increasingly variable and changing climate. One important component of this will be continued improvement in the information generated by science, and the ability of decision makers to use this information. This section provides a broad overview of the science currently available to help states make necessary decisions for adaptation planning under the uncertainty of climate change, and includes recommendations for improvements.

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[12] *One example of a successful collaborative effort between the Western states and the federal government is the Western States Federal Agency Support Team (WestFAST). The team was created in 2008 pursuant to a "Declaration of Cooperation" among nine federal agencies with water resources responsibilities and the Western States Water Council, which is a water policy advisory body affiliated with the WGA that consists of representatives appointed by the governors of 18 Western states. WestFAST includes representatives designated by each federal agency, as well as a federal liaison stationed in the Council's offices who works with the Council to increase collaboration between the federal government and the Western states with respect to water policy. It has also worked with the Council to help implement a number of water-related objectives that Western Governors have identified, including various objectives related to climate change.*

Status:

There are a number of information resources available to states under the heading of climate science that can be used in decision making; specifically, observations, climate models, paleoclimate data, a theoretical understanding of climate processes, impacts analysis and decision analysis. Each provides valuable information for policy decision makers. In recognition that climate-related science is improving steadily, and yet provides a diversity of perspectives, greater attention needs to be paid to a mixed portfolio of methodological approaches that treat the full spectrum of extremes, variability, and change, and that characterizes the strengths, limitations, variability, and uncertainties of approaches for different needs. This portfolio includes the development of higher resolution global models; temporal and spatial downscaling using dynamical and statistical models; climate analogs from paleo and instrumental records; sensitivity analyses; and scenario development. Each method or analytical technique in this portfolio brings a set of uncertainties and particular benefits or deficiencies, some of which are large or only partly characterized. Observations are critical for efforts aimed at attributing causes to on-going change, evaluating models, and warning of likely future conditions.

Models that project future changes in the climate are only one aspect of the available science, and they offer ever-evolving information that can inform adaptation planning. Global climate models are the backbone of climate change science and decision-support because of the inherent global nature of climate change, as well as the myriad global impacts on the Western region's climate. Regional climate models are also critical because they can provide the increased spatial resolution needed to understand and project climate change from regional to local scales. For example, the ability to resolve the West's complex topography and fine-scale storm features (i.e., clouds) is often critical for assessing future hydrological and ecosystem change. At the same time, a diversity of specialized "impact models" rounds out the hierarchy of models that need to be resourced, improved and used for climate change decision-support. No single lab or university supports all the modeling resources needed, and for this reason state adaptation planning will ultimately benefit from the best science available from a range of sources from within and outside the West.

Global and Regional Models

The effectiveness of global and regional models is being widely discussed at the national level and their development is being targeted for significant financial investment. Western Governors adopted policy in 2009 in support of funding to improve the predictive capabilities of these models and further characterization of the uncertainties associated with climate projections. These types of models offer their own strengths and limitations in contributing to the scientific information applicable for adaptation planning. Global models are now being expanded to include a wider range of ecological, chemical, biological, and human components (see Figure page 9). However, existing global climate models credibly produce climate conditions at scales that may be too coarse to be usefully mapped to these adaptation decisions due to certain limitations, including model resolution, computing power, and regional influences such as small-scale weather phenomena. While these limitations are not overly important on a global scale, they can skew regional projections.

In contrast to global models, regional models provide greater spatial detail, which is very useful in areas like the mountainous West where significant climate variation (microclimates) exist. Like global models, regional models are continually evolving to incorporate earth system components related to the atmosphere, land, ocean, and ice (see Figure page 9). The limitations of global models to project local climate patterns (e.g. precipitation from convective storms or

interaction with mountains) persist in regional models; however, a number of approaches have been developed to compensate for those biases. As a result, regional models are already providing useful projections and are improving rapidly. Further improvements in their design and use will be a key component in answering an ever-broadening set of adaptation questions confronting the states.

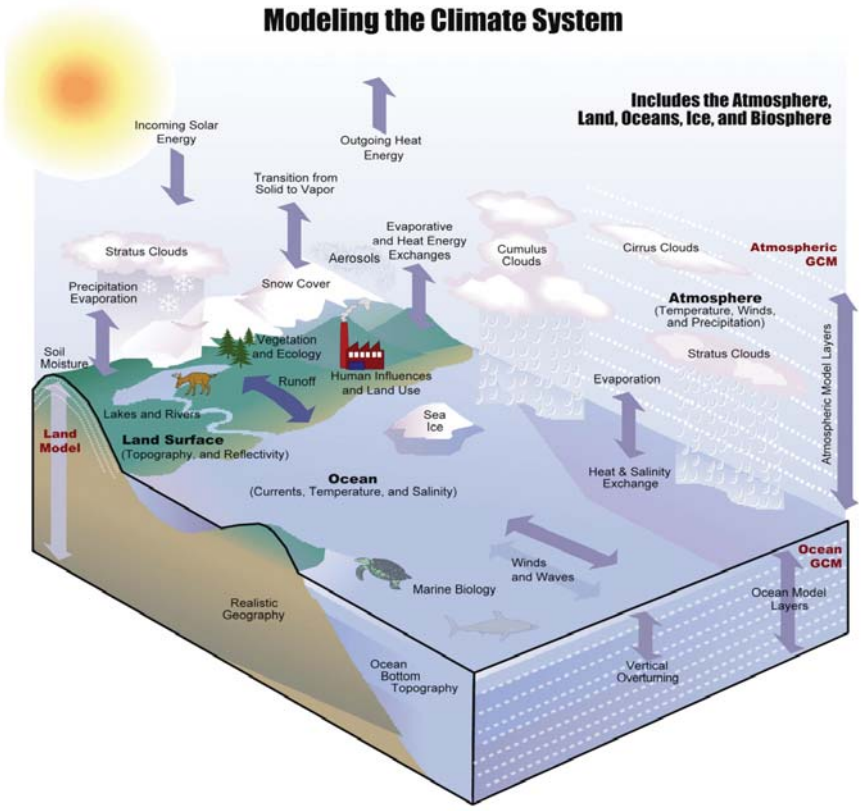


Figure 1: Courtesy of the National Center for Atmospheric Research
Karl, T. R., Trenberth, K. E., 2003: Modern Global Climate Change.Science, 302, 1719-1723.reproduced with permission.

Current Utilization of Climate Science

Concurrent with on-going improvements in global and regional models, existing models and observations have been used by states to initiate assessments of climate change impacts and adaptation planning efforts. For example, *The Washington State Climate Change Impacts Assessment*[13] released in early 2009, provided important regional projections for temperature, precipitation, and resultant hydrology in addition to allowing for analysis of future salmon habitat, human health impacts, changes in forest health and forest fire risk, and future effects on key agriculture and infrastructure elements.

Resource managers in the West have been working to prioritize science information needs in order to support necessary resource management decisions. Water managers have been particularly active on this front. For example, the U.S. Army Corps of Engineers and the U.S. Bureau of Reclamation are preparing a report entitled, *Addressing Climate Change in Long-Term Water Resources Planning and Management: User Needs for Improving Tools and*

[13]*Washington State: The Washington Climate Change Impacts Assessment: Evaluating Washington's Future in a Changing Climate. The Climate Impacts Group, University of Washington, June 2009. http://cses.washington.edu/cig/res/ia/waccia.shtml.*

Information. The Water Utility Climate Alliance, an association of major water providers in the West, developed a report entitled, Options for Improving Climate Modeling to Assist Water Utility Planning for Climate Change.

Other groups of resource managers, such as air, wildlife and habitat, and forestland managers, have also been active in issuing reports that assess vulnerabilities and prioritize science needs. As indicated in the *Smart Practices* section of this report, there is a need for an adaptation planning approach that does not solely rely on single sources of information, such as predictive models. These reports have helped to identify priorities for climate models and the types of information that will be needed to inform real, on-the-ground decisions. The fundamental premise of these efforts is that by articulating the needs of decision makers, they can inform the research agenda of the federal and academic climate research community to produce decision-relevant or actionable information whenever possible.

It is important to note that certain emerging phenomena, such as ocean acidification, are not yet components of these integrated climate models and will require substantial parallel efforts by the federal and academic research communities to gain the scientific insights necessary to support the states' resource management needs. Additional scientific information will also be needed on a range of well-studied but complex impacts related to many issues, including wildfires, agriculture, changes in air quality, hydrology, fish, and wildlife. It is paramount that federal agencies coordinate closely with Western states to identify the top priorities in these areas so that successful strategies for adaptation planning may be developed and the limited federal research dollars spent strategically.

Recommendations

- In order to improve the effectiveness of science to inform decision making, priority should be placed on enhanced and sustained support for climate-related monitoring, data accessibility and improved data-oriented decision-support systems.
  - For the large quantity of climate-related data that already exists, as well as that which would come from expanded monitoring networks, there is a need for improved quality control of data and data dissemination capabilities, particularly in terms of making data more useful to the wide range of decision makers in Western states.
  - Observational data is critical for effective climate adaptation efforts. The current monitoring network is not optimal and many key historical data collection programs are degrading due to a lack of funding and other factors. States should work with Congress and the Administration to ensure that monitoring networks are expanded and well maintained and that funding for new climate change adaptation efforts does not come at the expense of existing federal programs that provide critical basic data.[14]
  - Western Governors urge Congress and the Administration to fund research to improve predictive capabilities for climate change and related impacts at regional and global levels.
- Enhanced communication and dialogue between the science community and decision makers is essential to help set priorities for scientific investment in information that informs decision makers, and also for maximizing the usability of knowledge created by the science community.
  - In coordination with workshops targeting the advancement of smart adaptation strategies,

[14]*Examples of federal programs that provide critical basic data include the U.S. Geological Survey's (USGS) Cooperative Water and National Stream Flow Information Programs; the U.S. Department of Agriculture's Snow Survey and Water Supply Forecasting Program and related SNOTEL sites; and the USGS/National Aeronautics and Space Administration Landsat Data Continuity Mission's Thermal Infrared Sensor (TIRS).*

Western states should convene and promote funding for on-going scientific forums with researchers and decision makers working together to identify science, monitoring, modeling, and communication needs. Forums should focus on all aspects of adaptation science and application in identifying priority needs for decision makers, coordinating among many different scientific efforts, and increasing state and regional capacity to meet science and application needs. Priority needs for broad-scale monitoring and modeling should to be identified, as well as best practices for data access and use.

- State and federal agencies should establish a network of existing and new research centers among the 19 Western states that are coordinated in their support for the development of science to inform decision making. This network of research centers should work closely with the aforementioned institutions and forums to achieve maximum coordination and efficiencies.

3. Federal Legislation

Issue:

Climate adaptation is being considered as a component of federal legislation by the U.S. Congress. The Western states have unique land ownership patterns, management institutions, and resource challenges, and they may experience different regional impacts from climate change from the rest of the United States. This section identifies basic principles of importance to Western states that should be considered in any federal legislation that addresses climate adaptation.

Status:

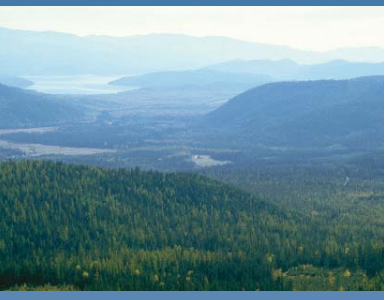
Climate adaptation has been included as a component of the several comprehensive climate bills that have been considered by the U.S. Congress[15]. It has also been the subject of several stand-alone and sector-specific bills, addressing adaptation needs for forestry, natural resources, oceans and coasts, public health, or water. Generally, these bills have included programs and funding for federal, state, and local agencies and managers to begin to respond to the impacts of a changing climate. They have also included overarching strategies, guidelines, and requirements for both federal and state programs.

Because climate adaptation is an emerging practice and not all Western states have engaged in robust climate response, the WGA has not developed a specific position on legislation. However, in the course of this project, several principles have emerged that should be considered for potential federal legislation.

Principles for federal legislation on climate adaptation:

1. **Legislation should respect the role of states.** States will be on the front lines of climate change response and leading on-the-ground adaptation efforts. Any legislation that addresses climate adaptation should recognize the central role of states and local governments in responding to climate change. To the extent possible, legislation should streamline administrative requirements and remove federal barriers to state and local climate response. Any potential legislation should allow flexibility based on state circumstances and plans.

[15] *See http://www.georgetownclimate.org/federal/legislative-tracker.php?countrytabs=1.*



2. **Legislation should invest in climate science to support decision making.** While there have been substantial improvements in understanding and projecting climate change, much work remains to make this investment most useful for state decision makers. Observation and monitoring information provides the basis for nearly all subsequent science and applications and is needed for evaluating the effectiveness of adaptation actions and for validating modeled projections. States are concerned that the nation's observational capabilities have been neglected over time and are degrading rather than improving. Improvements in climate science and modeling are also urgently needed, including increased resolution and incorporation of additional physical factors (e.g., convection), as well as development of integrated predictive systems. Basic research on, and modeling of, the effects of climate change on specific sectors is urgently needed in the areas of public health; human communities; and ecosystem conditions, given expected climate change. Finally, research and development are needed to improve the delivery of information and its incorporation into decisions at federal, state, and local levels and in the private sector. States should be directly involved in defining the priorities for these activities.
3. **Legislation should invest in state planning and adaptation.** The impacts of climate change are being observed in Western states and are likely to become more pronounced in the future. Any federal legislation should recognize the utility of existing state resource management plans and support investments in new state planning for climate adaptation. Legislation should provide resources to states to implement climate response activities, especially relating to natural resources, infrastructure, water supply, agriculture, public health, and communities.
4. **Legislation should include a comprehensive approach to climate adaptation.** Any federal legislation should take a balanced approach in addressing adaptation across several key sectors, including natural resources, physical infrastructure, water resources, communities, and economies. A narrow, or sector-specific, approach to adaptation will neglect key areas of interest for Western states, making it more difficult to coordinate adaptation activities to address impacts across sectors. The following sectors should be addressed and the interactions among them should be considered.
   - Natural Resources: This includes not only state trust responsibility for fish and wildlife, but also freshwater, wetlands, forests, coastlines, and air quality. Western states will manage impacts to specific resource areas, as well as the interactions among resource areas. One example would be interactions among forest health, fisheries' health, and water supply as they relate to increased threats from invasive species.
   - Physical Infrastructure: This includes roads, bridges, railroads, airports, seaports, dams, reservoirs, wastewater treatment facilities, and buildings that may be at risk of flooding, sea-level rise, wildfires, extreme weather, or other impacts from climate change.
   - Water Resources: This includes efforts to plan, design, construct, implement or operate programs or projects designed to respond to climate change by conserving water, relocating infrastructure, preserving or improving water quality, enhancing watershed protection, sustainably managing groundwater, desalinating or treating water, or improving agricultural irrigation systems.
   - Human Communities, Livelihoods, Public Health and Agriculture: This includes protecting communities and economies; monitoring and responding to the potential public health effects of climate change, including those related to heat stress, asthma and respiratory illness, as well as food and waterborne disease; and protecting farms and ranches from heat waves, drought, invasive species, and direct impacts to crops and livestock due to climate change.

   As described above, any federal legislation should respect and support state programs to address these sectors, not infringe on or compromise state programs.

5. **Legislation should provide a clear path for coordinating federal initiatives on climate adaptation.** A wide range of federal agencies and programs will be affected by climate change. Many federal agencies are developing new initiatives or programs to respond to climate change. These programs should be well-coordinated by the federal government, so they are not duplicative and can best achieve their purpose of responding to climate change. They should also recognize and respect the role of existing federal programs, including the Regional Integrated Science Assessments (RISAs) and the National Integrated Drought Information System (NIDIS). From the perspective of the Western states, which will be engaging with many of these new and existing programs, clear and effective coordination will be essential.
6. **Legislation should establish a National Climate Service.** A National Climate Service should be established to undertake, coordinate, and communicate necessary research and modeling with respect to climate change and adaptation. A National Climate Service should:
   - provide relevant and authoritative planning and decision-making tools for local and state governments as they address climate change and adaptation issues;
   - connect social, health, and economic trends to climate change (and vice versa); and
   - include public education and outreach in its mission.

   The delivery of climate services should be regionalized, to reflect geographic differences in climate impacts and to tailor climate response to local needs, and it should be aligned to ensure effective service to state and local governments and industry. The governors recommend Climate Service develop a single portal to deliver consistent and coordinated climate information and resources from across all federal department, agency, and office activities to end users and decision makers.

Recommendation:

- WGA should use these priorities to educate Congress on the priorities of Western states with respect to climate adaptation, so they may be considered in the development of any federal legislation.

Conclusion

The principles and recommendations outlined in this scoping report will assist states as they prepare for, and respond to, climate change and continue to work together to achieve their individual state and regional goals.

Appendix 1:
WGA Climate Adaptation Work Group

WGA Climate Adaptation Work Group

Statewide Climate

Ginny Brannon	Colorado Public Health and Climate
Lis Cohen	Utah Office of the Governor
Kurt Malchow	California Natural Resources Agency
Jackie Poston	Alaska Natural Resources
Spencer Reeder	Washington Department of Ecology
Mark Robbins	Alaska Office of the Governor
Doug Robotham	Doug Robotham

Water and Western States Water Council

Nathan Bracken	Western States Water Council
Tony Willardson	Western States Water Council
Jeanine Jones	California Department of Water Resources

Air and Western Regional Air Partnership

Cheryl Heying	Utah Air Quality
Mary Uhl	New Mexico Air Quality

Forestry and Forest Health Advisory Council

Julie Altemus	Montana DNRC – Forests

Wildlife and Western Governors' Wildlife Council

Bob Broscheid	Arizona Game and Fish
Holly Michael	Oregon Fish and Wildlife

Appendix 2:
WGA Climate Adaptation Work Session

Attendees:

WGA Climate Adaptation Work Group

Julia Altemus	Montanta/FHAC
Nathan Bracken	Western States Water Council
Jess Byrne	Idaho
Lis Cohen	Utah
Marc Macy & Dennis Todey	South Dakota
Kurt Malchow & Jeanine Jones	California
Holly Michael	Oregon/WGWC
Jason Nisbet (by phone)	North Dakota
Spencer Reeder	Washington
Mark Robbins	Alaska
Doug Robotham & Ginny Brannon	Colorado
Mary Uhl	New Mexico

Federal, Academic, and NGO Partners

Tom Armstrong (by phone)	Department of the Interior
Vicki Arroyo	Georgetown Climate Center
Terri Cruce	Georgetown Climate Center
Marcia Blair	CEQ
Jake Donnay	National Association of State Foresters
Patty Glick	National Wildlife Federation
Jessica Grannis	Harrison Institute
Greg Holland	National Center for Atmospheric Research
Heather Holsinger	Pew Center
Avra Morgan	Bureau of Reclamation
Chuck Hennig	Bureau of Reclamation
Jim Morrison	United States Forest Service
Phil Mote (by phone)	University of Oregon
Kit Muller	Bureau of Land Management
Robin O'Malley	United States Geological Survey
Roger Pulwarty	National Oceanic and Atmospheric Administration
Kelly Redmond	Western Regional Climate Center
Joel Smith	Stratus Consulting
Jason Vogel	Stratus Consulting
Brad Udall	Western Water Assessment
Greg Watson	United States Fish and Wildlife Service
Darrell Winner (air)	Environmental Protection Agenc
James Goodrich (water)	Environmental Protection Agency

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WESTERN GOVERNORS' ASSOCIATION

1600 Broadway • Suite 1700
Denver, Colorado 80202
(303) 623-9378
www.westgov.org