

# CLIMATE SERVICES

## A Summary of Academic, Administrative, and Legislative Initiatives

Prepared by Mark Shafer, Oklahoma Climatological Survey  
for the 2002 annual meeting of the American Association of State Climatologists

Within the last two years, several climate services initiatives have emerged that aim to tie generation of climate knowledge and predictions to specific user groups. Initiatives have come from both within the administrative or academic realm and from the legislative arena. The following pages summarize some major initiatives within each category. Each section has a brief overview of the initiatives, followed by a more detailed summary of what is included in the respective initiatives. For many, the overview pages may be sufficient to grasp the issues under the microscope; for others the detailed summaries may prove more meaningful. The list is by no means exhaustive, but it does provide a flavor of the issues and the fact that groups from all angles are interested in the notion of climate services, and how that can help us reduce our vulnerability to climate variability and climate change.

The administrative and academic initiatives include the National Research Council's (NRC) Board on Atmospheric Sciences and Climate (NRC/BASC) *A Climate Services Vision*, the National Oceanic and Atmospheric Administration's (NOAA) *Climate Observations and Services*, and two initiatives by the American Meteorological Society (AMS). Legislative initiatives include a National Climate Services proposal included as part of the Energy Policy Act of 2002, the Drought Preparedness Act, and the Weather Safety Act. A letter from Ken Crawford (Director, Oklahoma Climatological Survey) to Rep. J.C. Watts (R-OK; author of the Weather Safety Act) is included. Dr. Crawford sent the letter on behalf of a request by Roger Pielke, President-Elect of the American Association of State Climatologists.

Some common components to many of these proposals are: (1) a user-centric or utilization-focused mission, (2) integrated stakeholders, (3) participation by multiple arenas of government, (4) the involvement of academia and the private sector, (5) goal-oriented research and analysis, (6) an emphasis on the importance of data acquisition and quality, (7) improvements to modeling capabilities, and (8) development of new products and services.

This is intended to summarize aspects of initiatives that relate to climate services, especially those most closely related to operations of State Climate Offices. The summaries and any opinions expressed or implied are those of the author, and in no way reflect positions of the American Association of State Climatologists, the Oklahoma Climatological Survey, or The University of Oklahoma. Readers are encouraged to consult the original documents for their own interpretation.

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\* *Corresponding author address:* Mark Shafer, Oklahoma Climatological Survey, 100 E. Boyd, Suite 1210, Norman, OK 73019-1012; e-mail: mshafer@ou.edu

# ADMINISTRATIVE & ACADEMIC INITIATIVES



In the past two to three years, several initiatives have emerged from within the scientific and federal agency communities. These include the seminal report by the National Research Council's Board on Atmospheric Sciences and Climate (NRC/BASC) "A Climate Services Vision", published in 2001. The NRC report provides a set of five guiding principles that should be followed in the development of a new climate services system. These include a user-

centric focus on activities, active research, information on a variety of time and space scales, active stewardship of the knowledge base, and participatory. The report then moves on to provide a series of recommendations within three broad categories: promoting more effective use of observing systems, improving the capability to serve climate information, and conducting interdisciplinary studies.

Shortly after the NRC/BASC report was published, NOAA published a plan on improving its delivery of climate services. The plan focuses upon integrating diverse elements within NOAA through a Program Board to set priorities, a Program Office, and an external Science Advisory Board. The plan inventories existing NOAA activities and cites strategic priorities for each of four areas: monitoring and observations, research, modeling, and services.

The American Meteorological Society, at about the same time, put forth two proposals of its own. One, "Improved Weather and Climate Services for the Nation," focuses on the ability of the meteorological community to conduct research and improve forecasting. The proposal calls for an investment in infrastructure and research, examination of policies, focus on education, and establish a National Commission on the Atmosphere to provide advice to elected officials and the scientific community. The second document, "A National Priority: Building Resilience to Natural Hazards" is co-signed with 34 other organizations. It focuses on activities that can be taken to reduce vulnerability to natural hazards, of which most are weather or climate-related.

Two other initiatives are not discussed in detail, but bear mention. For nearly a decade, the USDA has been involved in developing the Unified Climate Access Network (UCAN). UCAN already addresses some of the major points raised by the NRC/BASC and NOAA reports. It can serve as a central element to improve access to climate information for a variety of users. The other initiative is President Bush's "Clear Skies" initiative. Although it is not specifically climate-related, it does address environmental issues and may be worth looking at in that context.

## **A Climate Services Vision: First Steps Toward the Future** National Research Council / Board on Atmospheric Sciences and Climate, 2001

The National Research Council report was designed to summarize the state of climate services and offer some recommendations for the potential evolution of climate services. The report offers no concrete structures or funding needs, but it does set the stage for discussions on how climate services should evolve and what structures would be required to move the process along.

The Board on Atmospheric Sciences and Climate (BASC) was asked by the Federal Committee for Meteorological Services and Supporting Research to: (1) define climate services; (2) describe potential audiences and providers of climate services; (3) describe the types of products that should be provided; (4) outline the roles of public, private, and academic sectors; and (5) describe fundamental principles that should be followed in the provision of climate services. BASC initiated a series of planning meetings during 2000 to address these issues, including a workshop at Woods Hole in August of that year.

### Definition / Demand for Climate Services

In the report, the Board defines climate services as “the timely production and delivery of useful climate data, information, and knowledge to decision makers.” The report states that historically, climate services were based on statistical analysis of existing weather records. In recent years, understanding short-term climate fluctuations and improvements in forecasting have changed climate services. However, despite such gains in knowledge and forecast skill, effective use of information is not straightforward. What a climatologist considers a skillful forecast may have drastically different impacts within the bounds of the forecast’s uncertainty.

Societal value of climate information is dependent upon:

- The strength and nature of linkages between climate, weather, and human activities;
- The nature of uncertainties associated with forecasts;
- The accessibility of credible and useful climate information by decision makers;
- The ability of users and providers to identify each other’s needs and limitations;
- The ability of users to respond to useful information.

Much of this relates to communication between the producers and stakeholders or decision makers.

### Evolution of Climate Services in the United States

Climate services are continually evolving in response to a growing understanding of climate combined with a growing appreciation of the intersection of climate and human endeavors. “Climate service” is best thought of as a structured portion of a larger applied earth sciences program, much like “weather service” focuses upon short-term events. Like the weather service, which was established with the purpose of collecting observations and progressed to forecasting, climate services has the potential to move beyond analysis of existing records and develop a more prognostic capability.

The efforts of multiple federal, state, and local agencies to collect climate data was brought together into the U.S. Weather Records Center, renamed the National Climatic Data Center (NCDC) in 1951. The state climatologist program was developed three years later as “an attempt

to better link the needs of state and local users and the capabilities of the Weather Bureau.” However, due to budget pressures, uneven results, and concerns over excessive federal involvement in what was perceived to be a state role, the state climatologist program was terminated at the federal level in 1973.

Recognizing that there was still a need for climate services on the regional level, the National Climate Program Act of 1978 established regional climate centers (RCCs). The RCCs were designed to “emphasize the breadth of climate service requirements, including evaluation of data, archiving, indexing, retrieval, quality assessment, synthesis, interpretation, and dissemination, and maintain a central focus on the user.” However, due to the nature of the funding – congressional earmarks – annual funding became uncertain throughout the 1990s as administrations zeroed the budget line and Congress re-appropriated funds. Even though RCCs maintain an important niche in climate services, the BASC report finds that “climate services are made up of a mixture of elements or components without effective national integration” and that “NOAA has been unsuccessful in its attempts to link the activities of NCDC, the RCCs, and the state climatologists.”

The federal structure of climate services presently consists of several entities, many of which are not directly related to other elements. Central elements include NCDC, within NESDIS and the Climate Prediction Center within the National Weather Service’s Climate Services Division. There are also several research laboratories within NOAA’s Office of Research that contribute. Other federal agencies involved in climate services include NASA (operational satellite data, data assimilation and reanalysis), the USGS (stream measurements), the USDA (Joint Agricultural Weather Facility), and the Department of Energy (research sites). Other federal programs, especially the U.S. Global Change Research Program, contributes to climate services through data collection, climate prediction efforts, conducting assessments, and research on climate change and variability. In addition to the federal efforts, a growing private sector also is involved in weather and climate services. The American Meteorological Society lists over 550 Certified Consulting Meteorologists and notes more than 250 private weather firms on the NWS web site.

#### Guiding Principles for Climate Services

Given the trends in demand for climate services and the activities in which various federal and non-federal entities are involved, BASC concludes that the growth in knowledge of climate and human interactions and technological advances, including communication networks, allow for a transformation of climate services. They envision the emergence of a broader, organized, and sustained environment service, bringing in weather, climate, land-use, pollutants, and other factors that address multiple stresses within regions. The parts act together as a more holistic place-based approach to earth sciences. This requires more cohesive management and integration to integrate data from diverse sources, rather than a diverse set of services for different elements of the earth system

The BASC reports outlines five “guiding principles” for the development of a new climate services system:

1. The activities and elements of a climate service should be user-centric;

2. If a climate service function is to improve and succeed, it should be supported by active research;
3. Advanced information (including predictions) on a variety of space and time scales, in the context of historical experience, is required to serve national needs;
4. The climate services knowledge base requires active stewardship; and
5. Climate services require active and well-defined participation by government, business, and academe.

First, the user community is diverse, with a wide range of space and time scales needed. Users are becoming increasingly diverse and knowledgeable, with a commensurate increase in specialized needs. In order to address these needs, evaluation, mutual information, and feedback are needed to improve communication and accessibility of information.

Second, research is needed not just on the fundamentals of climate variability and change, but on diffusion of knowledge and information. This requires a mission-oriented research with active mechanisms to transfer knowledge from research to useful products.

Third, information has to go beyond numbers and prediction; it requires context. Information should be presented from the perspective of the historical record to guide understanding of natural variability. Predictions should be accompanied by analysis of probabilities, limitation, and uncertainties. Access to knowledge on causes and character of natural variability are necessary. Continuous, accurate, and reliable historical climate observations are needed at diverse locales, and products need to be provided for scales from local to global.

Fourth, observations must be reliable and freely exchanged. The BASC report sites Karl et al. (1995; "Critical issues for long-term climate modeling", *Climate Change* 31:185-221) on data characteristics that make for reliable long-term observations. Reliable data is only the first part of it – making the data accessible is essential. This requires open and free exchange of data, combining observations into useful, multi-purpose records, and assuring synergism between observations, theories, and models. All of this should be driven by a "robust and easily accessible delivery system."

Fifth, the government, private sector, and academia each have important roles in providing climate services. The government should be motivated by "public goods and services", which they describe as non-rival and non-exclusive. These are products that are of a general nature, not for individuals or individual commercial operations. Government should also take the lead role in maintaining the official climate records. The private sector should use the data to meet basic and applied research needs of its users. The private sector is also the primary developer of new technology, and should retain its proprietary interest on data it generates, even if those data are subsequently transferred to a public agency. Academic research organizations should focus on their central mission of research, education, and outreach. Sometimes this may include research data and analysis and product development in partnership with industry towards meeting these goals.



### First Steps Toward an Effective Climate Service

The specific recommendations offered in the report are “first steps” toward developing a comprehensive climate services effort. As such, they are largely focused upon enhancing, rather than reorganizing, existing activities. Therefore, present relationships in the provision of information to the public would remain largely unaltered.

Their recommendations fall into three general categories with ranked specific sub-categories:

#### 1. **Promote more effective use of the nation’s weather and climate observation systems .**

- *Inventory existing observing systems and data holdings* – this effort would be led by the Office of the Federal Coordinator for Meteorology; non-federal systems should be evaluated for adherence to principles and resources needed to bring them into compliance.
- *Promote efficiency by seeking out opportunities to combine efforts of existing observation networks to serve multiple purposes in a more cost-effective manner.*
- *Create user-centric functions within agencies* – formal mechanisms are needed to foster a “structured dialog” between climate scientists and forecast users.
- *Perform user-oriented experiments* – study the mechanisms of production, distribution, communication, understanding, and format of how information is used.
- *Create incentives to develop and promote observation systems that serve the nation* – develop a federal matching program for states and regional centers or networks related to local climate services that fosters greater coordination, stewardship of the data, and free exchange.

#### 2. **Improve the capability to serve the climate information needs of the nation.**

- *Ensure a strong and healthy transition of U.S. research accomplishments into predictive capabilities that serve the nation.*
- *Expand the breadth and quality of climate products through the development of new instrumentation and technology.*
- *Address climate service product needs derived from long-term projections through an increase in the nation’s modeling and analysis capabilities.*
- *Develop better climate service products based on ensemble climate simulations* - including blending model-data hybrids to extend records and for variables which are not directly observed; model results should be targeted to specific issues.

#### 3. **Interdisciplinary studies and capabilities are needed to address societal needs .**

- *Develop regional enterprises designed to expand the nature and scope of climate services* – develop an “intimate connection” between research, operational activities, and the support of decision making; requires integrated observations, regional information systems, framework for process studies (to identify deficiencies in understanding), predictive capability, and user-centric function (research tuned to user needs).
- *Increase support for interdisciplinary climate studies, applications, and education* – put more funds into place-based institutions to promote policy-driven knowledge, including developing infrastructure and staffing.
- *Foster climate policy education* – climate services is increasingly interdisciplinary; should initiate majors and minors in climate policy.
- *Enhance the understanding of climate through public education* – outreach and education are needed in predictions, understanding uncertainties and probabilities.

## **NOAA's Climate Observations and Services** National Oceanic and Atmospheric Administration, 2001

In the latter part of 2001, NOAA issued a document that summarizes their climate services and strategic priorities. The document describes their actions in terms of observations, research, modeling, diagnostics, analysis, products, and services with respect to climate information. The purpose of the document is to move toward a more coordinated, integrated program of climate services, in tandem with the recommendations offered in the NRC / BASC report. Concurrent with the report, NOAA established the Climate Observations and Services Program. The new program is designed to integrate resources from several line offices with interagency, academic, and private sector partners. Together, the plan and the Program seeks to improve utilization of climate information.

The NOAA plan calls for an integrated focus – transforming observations into products and services that are meaningful to user groups. The heart of the proposal is (1) attention to observations, (2) research, modeling, diagnostics and analysis, and (3) products and services. Their plan recognizes that much of the information coming from the meteorological and climatological communities lack sufficient consideration of the needs of external users. They call for a new emphasis reflecting the pull for knowledge from regional users and a mechanism for feedback to influence the content of each of the three areas.

### The Observing System

The NOAA document states that “observations are the foundation of climate services.” NOAA monitors, collects, and archives data about every aspect of the atmosphere, including the physical state of the oceans, atmosphere, land surface, cryosphere, atmospheric composition, and pre-instrumental paleoclimate records. Observation systems range from ground-based in-situ measurements such as ASOS, the Climate Reference Network, and the Cooperative Observer Network, to remote sensing techniques such as satellites and radar. NOAA agencies also archive data from ships, buoys and radiosondes to provide important information in data-sparse regions. Observations are supplemented by climate information reconstructed from tree rings, corals, ice cores, ocean sediments, and pollen data, in addition to historical documents. Various levels of quality control are applied to these data sets, and information about the data and observing systems is maintained for further analysis.

### Transforming Data into Information

Archiving data is not sufficient to meet climate services needs. A variety of research, models, and analyses are needed to turn numbers into information. Research activities within NOAA include aspects of climate variability, the water cycle, atmospheric chemistry and aerosols, the carbon cycle, and climate and society. The latter includes attention to institutional, economic, and cultural behavior, to determine how humans prepare for and respond to climate variability.

NOAA's models operate on seasonal to inter-annual time scales, in addition to the climate change models that look decades or longer into the future. Model improvements are tested at one of seven Applied Research Centers to improve model prediction and reduce uncertainty.

NOAA engages in several activities to place data into context. These include development of specialized data sets, model reanalysis, and trend analysis. The goal of these efforts is to better understand and monitor changes in the climate system, match observations with theory, model data not available elsewhere, and remove biases from observation records (such as time-of-day).

#### Products and Services

NOAA's products and services encompass seven groups: climate data products, assessments, monitoring, applications, forecasts and outlooks, education and outreach, and private sector products and services. In producing products within each of these groups, NOAA seeks collaboration with others, including means such as regional consortia, constituent meetings, and joint workshops. Products range from statistical analyses used in planning to seasonal outlooks on the development of climate events such as ENSO, drought, or seasonal hurricane activity.

NOAA also periodically publishes statements on the 'state of the climate'. Projections or outlooks of upcoming seasonal climate conditions often accompany such statements. Several NOAA programs include hands-on collaboration with decision-making communities to understand applications and limitations of products.

#### Structure and Strategic Priorities

NOAA seeks to build upon existing efforts, including existing climate services in Regional Climate Centers and State Climatologists, which they view as a model of transforming research into operations. Private industry partnerships "hold tremendous promise: for innovative application of information." In addition, partnerships with other mission-driven agencies, universities, and the international community are viewed as essential elements of both climate research and information dissemination.

The proposal seeks to build upon present capabilities by improving interaction between research and operations. To address this goal, the document outlines a new management structure. The proposal would create a Program Board to review priorities and budget elements, a Program Office to provide staff support to the Board, and an external Science Advisory Board to provide scientific advice and feedback.

The document also outlines strategic priorities for each of the activities discussed previously. For Monitoring and Observations, strategic priorities include developing benchmark data sets, modernizing and extending records, improving satellite-based systems, providing easy and affordable access to data and information, enhancing linkages to prediction, and leveraging partnerships. Research priorities include expanding the predictive capability of natural climate variability and supporting research on precipitation, water vapor, and atmospheric aerosols. Priorities for Modeling efforts focus on climate prediction from months to years, climate variability and predictability on longer time scales, addressing uncertainties in modeling and assessment of greenhouse gas concentrations and regional climate impacts, and developing a common computing and modeling infrastructure to better link research to operations. Service priorities include regional and sector-based research and demonstration projects, coordinating information delivery through collaboration with non-federal entities, developing public-private partnerships, improving assessment capabilities, and easing access to data, products, and knowledge.



**Improved Weather and Climate Services for the Nation:  
A Blueprint for Leadership**  
American Meteorological Society, 2001

The “Blueprint for Leadership” outlines the pressing needs and recommended actions for the atmospheric science community. It was developed for the purpose of influencing the Bush administration and Congress on research needs and funding issues. The importance of weather and climate are highlighted in the following quotes:

- “The impacts of weather and climate on everyday life are increasing.”
- “Each year, the aggregate toll amounts to thousands of deaths and billions of dollars in property loss and business disruption.”
- “Good weather and climate information and the associated services can be used to ensure a safer public, an expanding economy, a healthier environment, and a greater measure of national security.”
- “Despite great improvements in weather and climate services, public and commercial providers are failing to keep pace with growing national needs.”

The document outlines ‘current challenges’ in the meteorological community:

- Despite repeated modernizations over its 130-year lifetime, the weather observation network is aging and incomplete; there are inadequate funds for implementation of new technology to fill gaps;
- Monitoring networks for soil moisture, vegetation, stream flows, chemical processes, ocean temperature and salinity, etc., are in urgent need of refurbishing and augmentation;
- Computer resources are inadequate to run models at needed resolutions, to incorporate observations from varied sources effectively, and to produce the forecast ensembles needed to reduce uncertainty.

The Blueprint identifies recommended actions to address these shortfalls:

1. Infrastructure Investment – accelerate the current rate of investment in infrastructure for vital weather and climate monitoring and prediction;
2. Research Investment- augment weather and climate R&D and facilitate more rapid transfer into products and services;
3. Policy – examine policies that affect weather and climate services and strengthen international commitments to free and open exchange of meteorological data;
4. Education – increase the emphasis on meteorological education in public schools; and
5. Commission – establish a National Commission on the Atmosphere to provide the new administration and Congress with advice on these matters and explore how our nation’s weather and climate services can be optimally deployed.

With regard to climate services, if these initiatives were fully funded it would provide a wealth of new data and forecasts that could be employed in weather and climate services. Refurbishing and augmenting existing networks and implementing new technology would greatly increase the flow of information for those who provide services. If the atmospheric sciences community were able to deliver on the promise of improved predictions, the demand for specialized services would likely increase, creating more need for both public and private sector services.

## **A National Priority: Building Resilience to Natural Hazards** Proposal to the Natural Hazards Caucus Workgroup, 2001

The American Meteorological Society joined with 34 other co-signing organizations to produce a proposal for dealing with natural disasters. The document cites increasing costs of disasters, due to population growth and rising wealth. Each decade, property damage has doubled or triples in terms of constant dollars, to the point that the most devastating disasters now rival the costs of conducting wars. Nearly all disasters are weather- or climate-related. Severe weather or other hazards create tremendous impacts on the economy, may produce water shortages that cause societal and environmental stress and power shortages, may interfere with military missions, and may involve legal battles over air quality.

The co-signers conclude that resilience to extreme weather and climate events can be improved through taking the following steps:

1. Conduct, with Congress and the nation, a national assessment of community vulnerability;
2. Develop incentives that will encourage communities and state to implement pre-event mitigation measures;
3. Improve the timeliness and reliability of hazard detection and warnings;
4. Build resilience to hazards into every relevant federal government decision;
5. Create partnerships and put them to work;
6. Measure progress;
7. Develop a national culture of learning from mistakes;
8. Work cooperatively with other nations to reduce vulnerability to hazards; and
9. Provide leadership.

A national assessment would provide direction to local mitigation efforts and improve planning for anticipated problems. An awareness of vulnerability would help individuals take action that would reduce their own risks. The awareness also could help target assistance for community-level mitigation measures, such as FEMA's Project Impact. Mitigation measures include land use measures, disaster-resistant construction, and protecting critical infrastructure. Additional Research and Development is needed to make solutions more cost-effective and affordable.

Hazard detection and warnings begins with people. The co-signers advocate not just predicting hazards, but determining the social consequences and means to reduce threats. Again, research and development is at the cornerstone of such an endeavor. Observing networks, communications, and computing are needed to monitor early onset of hazards, better predict their development and impacts, and relay information, especially "from information starved to information rich."

Implementing these recommendations takes partnerships between all levels of government, private enterprise, non-governmental organizations, the academic community, and the general public. Frameworks that enable and foster collaborations are needed.

## LEGISLATIVE INITIATIVES



The following section summarizes bills in Congress that directly pertain to climate services or aspects of climate services. The three bills are the Energy Policy Act of 2002, containing sections on global climate change and establishing a National Climate Services and Monitoring program, the Drought Preparedness Act of 2002, and the Weather Safety Act. Of the three, the Energy Policy Act has progressed the furthest; it has passed both houses and is in Conference Committee. The Drought

Preparedness Act also has some life; it was introduced in both Houses and has many co-sponsors. The Weather Safety Act is less likely to pass, given that it was introduced late in the session and the sponsor, Rep. J.C. Watts (R-OK), is retiring.

The key sections of the Energy Policy Act are those relating to establishing a National Climate Services and Monitoring program, the Ocean and Coastal Observing System, and the National Climate Change Vulnerability and Adaptation Program. The first of these allocates up to \$75 million per year for the heirs of the National Climate Program Office (what it was named in 1978, but no such program office is listed on the Department of Commerce or NOAA web site now). Even if the \$50 million to be allocated for fiscal year 2002 represents current funding, that still represents an increase of \$25.5 million over the next two years. Two of the specified elements are functions in which State Climate offices are presently engaged:

1. A program for long-term stewardship, quality control, development of relevant climate products, and efficient access to all relevant climate data, products, and critical model simulations; and
2. Mechanisms to coordinate among federal agencies, state, and local government entities and the academic community to ensure timely and full sharing and dissemination of climate information and services, both domestically and internationally.

The Drought Preparedness Act would provide \$2 million annually for the coordination and integration of federal, state, tribal, and local drought plans. It includes development of common criteria for drought and incentives for pre-positioning resources to mitigate effects of drought.

The Weather Safety Act would focus efforts on assessing and reducing state's vulnerability to impacts related to both long-term climate change and shorter-term climate variations. The first two years are provided for developing assessments within each state of the vulnerability and resources available. These would be included in a state Vulnerability Scorecard. The Scorecards then would act as a basis for future mitigation efforts and funding initiatives. The Act would provide \$10 million over the first two years for these purposes.

## ENERGY POLICY ACT OF 2002 (H.R. 4)

Introduced 7/27/2001 in House by **Rep. Tauzin** (R-LA); co-sponsors **Reps. Hansen** (R-UT), **Oxley** (R-OH), and **Thomas** (R-CA)

Related Senate Bill *S.517* introduced 3/12/2001 by **Sen. Bingaman** (D-NM), co-sponsors **Senators Crapo** (R-ID), **Domenici** (R-NM), and **Murray** (D-WA)

Passed House and alternate version passed Senate; in Conference Committee (last met July 25)

In November 2001, the “Global Climate Change Act of 2001” was introduced as Senate Bill S. 1716. Since that time, the bill became included as part of the omnibus Energy Policy Act of 2002, or “the Energy Bill” as it has become known. The Climate Change Act includes not only aspects related to global climate change, but also would establish a National Climate Service. The following discussion focuses upon aspects of the original Senate Bill that are included as part of the Energy legislation.

The Energy Bill contains 9 basic parts:

- Division A – Reliable and Diverse Power Generation and Transmission
- Division B – Domestic Oil and Gas Production and Transportation
- Division C – Diversifying Energy Demand and Improving Efficiency
- Division D – Integration of Energy Policy and Climate Change Policy
- Division E – Enhancing Research, Development, and Training
- Division F – Technology Assessment and Studies
- Division G – Energy Infrastructure Security
- Division H – Energy Tax Incentives
- Division I – Iraq Oil Import Restriction

Of these, Divisions D and E include elements of S. 1716. Within each Division are one or more Titles. Key Titles include:

- Title X – National Climate Change Policy (in Division D)
- Title XI – National Greenhouse Gas Database (in Division D)
- Title XIII – Climate Change Science and Technology (in Division E)

Within each Title there may be one or more Subtitles and Parts. Titles X and XI focus primarily on generation and monitoring of greenhouse gasses. Climate Services is all contained within Title XIII. There are 6 subtitles in Title XIII:

- Subtitle A – Department of Energy Programs
- Subtitle B – Department of Agriculture Programs
- Subtitle C – International Energy Technology Transfer
- Subtitle D – Climate Change Science and Information (further separated into 3 parts – Part II contains the “National Climate Services and Monitoring.”)
- Subtitle E – Climate Change Technology
- Subtitle F – Climate Adaptation and Hazards Prevention (subdivided into 2 parts)

### Title X (Sec. 1001-10002, 1011-1016, 1021-1022, 1031-1032)

The findings on global climate change state that, based upon the Intergovernmental Panel on Climate Change (IPCC) report and National Academy of Sciences review, there is “general agreement that the observed warming is real and particularly strong within the past twenty years” and that human influences are the cause of the warming. As a result, the United States and other

developed countries should take the lead in addressing climate change and stabilize greenhouse gas levels to allow ecosystems to adapt naturally. However, this should be done in a way that minimizes economic and social disruptions, primarily through the use of flexible mechanisms such as tradable carbon credits. Furthermore, the United States should participate in international negotiations, consistent with the United Nations Framework Convention on Climate Change.

The Act defines four key elements of a national climate change strategy: (1) defining emission levels that will stabilize greenhouse gas levels, (2) doubling energy research and development funding and focusing on breakthrough technologies, (3) climate adaptation research, and (4) climate science research aimed to reduce uncertainties. It creates an Office of National Climate Change Policy within the Executive Office of the President, whose Director reports directly to the President. The Office would establish an Interagency Task Force to develop and implement a comprehensive National Climate Change Strategy that includes “meaningful participation” with federal, state, tribal and local governmental agencies, non-governmental organizations, academia, scientific bodies, industry, the public, and other interested parties. It would also include a public awareness campaign “to further the understanding of the full range of climate change-related issues.” The National Academy of Sciences would review the strategy and each 4-year update to evaluate the goals and recommendations, including evaluating the current scientific knowledge regarding climate change and its impacts, understanding of human social and economic responses and natural ecosystems, advancements in energy technologies, and economic costs and benefits of mitigation or adaptation activities. The bill provides \$5 million annually for this Office and an undetermined sum for the National Academy’s review.

The Act also creates an Office of Climate Change Technology within the Department of Energy. This Office would manage energy technology research and development. This Office would undertake cutting-edge research with great potential for transforming energy production or demand. As R&D programs mature, they would be transferred to other, existing programs. This new Office would have a budget of \$4.75 billion over eight years.

Other provisions in Title X include a requirement that the Office of Science and Technology Policy (OSTP) “understand, assess, predict, mitigate, and respond to global climate change” and advise the President and Director of the new Office of National Climate Change Policy on science and technology issues related to global climate change. Another provision requires that any regulations that significantly affect energy supply, distribution, or use shall include an estimate of the change in net annual greenhouse gas emissions resulting from the action and state any reasonable alternatives to that action.

#### Title XI (Sec. 1101-1111)

Title XI establishes a greenhouse gas inventory, reductions registry, and information system for use by public and private entities to design efficient and effective greenhouse gas emission reduction strategies. It sets forth requirements for the Departments of Energy, Commerce, and Agriculture and the Environmental Protection Agency to develop the database and standards and to monitor emissions and carbon sequestration activities. The designated agencies would publish an annual report that describes the total greenhouse gas emissions and reductions during the year, including a sector-by-sector analysis of emissions and reductions. The scientific methods used to



calculate emissions and reductions would undergo review by the National Academy of Sciences to evaluate the methods, assumptions, and standards used.

Title XIII, Subtitle D (Sec. 1331-1337, 1341-1349, 1351-1352)

Subtitle D consists of three general parts: amendments to the Global Change Research Act of 1990, National Climate Services and Monitoring, and establishing an Ocean and Coastal Observing System.

Amendments to the Global Change Research Act are aimed at increasing the flow of information from the Committee on Earth and Environmental Sciences (that oversees GCRP; renamed in the bill to the Committee on Global Change Research) to policy makers. Of particular note, the amendment would “establish a common assessment and modeling framework that may be used in both research and operations to predict and assess the vulnerability of natural and managed ecosystems and of human society in the context of other environmental and social changes.” It also creates an Integrated Program office within OSTP that would manage interagency coordination, budget requests, and allocate funds that address critical research objectives or operational goals of the program, especially to fill research gaps. The Committee would be required to develop a list of priority areas for research and development that would be funded via NSF’s Science and Technology Policy Institute, with no less than \$17 million allocated annually for those priorities

The National Climate Services and Monitoring amends the National Climate Program Act (1978; hereafter NCPA). Findings in the bill state that “the present rate of advance in research and development and application of such advances is inadequate and new developments must be incorporated rapidly into services for the benefit of the public” and that “the United States lacks adequate infrastructure and research to meet national climate monitoring and prediction needs.” Amendments focus attention on climate variability, including seasonal and decadal fluctuations.

Changes to NCPA focus on “methods for improving modeling and predictive capabilities and developing assessment methods to guide national, regional, and local planning and decision-making on land use, water hazards, and related issues.” It also adds that the Secretary of Commerce shall submit a plan of action for a National Climate Service under the National Climate Program, containing the following elements:

3. A national center for operational climate monitoring and predicting;
4. Design, deployment, and operation of an adequate national climate observing system;
5. Establish a national coordinated modeling strategy;
6. Improve modeling and assessment capabilities on regional and local scales;
7. Improve capacity to assess impacts of predicted climate changes and variations;
8. A program for long-term stewardship, quality control, development of relevant climate products, and efficient access to all relevant climate data, products, and critical model simulations; and
9. Mechanisms to coordinate among federal agencies, state, and local government entities and the academic community to ensure timely and full sharing and dissemination of climate information and services, both domestically and internationally.

There is also a related provision [Sec. 1501(a)(3)] that would require “free exchange of meteorological data.” The original NCPA created a National Climate Program Office within the Department of Commerce. Funding would go to the heirs of this entity. The bill authorizes, \$50, \$65, and \$75.5 million for fiscal years 2002, 2003, and 2004, respectively. There are additional provisions that provide support for focused research on the Pacific and Arctic, and a \$10 million annual appropriation for the study of abrupt climate changes.

The Ocean and Coastal Observing System would establish and maintain an integrated system for long-term, continuous, and real-time observations for assessing climate change processes, improving forecasts and warnings, strengthening national security, enhancing the safety and efficiency of marine observations, managing coastal ecosystems, evaluating the effectiveness of environmental policies, reducing ocean and coastal pollution, and providing information to the public. The system would use “an end-to-end engineering and development approach” to design the system, integrate existing operations, include demonstration projects, and work with “academic, State, industry and other actual and potential users”. Standards will include a common set of measurements, standards for quality control, evaluation of forecast models, data management standards, and designation of regions. The Act provides \$235 million in 2003, increasing to up to \$445 million in 2006 to the National Ocean Research Leadership Council.

Title XIII, Subtitle F (Sec. 1371-1373, 1381-1385)

Subtitle F has two parts: creation of the National Climate Change Vulnerability and Adaptation Program and programs for utilizing remote sensing data and air quality studies. The National Climate Change Vulnerability and Adaptation Program would be created within the Department of Commerce with a budget of \$4.5 million. The Program would conduct vulnerability assessments based upon the state-of-knowledge climate predictions, including evaluating severe weather events, sea level changes, hydrologic cycle changes, natural hazards, and alteration of ecological communities. The program would submit a report to Congress that identifies actions that may be taken to reduce vulnerability of human life and property, improve resilience to hazards, minimize economic impacts, and reduce threats to critical biological and ecological processes. The Secretary will also undertake an assessment of coastal regions and devise an adaptation plan. The Act includes a program to provide technical planning assistance to coastal States and local governments, providing information from the national assessments for each state or local region to develop its own plan. Three million dollars are provided annually for regional assessments and an additional \$3 million for coastal adaptation grants. An additional \$35 million is provided for construction and support of the Barrow Arctic Research Center.

Pilot projects that would integrate sources of remote sensing and other geospatial information would be funded by NASA through the NOAA Coastal Services Center. Priority would be given to areas most sensitive to climate change, those that make use of existing data sets, and those that integrate multiple sources of information. In addition, NOAA would conduct regional air quality studies to assess the effects of pollutants, transport of pollutants between regions, and production of pollutants via chemical reactions. NOAA would establish a program to provide operational air quality forecasts and warnings for specific regions within the United States. Appropriations are made of \$3 million annually for regional studies and \$5 Million initially with undetermined annual appropriations for forecasts and warnings implementation. Total appropriations for these activities will be \$17.5 million in 2003 increasing to \$25 million in 2006.

## **DROUGHT PREPAREDNESS ACT (H.R. 4754 / S 2528)**

*HR 4754* Introduced 5/16/2002 in House by **Rep. Hastings** (D-FL); 55 co-sponsors  
*S 2528* Introduced 5/16/2002 in Senate by **Sen. Domenici** (R-NM); 19 co-sponsors  
Last Action: Referred to committees when introduced (both bills in Committee)

The Drought Preparedness Act was introduced separately within the House and Senate in identical form. The Act would establish a National Drought Council, improve national drought preparedness, and assist mitigation and response efforts. The Act defines drought as “a major natural disaster that is caused by a deficiency in precipitation” that leads to deficiencies in water supplies or causes substantial economic or social impacts or physical damage or injury to individuals, property, or the environment.

The National Drought Policy Commission, that was established in 1998, issued a report in May 2000 that included the following elements. The Commission favored preparedness over insurance, insurance over relief, and incentives over regulation. Delivery of services should be “through collaboration with state and local governments and other non-federal entities.” The Commission also encouraged the development of research priorities and noted the need for improved collaboration among scientists and managers. The Drought Preparedness Act builds upon these principles to develop a federal program for streamlining resources and assistance to states, tribal, and local governments.

The Act establishes a National Drought Council, composed of eleven members drawn from federal and non-federal entities. Four members would be agency directors: the Director of the Federal Emergency Management Agency (FEMA) and Secretaries of the Interior, Agriculture, and Army. Four members would be governors, one each from designated FEMA regions. The remaining appointments would be: one member appointed by the Federal Co-chair in coordination with the U.S. Conference of Mayors, one member appointed by the Secretary of the Interior in coordination with Indian tribes, and one member appointed by the Secretary of Agriculture, in coordination with the National Association of Conservation Districts. Council members would serve two-year terms and meet at least semiannually. The Council would be co-chaired by the FEMA Director and one member selected from the non-federal members. The Council would have a term of 8 years and a budget of \$2 million annually, and may be extended upon the Council’s recommendation.

Specified duties of the Council would include:

- Developing a comprehensive National Drought Policy Action Plan, within one year of the first meeting, that delineates and integrates responsibilities among federal agencies, assures those activities are coordinated and integrated with other non-federal entities, and avoids duplication of drought preparedness and monitoring programs already in existence;
- Evaluating federal drought-related programs and recommending steps to eliminate discrepancies between goals and actual service delivery, duplication, and other circumstances that interfere with the effective operation of the program;
- Recommending common interagency triggers for authorizing federal drought mitigation programs and improving the fairness and consistency of assistance programs;

- Developing an effective drought information delivery system through the National Drought Monitoring Network that would communicate drought conditions and impacts to non-federal entities, including near-real-time data, information and products.
- Facilitating the development of drought preparedness plans;
- Making available drought planning models to reduce water resource conflicts;
- Developing and coordinating public awareness activities, including explanations on causes, impacts, damages, benefits of land stewardship, appropriate responses, and information on state and local laws.

The Council would be required to consult with groups affected by drought, including representatives of agricultural production, wildlife, fisheries, forestry and fire management, credit community, rural and urban water associations, environmental interests, engineering and construction, scientists, and small businesses. The Act also establishes the National Office Drought Preparedness to provide assistance to the Council.

The Act also creates a Drought Assistance Fund. The Fund would be used to provide financial assistance to states, Indian tribes, local governments and critical services providers for activities involved in the preparation and implementation of drought plans. Funds could also be used for activities related to technology transfer and strategies, developing post-drought evaluations, and supplementing costs of a drought information delivery system. No authorization amount is specified.

The Act requires critical affected agencies (FEMA, Interior, Agriculture, and the Army) to develop drought plans within two years, stating that these plans should be integrated within a larger federal planning requirement. The plans should also be integrated with State, tribal, and local government plans that are affected by federal projects and programs. State, tribal, regional, and local plans should include mechanisms for monitoring resources, identifying areas that are at high risk for drought, mitigation strategies to reduce the vulnerability of an area, and be integrated with other existing plans.

All drought plans should contain the following provisions: (1) address the health, safety, and economic interests of persons directly affected by drought; (2) consider environmental issues such as water quantity and quality, protection of threatened and endangered species, and fire management; (3) include hydrologic characterization studies to determine how water is being used during times of normal water supply; (4) thresholds or criteria for mitigation or emergency assistance (drought triggers); (5) specific implementation actions, including water allocation and wildlife management; (6) comprehensive insurance and financial strategies to manage risks and financial impacts; and (7) consider the impact of the plan on utility rates and revenues for those that may suffer adversely from water shortages. Periodic drought exercises and plan updates are recommended. All plans should allow for public participation in their development, adoption, and implementation.

The Act also contains a provision for wildfire suppression activities. The federal government expended over \$630 million annually from 1996-2000, and anticipates that it is more cost-effective to pre-position resources than to respond to large fires once they are out of control. Through FEMA, states may be reimbursed for a portion of expenses related to mobilization of resources from staging areas for areas where fires pose a threat to life and property.

## WEATHER SAFETY ACT (H.R. 4900)

Introduced 6/6/2002 in House by **Rep. Watts** (R-OK); co-sponsors **Reps. Gene Green** (D-TX) and **Simmons** (R-CT)

Last Action: Referred to House Committee on Science on 6/6/2002

The Weather Safety Act would create a new Office of Climate Change Vulnerability and Resilience Research within the Department of Commerce. The Office would manage the National Climate Change Vulnerability and Resilience Program and coordinate climate change and climate variation vulnerability and resilience research within the United States. An initial appropriation of \$10 million is authorized in the bill.

The Program's purpose would be to evaluate and make recommendations with respect to local, regional, and national vulnerability and resilience to impacts for both long-term climate change and shorter-term climate variations. The Act stipulates that the Secretary of Commerce shall consult with federal agencies participating in the U.S. Global Change Research Program and other appropriate federal, state, or local agencies.

The first task of the new Office and Program would be to conduct vulnerability assessments for each state. Evaluations would be based upon historical data, current observational data, and, where appropriate, available predictions of vulnerability to phenomena associated with climate change and variation. Such phenomena include changes in severe weather events, natural hazards – including droughts, floods, wildfires, and tsunamis, annual and inter-annual climate events (such as El Nino), changes in sea level, changes in the hydrological cycle, and alterations of ecological communities. A Vulnerability Scorecard would be created for each state. The Scorecard would assess each state's vulnerability to these hazards and their capacity to respond. Scorecards would be created in cooperation with state and local institutions, including university researchers and programs. The Scorecards would also act as a basis for further actions and evaluation of improvements in reducing vulnerability over time.

Within two years of the enactment of this Act, the Office would prepare a report to Congress that includes the Vulnerability Scorecards and preparedness recommendations. The report would identify and recommend implementation and funding strategies for both short-term and long-term actions that may be taken at local, state, regional, or national level to minimize threats, negative economic impacts, and to improve resilience to change.

The Act requires the Office to coordinate research programs that address vulnerability aspects of climate change or variability and to apply results of research to improve the criteria used for the Scorecards. The Office would also measure progress in each state's capacity to respond to hazards and review and update Vulnerability Scorecards and associated recommendations.

A final section of the bill stipulates: "the Secretary of Commerce shall make widely available appropriate information, technologies, and products to assist local, state, regional, and national efforts to reduce loss of life and property due to climatic change and climatic variation, and shall coordinate the dissemination of such information, technologies, and products through all appropriate channels."



***A letter on behalf of the AASC to Representative J.C. Watts, Jr. (R-OK)***

Dear Congressman Watts,

I call to your attention the American Association of State Climatologists' (AASC) recent policy statement on Climate Variability and Change. Your recent statements closely reflect the sentiment of the AASC document: "ongoing political debate about global energy policy should not stand in the way of common sense action to reduce societal and environmental vulnerabilities to climate variability and change." The AASC wholeheartedly supports your call for attention on shorter-term climate variability, and views your Weather Safety Act as an important first step in addressing our nation's vulnerability to such hazards.

The AASC document (attached here and available at: <http://lwf.ncdc.noaa.gov/oa/climate/aasc.html#policy>) includes the following:

- It is important to consider climate vulnerability as well as climate variability – past climate can help us understand variability, but societal and environmental changes must be considered to assess vulnerability;
- Human influence on climate variability is not limited to greenhouse gas emissions – factors such as land use practices have a significant impact;
- Climate predictions are not (yet) sufficiently skillful to predict events such as length of growing seasons, droughts, floods, heat waves, tropical cyclones, or winter storms, where most societal impacts are felt;
- Policy responses should be flexible and sensible, especially given the uncertainties remaining in climate and seasonal prediction models;
- Climate has a profound effect on the economy – energy, agriculture, insurance, water supply and quality, ecosystem management, and natural disasters, to name a few.

As an example of this latter point, recent articles have suggested that an unusually cool May contributed to a 0.9% national decline in retail sales from the preceding month. This in turn affects the Federal Reserve Board's decision-making on interest rates, which reverberates throughout the U.S. and global economy.

The AASC document concludes with a call for improving the climate observation and services infrastructure. On the observation side, the document calls for modernizing and maintaining high-quality long-term climate data, which is the basis for advances in understanding and prediction. On the services side, it is essential to consider communication. Climate services, provided primarily by the State Climate Offices, Regional Climate Centers, and the National Climatic Data Center, need resources to improve their ability to monitor emerging climate threats and to disseminate data and information to affected sectors.

As one of the many State Climatologists in this nation, I urge you to consider how we, and our professional organization, the AASC, can be of service to your efforts in reducing our vulnerability to natural hazards. As the State Climatologist for Oklahoma, I thought it was appropriate that I write representing the AASC, but I would also encourage you to discuss these matters with Jay Grymes, State Climatologist for Louisiana and current President of the AASC.

Thank you for your attention to the AASC policy statement and I look forward to assisting your efforts in reducing our vulnerability to natural hazards.

Respectfully Yours,  
Kenneth C. Crawford, Director  
Oklahoma Climatological Survey  
Regents' Professor of Meteorology