

## **On the Infrastructure Supporting Weather, Water, Environmental, and Climate Sciences, Services, and Assessments**

A Policy Statement of the American Meteorological Society  
(Adopted by the AMS Council on 1 October 2009)

This Policy Statement is intended to enlarge upon Section 3 of the statement entitled “Enabling National Weather and Climate Priorities,” adopted by the Council of the AMS on 17 September 2008.

The infrastructure supporting weather, water, environmental, and climate sciences, services, and assessments is a critical national resource. It is essential for optimal decision-making with respect to the protection of life, mitigating losses, environmental stewardship, efficiency of weather- and climate-sensitive sectors of our economy, and national security. This infrastructure consists of observation systems; communications; high-performance computing; and data management, archiving, and access. It also includes a vigorous research and development effort; education of the public, decision-makers, and the next generation of scientists and practitioners; and a robust service delivery system, all of which depend on effective partnerships spanning the public, private, and academic sectors.

**Observations** of the Earth system — atmosphere, ecosystems, oceans, rivers, lakes and streams, land and ice surfaces — are the fundamental building blocks of the infrastructure. Observational facilities may be surface or space-based, or on mobile platforms such as land vehicles, ships, aircraft, and balloons. Observations are used to initiate the prediction process that provides daily weather warnings and forecasts; to establish the record of climate evolution necessary for planning and policy formulation; for advancing research and development; and for myriad other applications. There exist both gaps and inefficiencies in the system; these have been identified in reports from the National Academy of Sciences, and must be addressed — nationally and internationally — in the future.

Key attributes of a low-risk observing system must include resiliency, robustness, and agility. A managed, long-term view of observations — past, present, and future — will assure the availability of needed observations, their standardization (performance, accuracy, and siting), and their transition from research into service. A necessary component of the future evolution of a composite national observation system is a mechanism for systematic quantitative tests of potential observing system contributions to national needs.

**Communications** are essential to the efficient collection of observations, their timely use in products and services, and the dissemination of those products and services. They are also essential for the international exchange of observations, and such exchanges are key to effective global partnerships. The costs and effects of weather and climate extend beyond national borders; and, of course, the value of data and information extend beyond these borders as well.

The volume of environmental data is expected to increase dramatically in coming years. Communications systems must be designed with the requisite bandwidth capacity to move information efficiently, and to afford rapid and effective automated data assimilation.

**Computing and Software.** The science of numerical weather prediction is the foundation of modern weather and climate forecasting, and scenario-based estimates of global climate change. The execution of mathematical models of the Earth system requires the acquisition of the most

advanced computing capabilities. Of necessity, our community has been a leader in calling for more powerful high-performance computing capability and associated algorithms and software.

Continued investment in high-performance computing and software will pay major dividends to the public, to industry, and to government, not only in improved weather and seasonal climate forecasts, but also by narrowing the uncertainties in climate-change estimates. Additional computing capability and efficient software will improve the complexity and realism of the Nation's environmental modeling efforts, resulting in better information for users.

***Data Management/Archiving/Access/Uses.*** As the volume of environmental information increases in future years, the efforts required for quality assurance and to store, maintain, and provide access to it must also be increased. Investments in archive systems will be critical to ensure researchers, public agencies, private industry, and the public will have access to these data and metadata for a variety of reasons.

***Research and Development.*** As human society and ecosystems under stress become ever more sensitive to the environment, timely and useful information becomes ever more important. Such information can only result from continued investment in a vigorous research and development enterprise involving our universities, industry, and government. Weather, water, environmental, and climate products and services must be based on the best available physical and social science. Advances in the sciences must be introduced into products and services effectively.

***Service Delivery.*** This nation's delivery mechanism for weather, water, environmental, and climate products and services is an enterprise involving the public sector, private service providers, and the media. Each of the partnerships involved requires continual attention and mutual respect. Enhancing this enterprise is essential to maintain and improve standards of performance for customer service delivery for accurate, timely, and consistent service.

***Education and Human Resources.*** There is an increasing need for intellectual resources in the meteorological, climatological, and related environmental sciences to address the challenges of the future and sustain our Nation's leadership. The development of human capital in STEM (Science, Technology, Engineering, and Mathematics) must begin in the early K-12 experience, through undergraduate and graduate college levels and with continuing education maintaining currency. Programs should enable participation from all under-represented groups.

***Conclusion.*** The infrastructure described in this Policy Statement is absolutely essential to the provision of weather, water, environmental, and climate services to this nation and others around the world. The components form links in a chain. Each is important; the neglect of any diminishes the effectiveness of the whole. The American Meteorological Society urges Congress and the Administration to provide continual attention to and enhanced support of these vital national resources.

[This statement is considered in force until October 2012 unless superseded by a new statement issued by the AMS Council before this date.]