

## Weather Services for the Nation: Becoming Second to None

During the 1980s and 1990s, the National Weather Service undertook a major, comprehensive modernization effort that succeeded in achieving major improvements for the weather, water, and climate enterprise. Despite this success, accelerating improvements in technology and the science of meteorology and hydrology imply that continuing modernization of the National Weather Service (NWS) is required. This report uses lessons learned from the 1990's modernization process to develop guidance on how best to plan, deploy, and oversee future improvements to the National Weather Service.

Twelve years after the official completion of the National Weather Service's (NWS) modernization project, known as the Modernization and Associated Restructuring, the NWS still faces significant challenges. These include:

### *Keeping pace with advances in science and technology*

Significant advances in the atmospheric and hydrological sciences continue, and the NWS is struggling to maintain the pace of acquiring, integrating, and communicating critical forecast and warning information based on these advances. The Modernization and Associated Restructuring focused on NWS observational and warning functions and instituted an operational framework appropriate for that time, but now critical components within the NWS are lagging behind the state of the science and, in some cases, their peer entities elsewhere in the world.

### *Meeting expanding and evolving user needs*

Needs for weather information have changed significantly in recent years. With the broad adoption of the internet and mobile technology,

members of the public have found new ways to access weather information and make use of it in their daily lives, and



now expect continuous improvements in public safety and property protection from severe weather. To meet these needs, the NWS will need to improve forecast and warning capabilities, and will need to do so faster than the rates of construction and population increase locations at risk from severe weather.

### *Partnering with an increasingly capable enterprise*

At the time of the Modernization and Associated Restructuring, the delivery of weather information was largely synonymous with the NWS and the broadcasting sector. Today, the weather, water, and climate enterprise has grown considerably. Private sector and other organizations provide sensor data, weather forecasts, and end-user services to a broad set of customers, and rely heavily on core NWS infrastructure and capabilities to provide these services. Together, this combination of the NWS and third parties serves the nation better than the NWS could on its own.

### *Responding to the challenges*

Meeting the key challenges within the evolving context will require the NWS to evolve its role and how it operates. This report presents three ways to respond to these challenges.

### **1. Prioritize Core Capabilities**

Prioritizing the NWS's core capabilities would strengthen the products and services that the public and the enterprise depend upon, such as

### *The Evolving Context of NWS Improvements*

The challenges facing the National Weather Service are made more difficult by external factors, including:

- Budget resources are uncertain and will likely be constrained for the next decade.
- Increasingly high operational performance standards are expected of the NWS.

Additional important contextual issues include: the continued rapid, transformative pace of technological change; the expansion of number and type of observational data; the continued concentration of infrastructure investment and population growth in vulnerable areas; the potential impact of climate change on weather patterns; and the continued evolution of the international dimensions.

foundational datasets, issuing watches and warnings, and transition of research to operations.

- The NWS should evaluate all aspects of its work that contribute to its foundational datasets, with the explicit goal of ensuring those foundational datasets are of the highest quality and that improvements are driven by user needs and scientific advances. As part of this initial and ongoing evaluation effort, clear quality and performance metrics should be established. Such metrics would address the technical components of NWS operations, as well as the efficiency and effectiveness of the flow of weather information to end users.
- The NWS should ensure that a similarly high priority is given to: (a) product generation and dissemination; (b) the brokering and provision of data services, and (c) development and enhancement of analysis tools for maintaining a common operating picture.
- The NWS should engage the entire enterprise to develop and implement a national strategy for a systematic approach to research to operations and operations to research.

## 2. Evaluate Function and Structure

The current structure of the NWS primarily reflects the functions of the weather, water, and climate enterprise in the 1990s. It would now be prudent to re-evaluate the NWS organizational and functional structure.

**Foundational datasets** include the collection and integration of observations, the creation of advanced analyses, and deterministic and probabilistic model-based predictions.

**Product generation and dissemination** includes general weather forecasts, watches, warnings, advisories, and guidance.

**Brokering and provision of data services** includes provision of weather, water, and climate data to the rest of the enterprise and the public, as well as international responsibilities.

**A common operating picture** is a repository of digital and environmental data and forecasts, where all types of information are integrated to facilitate their use.

- In light of evolving technology, and because the work of the NWS has major science and technology components, the NWS should evaluate its function and structure, seeking areas for improvement. Any examination of potential changes in the function and organizational structure of the NWS requires significant technical input and expertise, and should include metrics to evaluate the process of structural evolution. Such an examination would include individual field offices, regional and national headquarters and management, as well as the National Centers and the weather-related parts of the National Oceanic and Atmospheric Administration such as the National Environmental Satellite, Data, and Information Service and the Office of Oceanic and Atmospheric Research.

## 3. Leverage the Entire Enterprise

Two decades ago, the NWS was viewed as the primary source of weather information, but today the private sector and other organizations generate and deliver a wide variety of information that complements the products available from the NWS. Improving interactions between the NWS the rest of the weather enterprise interaction could help NWS enhance its mission of serving the public.

- The NWS should broaden collaboration and cooperation with other parts of the weather, water, and climate enterprise. The greatest national good is achieved when all parts of the enterprise function optimally to serve the public and businesses. This process starts with the quality of core NWS capabilities but is realized through the effectiveness of NWS-enterprise relationships. A well-formulated enterprise strategy will also return direct benefit from the enterprise to the NWS, especially in areas of shared research, technology development, observational data sources, and improved end-user access to NWS-generated information.

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The National Academies appointed the above committee of experts to address the specific task requested by the National Oceanic and Atmospheric Administration. The members volunteered their time for this activity; their report is peer-reviewed and the final product approved by both the committee members and the National Academies. This report derivative was prepared by the National Research Council based on the committee's report.

For more information, contact the Board on Atmospheric Sciences and Climate at (202) 334-3512 or <http://dels.nas.edu/basc>. Copies of *Weather Services for the Nation: Becoming Second to None* are available from the National Academies Press, 500 Fifth Street, NW, Washington, D.C. 20001; (800) 624-6242; [www.nap.edu](http://www.nap.edu).

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