Mesoscale Probability Forecast Capability: A National Imperative

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NWS S&T Roadmap

NWS is developing a Science and Technology Roadmap

- **Develop stretch goals to rally and influence Nation's research strategies, plans and investments**
- **Harness the Nation's best expertise to solve scientific challenges**
- **Field next generation observing/forecast systems to…**
  - ✓ *Ensure timely, accurate and relevant weather information for governmental decision makers, general public, private industry*
- **Ensure rapid, on-demand access to information for all…from sophisticated user to general public**

Stretch Goals and Research Needs—We Need Your Help

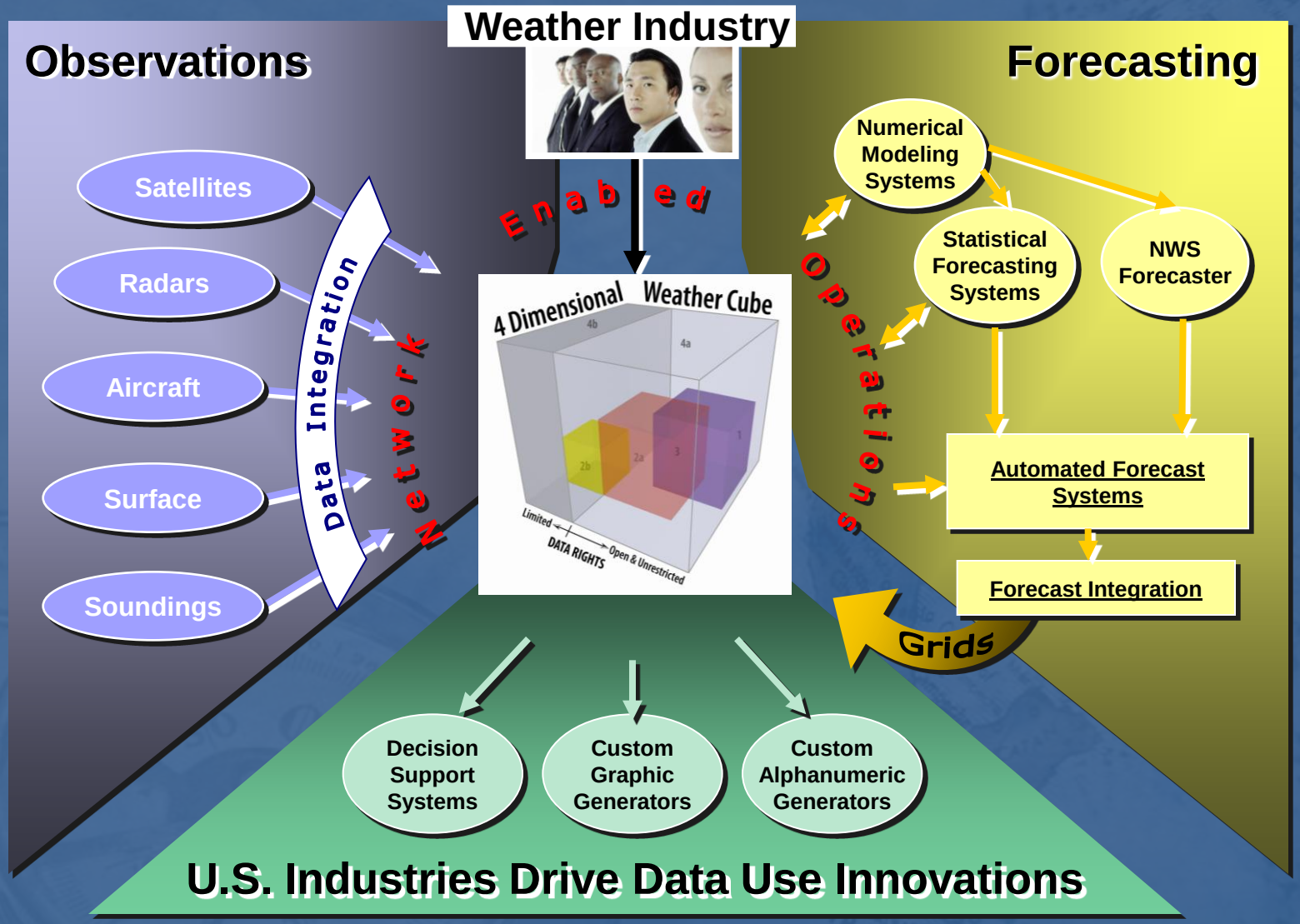
Science Service Area	Key Products/ Services	S&T Goal 2025 Examples	Research Needs and Opportunities: Examples
Fire Weather	Red Flag Warning	>24hr Lead Time (LT) with 95% POD	Simulations (high-resolution) of integrated fire weather/behavior
Hydrology	Inundation Forecasts	Dependable Street Scale Probabilistic Warnings	Physically based hydrologic models and ensembles
Aviation	Convection Initiation	30 mins LT	Initiation and evolution of convection
Severe Weather	Tornado Warning	Warn on Forecast, LT > 1hr	Improved understanding of tornado formation and severe weather microphysics
Winter Weather	Winter Storm Warning	30 hour LT	Snow band formation and snow intensity
Marine	Storm Warnings	Probabilistic Warning, LT > 5 days	Improve wave model physics from shelf to shore
Tropical Weather	Hurricane Track, Intensity Forecasts	Errors reduced by 50%	Causes of rapid intensity changes
Climate	Seasonal/IA Forecasts	Accurate 6 month+ LTs on forcing events	Earth system modeling with ensemble prediction and uncertainty
Air Quality	Air Quality Predictions	Accuracy >85% out to day 5	Advanced simulations of generation and reactive chemical transport of airborne particulate matter
Space Weather	Geomagnetic Storm Warnings	>90% accuracy, out to day 2	Data Assimilation: Ionosphere, Magnetosphere, and Solar Wind
Tsunami	Tsunami Warnings	<5 mins after triggering event	Enhanced observations and models
Emerging Areas/ Surface Wx	Wind Forecasts	1km resolution, 5 min updates	Meteorological influences on renewable and sustainable energy systems

Must Focus on Effects—Ensembles and Probabilistic Forecasts Enable Societal Benefits

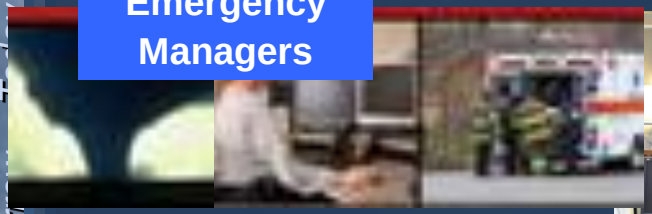
NWS SCIENCE AND TECHNOLOGY RO
Preparing for Tomorrow… Today

Improved Enabling Capabilities	Service Area Improvements	Potential Benefits
Observations Forecasts IT Infrastructure Dissemination/Access Decision Support Verification & Metrics Customer Outreach & Feedback Technologies Incorporating Social Science Strategies	Tropical Cyclone, Track, Intensity, Precip Forecasts	Reduce $10B/yr in trop cyclone damage
	Tornado and Flash Flood Warnings	Reduce $1B/yr in damage from severe wx
	Aviation, Fire, and Marine Forecasts	Reduce $60 B/yr losses from air traffic delays
	Flood and River Predictions	Reduce $4.3B/yr in flood damage
	Air Quality Predictions	Reduce mortality from 50,000/yr from poor AQ
	Space Weather	Reduce $365M/yr in losses (power industry)
	Seasonal Climate Forecasts for Energy, Agriculture, Ecosys, etc	Reduce $7B/yr in losses (drought)

Weather Information Data Base

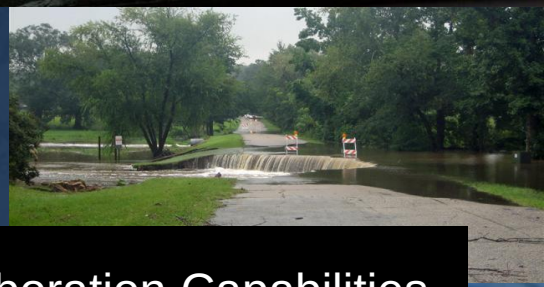


The WIDB and Decision Support



Emergency Managers

NWS Forecasters



WIDB

Emergency Operations Center

Advanced Communication/Collaboration Capabilities

IMETS

Responders

Goal

Deliver reliable, skillful, and accessible probabilistic forecasts integrated into decision support systems

- ***For some aviation weather elements by 2013***
  - ✓ Support for NextGen (Next Generation Air Transport System)
- ***For all weather elements by 2016***
  - ✓ Support for most NWS data and products
  - ✓ Support for Department of Defense and Homeland Security
  - ✓ Probabilistic forecasts critical for high end weather users
    - ***Energy production and conservation***
    - ***Hurricane evacuations***

Workshop Objectives

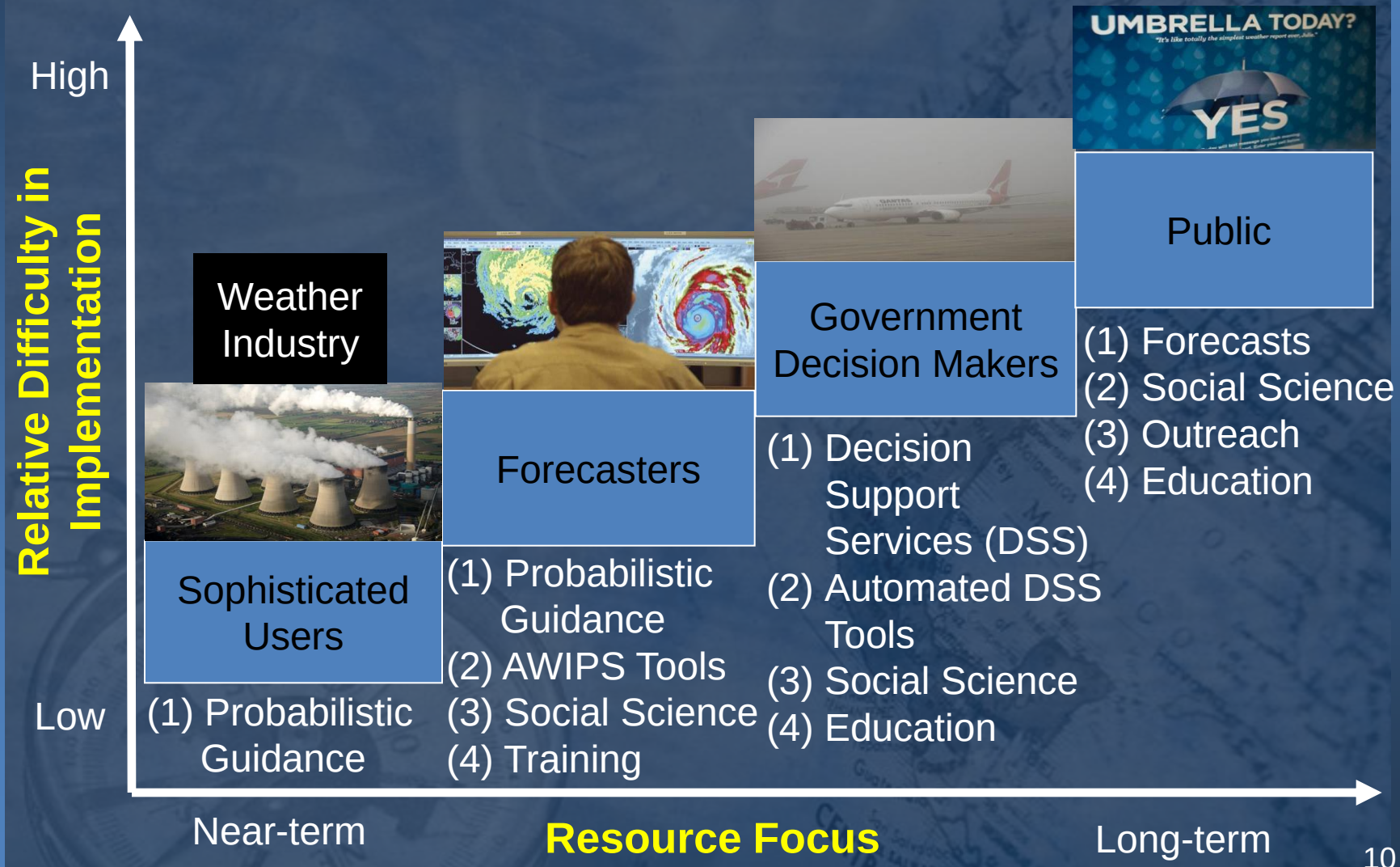
Create a framework for meeting the Nation's decision support needs

- **Tasks:**
  - ✓ *Develop an effective and lasting governance structure*
  - ✓ *Deliver a White Paper addressing strategy for success that is ambitious and executable*
    - **Disciplined testing protocols (e.g., DTC)**
  - ✓ *Workshop should focus on prediction capability*

Guiding Principles

- **Open, transparent, and inclusive development, evaluation, and implementation**
  - ✓ Harness best science from government, acedemia, and private sector
  - ✓ Rigorous evaluation of alternatives (verification; efficiency)
- **Streamline research to operations processes**
  - ✓ Consideration of operational readiness must be planned and demonstrated as an end-to-end forecast capability
- **Ensure framework consistency with larger uncertainty efforts**
  - ✓ NRC “Completing the Forecast” report
  - ✓ AMS-sponsored Ad Hoc Committee on Uncertainty in Forecasts (ACUF) strategic implementation plan
  - ✓ NWS S&T Roadmap

NWS Uncertainty Strategy



New Paradigm for the Future

Backup

Focus Area Team Summary: Post-Processing