Climate Services for Society: Challenges & Opportunities

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Impacts of Climate Change

Climate change is apparent now across our nation. Trends observed in recent decades include rising temperatures, increasing heavy downpours, rising sea level, longer growing seasons, reductions in snow and ice, and changes in the amounts and timing of river flows. These trends are projected to continue, though larger increases would result from higher levels of heat-trapping gas emissions, and smaller increases from lower levels of these emissions. The observed changes in climate are already causing a wide range of impacts, and these impacts are expected to grow.

Sea Ice and Permafrost

Risks and costs in Alaska increase as thawing of permafrost damages roads, buildings, and forests, and declining sea ice increases coastal erosion and threatens the existence of some communities.

Forests

Forest growth is generally projected to increase in much of the East, but decrease in much of the West as water becomes even scarcer. Major shifts in species are expected, such as maple-beech-birch forests being replaced by oak-hickory in the Northeast. Insect infestations and wildfires are projected to increase as warming progresses.

Coldwater Fish

Salmon, trout, and other coldwater fish will face additional stresses as water temperatures rise and summer streamflows decline. Ecosystems and the tourism and recreation they support will be adversely affected.

Interacting Stresses

Population shifts and development choices are making more Americans vulnerable to climate change impacts. An aging populace, and continued population shifts to the Southeast, Southwest, and coastal cities amplify risks associated with extreme heat, sea-level rise, storm surge, and increasing water scarcity in some regions.

Coral Reefs

Rising water temperatures and ocean acidification threaten coral reefs and the rich ecosystems they support. These and other climate-related impacts on coastal and marine ecosystems will have major implications for tourism and fisheries.

Responding to Climate Change

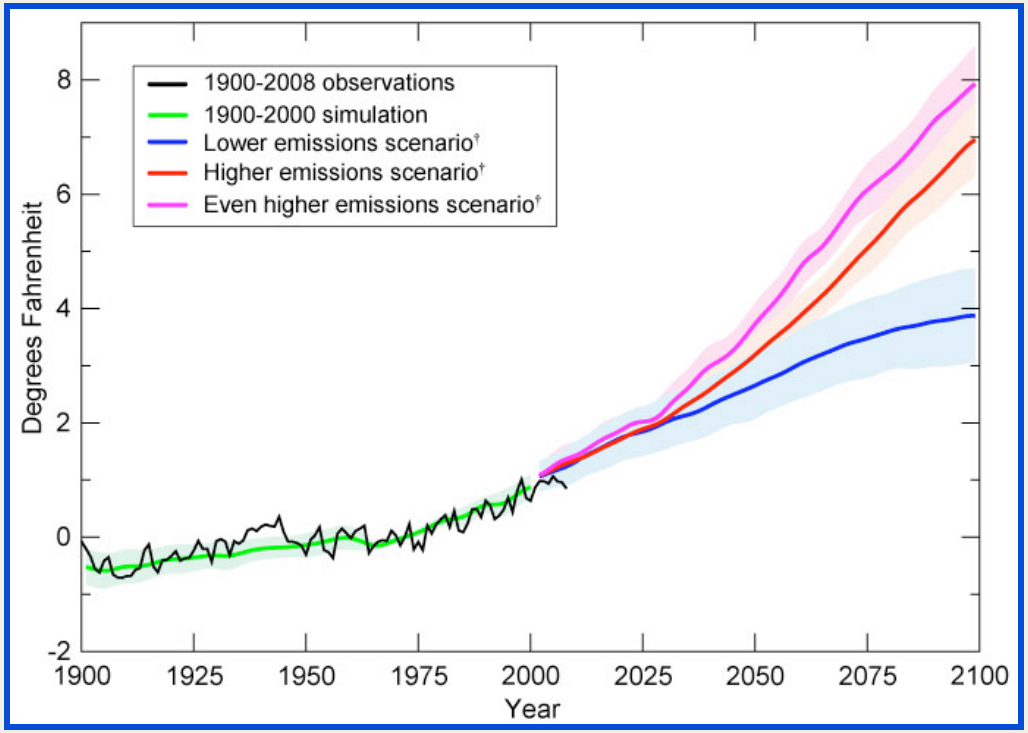
Responses to climate change fall into two major categories. “Mitigation” focuses on reducing emissions of heat-trapping gases and particles to reduce the amount and speed of climate change. “Adaptation” refers to changes made to better respond to present or future climate conditions in order to reduce harm or take advantage of opportunities. Both are necessary elements of a comprehensive response strategy.

Future climate change and its impacts depend on choices made today

Mitigation and adaptation (both are necessary)

- Large differences in future climate change projected to result from lower and higher emissions
- Scenarios underscore the importance of mitigation
- Choices about emissions now and in the coming years will have far reaching consequences for climate change impacts

Observed and Projected Global Average Temperature



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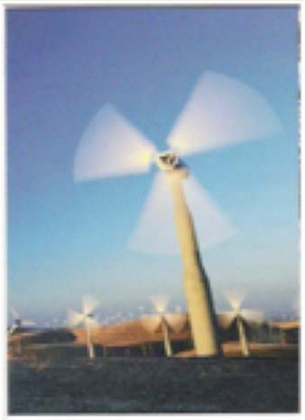
Two Complementary Responses to a Changing Climate



Mitigation: reduce emissions; energy efficiency; alternative energies, etc.

Implementation: NOW and save money

Impacts on climate change: 50-100 yrs.

Adaptation: planning ahead; incorporating likely future climate states into regular planning; taking action

Implementation: NOW and in future

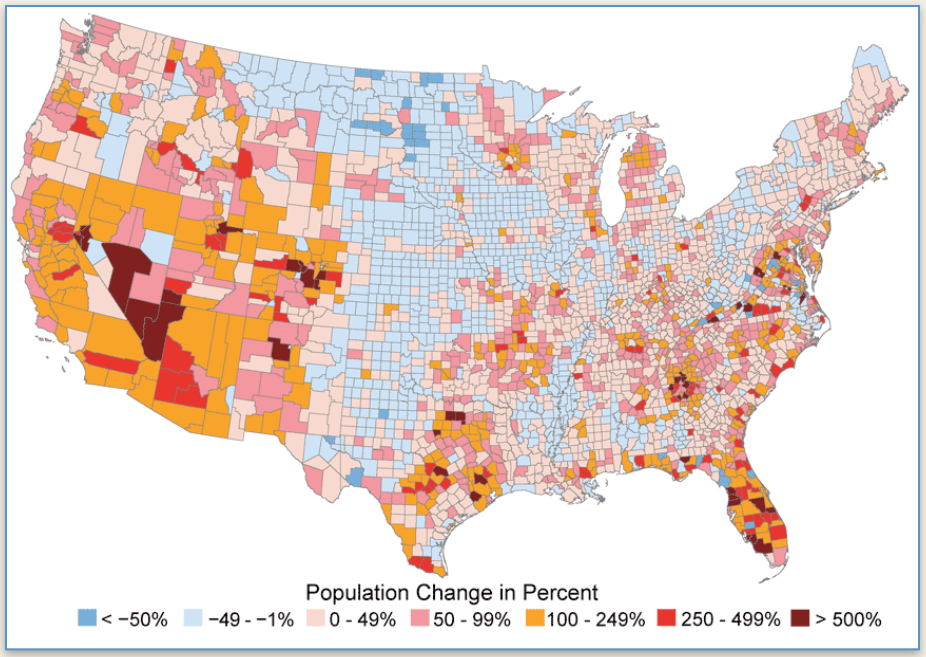
Impacts on community: Now and Future.

DECISIONS TODAY CAN REDUCE VULNERABILITY THROUGH ANTICIPATION AND ACTION

Climate change will interact with many social and environmental stresses

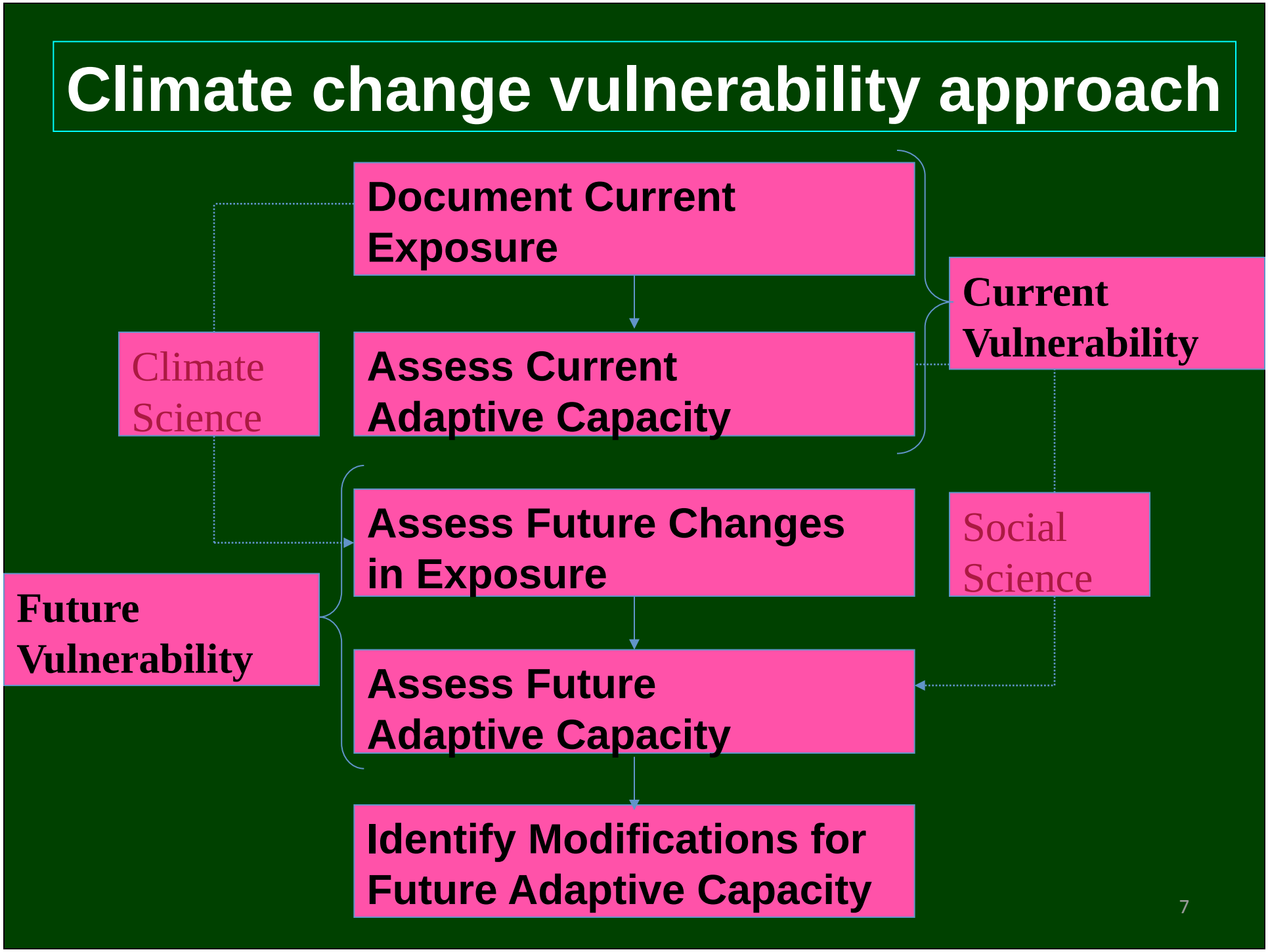
- Social trends can increase our vulnerability to climate change
  - Concentration of development along vulnerable coasts
  - Aging of U.S. population
  - Increasing urbanization
  - Population growth in Southeast, vulnerable to hurricanes, sea-level rise, and heat stress
  - Population growth in Southwest, vulnerable to increasing water scarcity and wildfires

Population Change, 1970 to 2008



- Impacts on people, infrastructure, and climate sensitive resources and sectors
- Development choices affect impacts of and vulnerability to climate change

Climate change vulnerability approach



Lessons

- **Adaptation manageable and cost effective when shared and carried out in a collaborative way**

- ***Culturally-appropriate*, *participatory process* enabling communities to explore options to reduce vulnerability and effectively balance a variety of interests and the needs**

World Climate Conference-3

Better climate information for a better future

The Vision for World Climate Conference-3 (WCC-3)

"Enable climate adaptation and climate risk management through the incorporation of science-based climate information and prediction into policy and practice at all levels."

WCC · 3

Geneva, Switzerland

31 August–4 September 2009

World Meteorological Organization
Weather • Climate • Water

UN SYSTEM
DELIVERING AS ONE ON
CLIMATE KNOWLEDGE

Pacific Climate Information System (PaCIS)

Vision: Resilient and sustainable Pacific communities using climate information to manage risks and support practical decision-making in the context of climate variability and change

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SOME SHARED LESSONS

- **Focus on integrated climate-society system**
- **Problem-focused approach**:
  - Understand place, context, history and decision making process as well as particular circumstances of specific groups
  - Useful & usable information responsive to user needs
- **Early & continuous partnership with users essential:**
  - Shared learning & joint problem-solving
  - Equitable attention to groups of all sizes
  - Stable, long-term commitment needed

SOME SHARED LESSONS

- **Products/services need to be on time and space scales relevant to decision-making:**
  - Address today's problems and plan for the future
  - Growing demand for decadal information for critical decisions such as infrastructure investments
  - Enhanced information related to extreme events, including attribution
- **Address both process and products:**
  - Continuous evaluation and adjustment
  - Both science and policies

SOME SHARED LESSONS

- **Promote climate literacy and regular communication**

- **Build on existing systems, institutions, programs, relationships & networks**
  - Expand partnership between science, assessment and services
  - Engage with trusted information brokers
  - Capitalize on unique assets, credibility and expertise of partner organizations
  - Government, private sector, universities, NGOs, …

Meeting the Rising Demand for Climate Services

Commerce

Coasts

Recreation

Ecosystems

Hydropower

Farming

Wind Energy

Private Sector

"All our greatest challenges are pervasive around the globe, and all are local in their solution." -*A stakeholder from Missouri*

The Climate Service

NOAA VISION*

By providing science and services, the Climate Service envisions an informed society capable of anticipating and responding to climate and its impacts

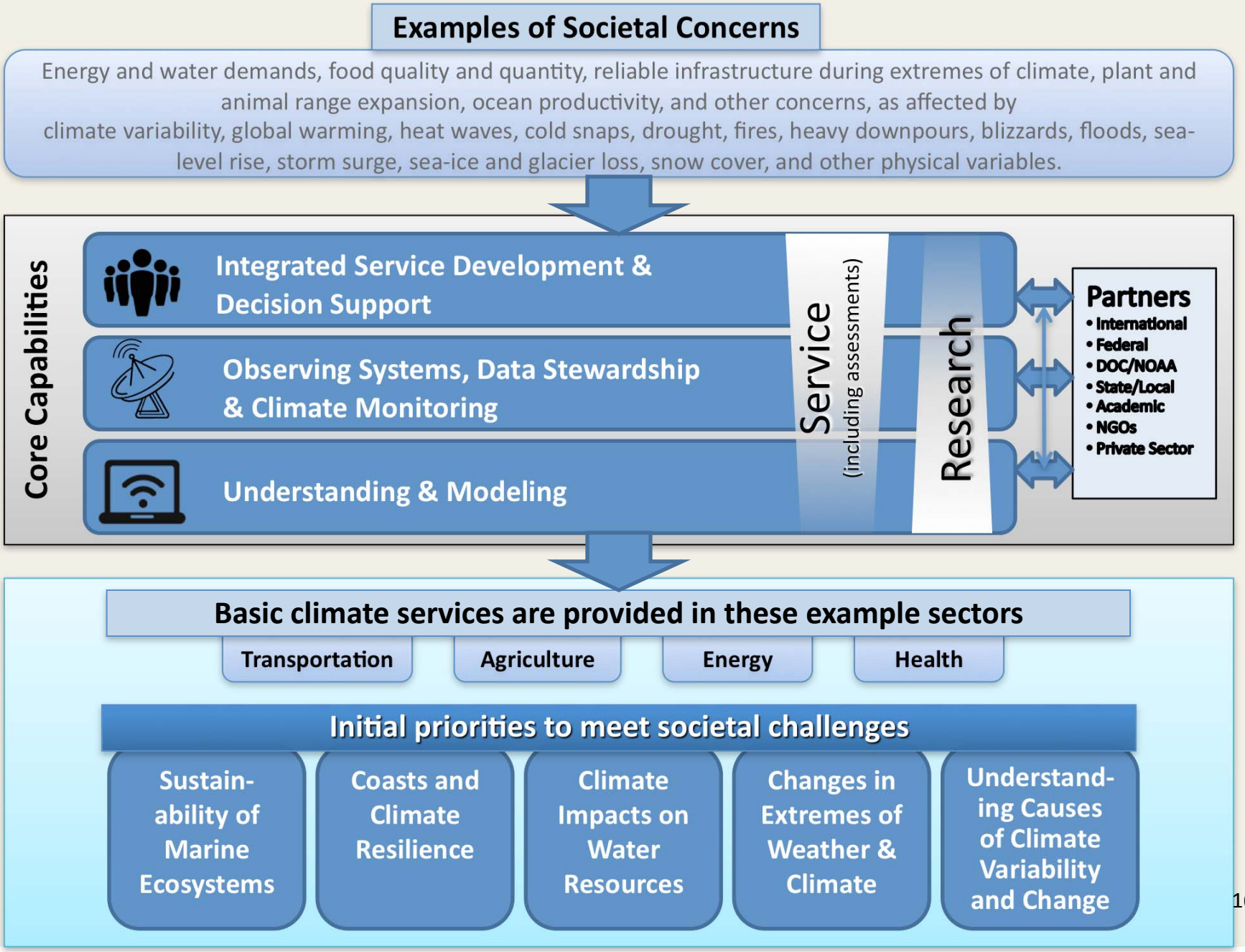
NOAA MISSION

Improve understanding and prediction of changes in climate and promote a climate-resilient society

NOAA OBJECTIVES

- *Improved understanding of the changing climate system and its impacts*
- *Integrated assessments of current and future states of the climate system that identify potential impacts and inform science, services, and decisions*
- *Mitigation and adaptation efforts supported by sustained, reliable, and timely climate services*
- *A climate-literate public that understands its vulnerabilities to a changing climate and makes informed decisions*

CS Core Capabilities Address Societal Challenges



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Regional Climate Services Partnership: Key Objectives

- ***Problem-focused*** products, information services & decision support tools
- ***Place-based*** information & assessments
- Robust, ***service-centric program*** with active user engagement through sustained dialogue & collaboration
- Connect to today's products while developing new, authoritative, reliable services
- Promote ***scientifically-based adaptation & mitigation*** by integrating NOAA science & service capabilities with partners
- **Promote partnerships** that *leverage the assets of government, academia, private sector & NGOs*

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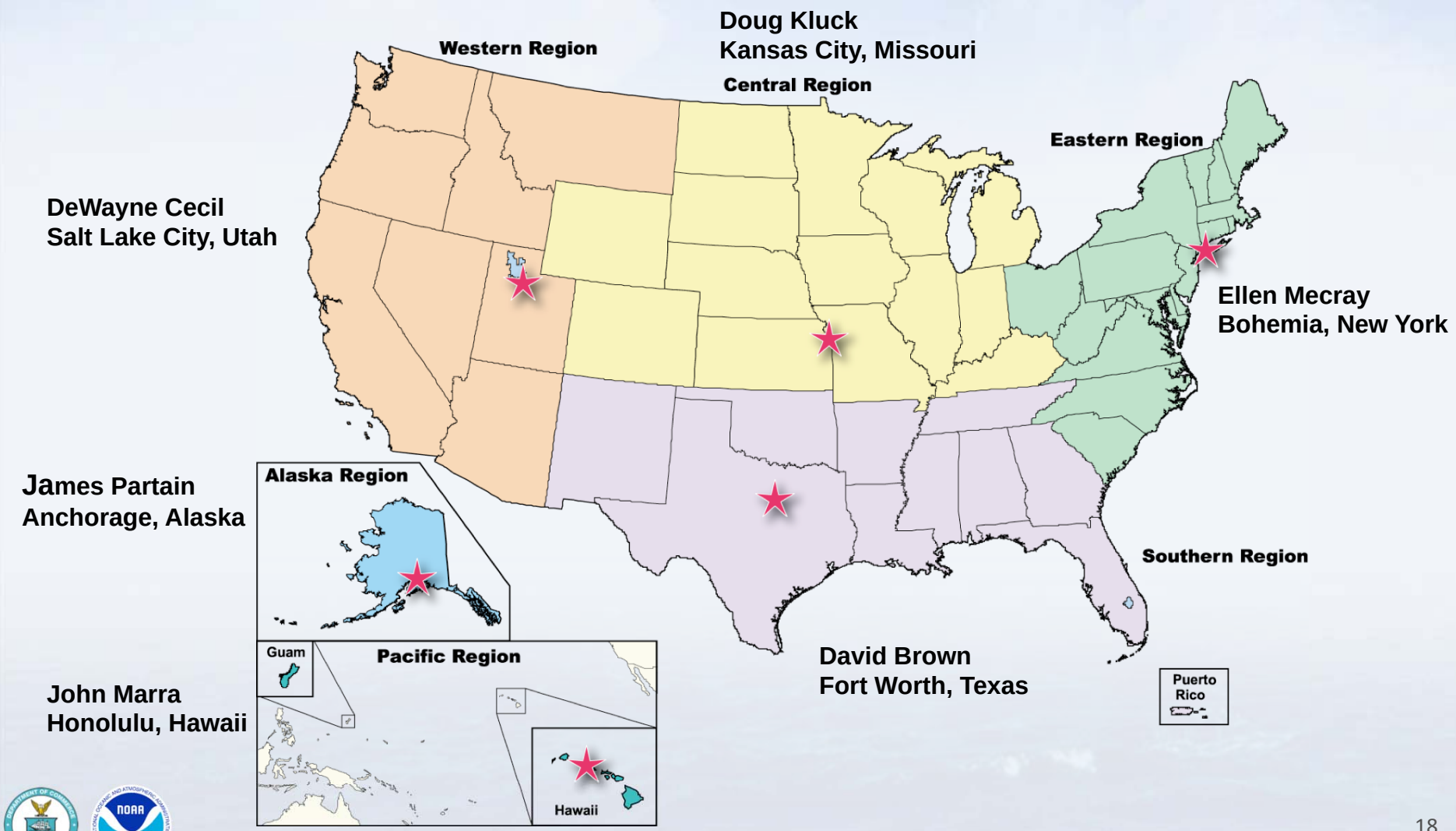
Regional Climate Service Directors



Effectively Anticipating and Responding to a Changing Climate Requires…

A continuously evolving understanding of the integrated "*climate-society system*" to address today's challenges and plan for the future

and

An adaptive management approach that provides for regular evaluation and adjustment of decisions as new scientific insights emerge and socio-economic and environmental conditions change

ADAPTING TO A CHANGING CLIMATE

People

Places

Possibilities

Partnerships

Understanding Risk & Enhancing Resilience