

Using Science to Inform Adaptation Decisions

NSTC Subcommittee for Disaster Reduction

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Dr. Ann Bartuska

*Deputy Under Secretary for Research, Education, and Economics
U.S. Department of Agriculture*

*Vice-Chair for Inform Decisions
Subcommittee on Global Change Research*



United States
Global Change
Research Program

www.globalchange.gov

Presentation Overview

- History of the USGCRP
- New National Global Change Research Plan
- Informing Adaptation Decisions
- USGCRP's Adaptation Science Workgroup
- Future Priorities for USGCRP Adaptation Research
- Questions and Comments

History of the USGCRP



The Global Change Research Act and USGCRP

- USGCRP began as a Presidential Initiative in 1989
- It was mandated by Congress in the Global Change Research Act (GCRA) of 1990 (P.L. 101 – 606)
 - *“To provide for development and coordination of a comprehensive and integrated United States Research Program which will assist the Nation and the world to **understand, assess, predict, and respond** to human-induced and natural processes of global change.”*
- Every 10 years, the USGCRP must produce a decadal National Global Change Research Plan (i.e. a Strategic Plan)
 - *“The Plan shall establish, for the 10-year period beginning in the year the Plan is submitted, the goals and priorities for Federal global change research which most effectively advance scientific understanding for global change and provide usable information on which to base policy decisions relation to global change.”*



The USGCRP Vision and Mission

Vision - “A nation, globally engaged and guided by science, meeting the challenges of climate and global change.”

Mission - “To build a knowledge base that informs human responses to climate and global change through coordinated and integrated federal programs of research, education, communication, and decision support.”



USGCRP and Global Change Science

The Program:

- **Coordinates** Federal research to better understand and prepare the nation for global change
- **Prioritizes** and supports cutting edge scientific work in global change
- **Assesses** the state of scientific knowledge and the Nation's readiness to respond to global change
- **Communicates** research findings to inform, educate, and engage the global community

USGCRP Agencies and Departments:

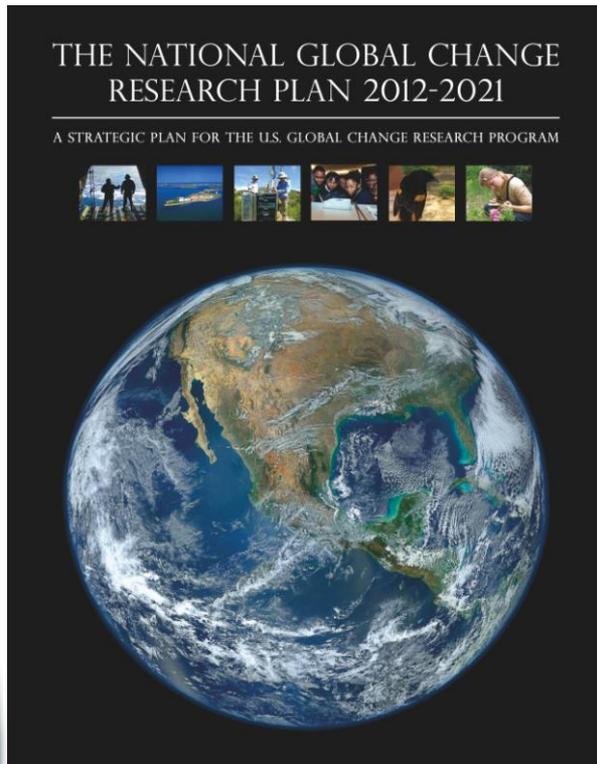
| | |
|---|--|
|  | Department of Agriculture |
|  | Department of Commerce |
|  | Department of Defense |
|  | Department of Energy |
|  | Department of Health and Human Services |
|  | Department of the Interior |
|  | Department of State |
|  | Department of Transportation |
|  | Environmental Protection Agency |
|  | National Aeronautics and Space Administration |
|  | National Science Foundation |
|  | Smithsonian Institution |
|  | United States Agency for International Development |



New National Global Change Strategic Plan



The USGCRP Decadal Strategic Plan



- The Strategic Plan outlines how the program will advance fundamental, use-inspired research to address the present and future challenges of climate and global change
- The Strategic Plan provides
 - Direction for USGCRP for the next ten years
 - Guidance for USGCRP to be an integrated “end-to-end” program: from fundamental global change research to societal decision support
 - Links the Program’s vision and mission to its goals and outcomes
- The Strategic Plan speaks to various stakeholders
- The Strategic Plan emphasizes
 - Human-natural systems
 - End-to-end science: from basic research to decision support

USGCRP Strategic Plan Goals and Objectives

| Goals | Objectives |
|----------------------------------|---|
| 1. Advance Science | <ul style="list-style-type: none">1.1 Earth System Understanding1.2 Science for Adaptation and Mitigation1.3 Integrated Observations1.4 Integrated Modeling1.5 Information Management and Sharing |
| 2. Inform Decisions | <ul style="list-style-type: none">2.1 Inform Adaptation Decisions2.2 Inform Mitigation Decisions2.3 Enhance Global Change Information |
| 3. Conduct Sustained Assessments | <ul style="list-style-type: none">3.1 Scientific Integration3.2 Ongoing Capacity3.3 Inform Responses3.4 Evaluate Progress |
| 4. Communicate & Educate | <ul style="list-style-type: none">4.1 Strengthen Communication and Education Research4.2 Reach Diverse Audiences4.3 Increase Engagement4.4 Cultivate Scientific Workforce |



Informing Adaptation Decisions



Example Challenge, Objective 1.2: Science for Adaptation and Mitigation

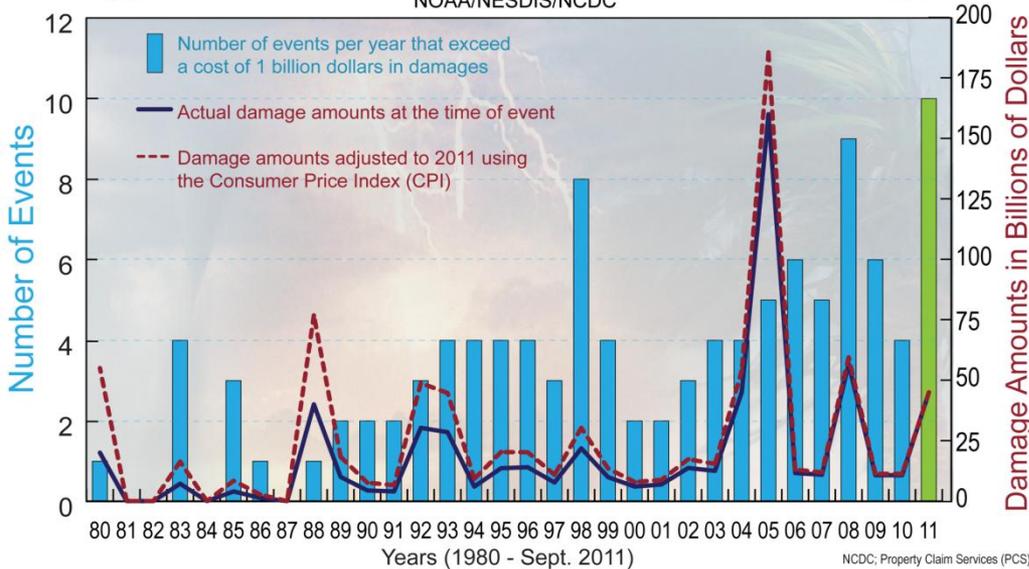
Weather and Climate Extremes

- Since 1980, 110 billion-dollar weather and climate disasters in U.S.
- Total losses since 1980 of billion-dollar disasters exceeds \$750 billion.
- Are Nations becoming more exposed and/or sensitive to severe events?

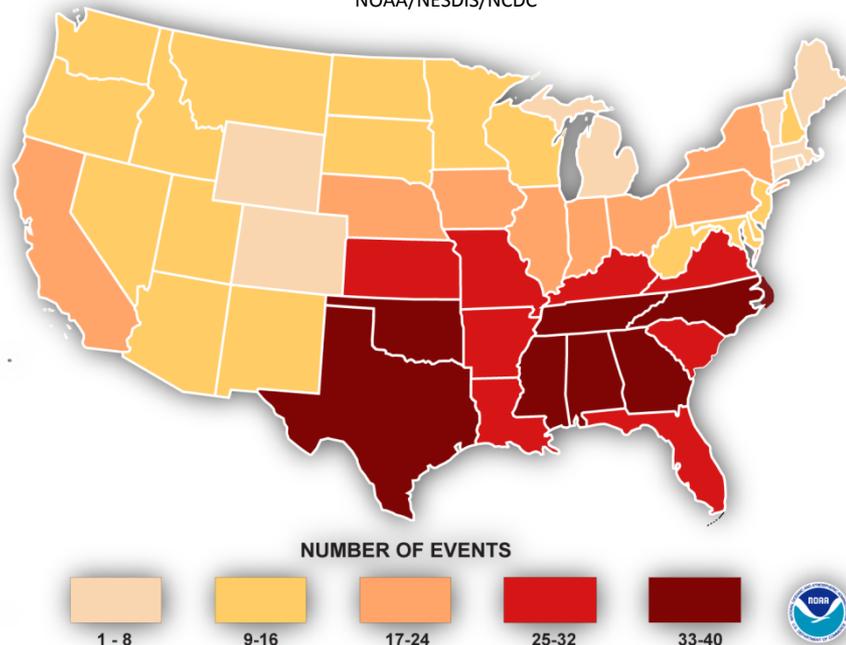
A record 10 Disasters in the U.S. in 2011 to date



Billion Dollar Weather/Climate Disasters
1980 - September 2011
NOAA/NESDIS/NCDC

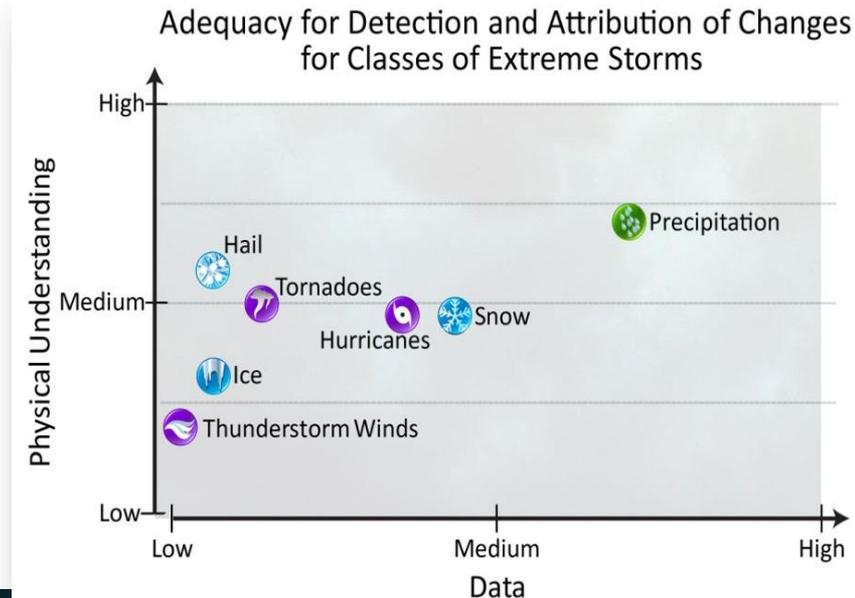


Number of Billion Dollar U.S. Weather/Climate Disasters
1980 – September 2011
NOAA/NESDIS/NCDC



Example Challenge, Objective 1.2: Science for Adaptation and Mitigation *Weather and Climate Extremes*

- Simultaneous (and cascading) extreme events and impacts
 - Example: Heat waves, poor air quality dispersion, severe drought, dust storms
- Detection and Attribution
 - What can we say about trends and their possible causes?
 - A challenge of rapid and scientifically rigorous explanation of and response to events
 - Need increased physical understanding; and need more accurate and lengthy historical records
 - Need better understanding of model uncertainties and implications of those uncertainties
 - ACE (Attribution of Climate-related Events)
 - Framing the question
 - A priori protocols; datasets; model simulations
 - Ensemble size consideration
 - Attribution as the pathway to improved prediction
 - Changes in the probability and severity of extreme events using heuristic models,
 - E.g., Potential Maximum Precipitation



Example Challenges, Goal 2: Inform Decisions

“Provide the scientific basis to inform and enable timely decisions on adaptation and mitigation.”



Why do people choose to live in high-risk areas?



Rising sea level resulting in decreasing wildlife habitats



Example Challenge, Objective 2.1: Inform Adaptation Decisions

Climate Variability and Change

“Improve the deployment and accessibility of science to inform adaptation decisions.”

- Assess and address decision maker needs and science requirements
- Identify and communicate relevant information
- Develop new information exchange approaches
- Support public and private sector responses to global change



Figure: Deer Island Sewage Treatment Plant. Image courtesy of Massachusetts Water Resources Authority.



Example Challenge, Objective 2.3: Enhance Global Change Information

Climate Variability and Change

“Develop the tools and scientific basis to enable an integrated system of global change information, informed by sustained, relevant, and timely data to support decision making.”

- Continually Improve Observing Systems, Data Stewardship, and Global Change Monitoring
- Translate Global Change Predictions and Projections
- Provide Timely, Relevant, and Integrated Global Change Information and Decision Support

Informing Decisions in Action

Illustrative examples of areas for which USGCRP science will support decisions making, taken from the Strategic Plan:

- **Water resource** and **energy planners** in many regions of the country need scientific information to address changes in the availability of freshwater and increasing energy demands
- **Farmers** depend on information to adjust and manage crops as planting seasons, growing zones, and pest and weed ranges change
- Inhabitants of **coastal cities** need to understand the implications of sea-level rise in the context of other changes (e.g., storm surges)
- **Health care providers** need to prepare for more severe heat waves and outbreaks of diseases previously unknown in their regions
- **Insurers** must account for increased and shifting weather extremes in assessing future financial risk



USGCRP's Adaptation Science Workgroup



History & Establishment of the USGCRP Adaptation Science Workgroup

- In 2009, the Federal government convened the Interagency Climate Change Adaptation Task Force (ICCATF) followed by the signing of In response to Executive Order 13514
- The Task Force includes an Adaptation Science Workgroup and an Agency Adaptation Workgroup, initiated in 2009 under CEQ
- In Summer 2010, the Adaptation Science Workgroup was established at USGCRP



Adaptation Science

Integrated scientific research that directly contributes to enabling adjustments in natural or human systems to a new or changing environment and that allows beneficial opportunities or helps moderate negative effects



Understanding Adaptation Science Needs

- Articulation of science, information, and decision needs through workshops, reports, and exercises in connecting science and adaptation planning including:
 - Adaptation Science Workgroup’s 2010 – 2011 listening sessions with cities, states, regions, natural resource managers, planners, and Federal agencies
 - America’s Climate Choices “Adapting” and “Informing” reports
 - NCA workshops and listening sessions
- Needs include:
 - Science capabilities for adaptation decisions
 - Science translation
 - Social, behavioral, and economic sciences
 - Evaluation of effective adaptation actions
 - Online data and information clearinghouse for adaptation

USGCRP's Adaptation Science Workgroup

- Current Workgroup includes representation from across USGCRP and non-USGCRP agencies
 - Ann Bartuska (USDA) is the USGCRP Vice Chair for Inform Decisions and Adaptation Science
 - Jeff Arnold (U.S. Army Corps of Engineers) and Steve Shafer (U.S. Department of Agriculture) are the Workgroup Co-chairs
 - Emily Wasley acts as the USGCRP National Coordination Office support staff
- USGCRP's Adaptation Science Workgroup current emphases in advancing science to inform adaptation decisions:
 - Identifying critical information needs
 - **Advancing social, behavioral, and economic sciences**
 - Identifying science and decision support capabilities
 - Translating science for decision-makers
 - **Integrating science into adaptation plans**
 - **Evaluating the effectiveness of adaptive actions**

USGCRP's Adaptation Science Workgroup Mission:

"To ensure that the Federal Government's science enterprise informs and empowers adaptation decisions at a range of scales for a diversity of users."

Advancing Social, Behavioral, and Economic Sciences

- The New National Global Change Research Plan emphasizes the need to integrate the contributions of multidisciplinary scientists with research activities in the physical, chemical, and biological sciences
- In March 2012, USGCRP launched a Social Science Task Force with Federal government experts to identify:
 - Human drivers of global change
 - Determinants of vulnerability and resilience to global change impacts
 - Research on decision support, including understanding the decision context, structures for co-production, decision frameworks, methods and tools

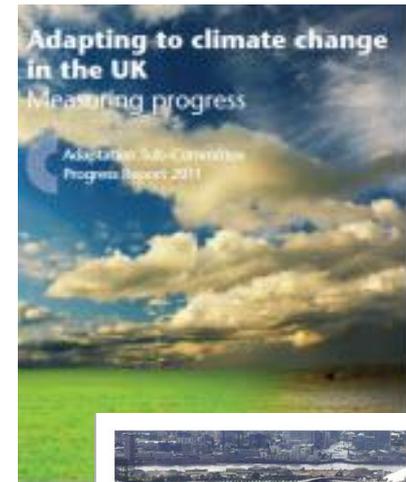


Integrating Science into Federal Agency Adaptation Plans

- Working closely with the Agency Adaptation Workgroup established under the Interagency Climate Change Adaptation Task Force
- Held 2 Workshops on science that supports adaptation decisions in collaboration with CEQ
- GSA pilot effort:
 - Partnered with NOAA to obtain the best available science to inform their adaptation plans and implementation actions
 - Conducted scenario threshing sessions to identify climate impacts and risks to assets
 - Identified champions within GSA to lead the efforts
- Worked with CEQ to request science needs from the agencies submitting their Agency Adaptation Plans in June 2012

Evaluating the Effectiveness of Adaptation Actions

- Identifying adaptation evaluation frameworks, measures, metrics
- Supporting the 2013 National Climate Assessment through technical input
 - Adaptation, mitigation, decision support
 - Evaluation
 - Indicators
- Upcoming conferences on the identifying approaches/information needs for assessing effectiveness of and progress in adaptation
- Partnering with the UK to gain insight on their evaluation efforts



Future Priorities for USGCRP Adaptation Research



USGCRP Annual Prioritization

- The Global Change Research Act (GCRA) of 1990 (Section 105)
 - *“...each Federal agency or department involved in global change research shall include with its annual request for appropriations submitted to the President...a report which (A) identifies each element of the proposed global change research activities of the agency or department...”*
- The SGCR develops annual global change research funding priorities to address:
 - *Science gaps and opportunities*
 - *Emerging scientific and societal needs*
- FY13 Priority theme is **extremes, potential thresholds, and tipping points**



Priority Area 1: Advancing Science for Adaptation Decisions

- **GOAL:** Build cross-agency capabilities in identification and advancement of knowledge needed to inform and support societal decisions and actions that enhance resiliency to climate variability and changes in patterns of extreme events
 - Enhancing identification and understanding of **social, ecological, and physical tipping points and thresholds;**
 - Improving understanding of **human responses to climate variability;**
 - Advancing understanding of the **impacts of multiple (climatic and non-climatic) interacting stressors** on human and natural systems



Priority Area 2: Regional Science, Tools, and Services

- **GOAL:** Ensure that the Federal Government's science enterprise implements an integrated, well-coordinated approach to providing critical information for adaptation decisions at local-to-regional scales
 - Regional scale is useful for advancing understanding, communication, and coordination on the impacts of **extreme events, climate variability, and climate change**, as well as the social, economic, and institutional **capacities to prepare and respond** to these impacts.
- In coordination with the NCA, Climate Change and Human Health Group, ICCATF, and other non-USGCRP agencies
- Already substantial foundation set for regional coordination including RISA, LCCs, NCA's Regions, etc.

Priority Area 3: Collaborative Frameworks

- **GOAL:** Leverage existing collaborative science-management frameworks to advance interagency research on adaptive capacity, particularly tipping points and thresholds, for a diversity of management challenges, including:
 - Wildfire preparedness and response
 - Agricultural decisions
 - Integrated water resources management
 - Stewardship of protected areas
 - Interactions across urban and natural systems
- Serves as an opportunity for collaboration with the Global Change Information System (GCIS)



Questions for the NSTC Subcommittee on Disaster Reduction

- Given your charge and USGCRP's Adaptation Research Focus Areas and Priorities:
 - What areas interest you the most?
 - What expertise could you bring to the Adaptation WG's efforts?
 - Do you see value in collaborating with us? In what ways?
 - What actions do you recommend we take to establish a partnership between us?
- Potential areas of collaboration include:
 - **USGCRP Annual Priority Theme:** Research on extreme events and disaster risk reduction (many USGCRP and non-USGCRP agency missions are impacted by disasters)
 - **NAS Extreme Events Workshop:** Collaboration opportunities
 - **Recent IPCC Special Report on Extremes (SREX)**
 - **Stakeholder Engagement:** Common voice

Questions & Comments

For more information, please see the USGCRP Adaptation Science website <http://www.globalchange.gov/what-we-do/adaptation-science>

