

USGCRP Climate Science Special Report *Prospectus and Outline*

Overview

As key input into the Fourth National Climate Assessment (NCA4), the U.S. Global Change Research Program (USGCRP) will oversee production of a special, stand-alone report of the state-of-science relating to climate change and its physical impacts. This Climate Science Special Report (CSSR) will be started in the second quarter of 2016, and completed in the third quarter of 2017. The CSSR will serve several purposes for NCA4, including: (1) providing an updated detailed analysis of the findings of how climate change is affecting the weather and climate across the United States; (2) providing an executive summary that will be used as the basis for the science summary for NCA4; and (3) providing foundational information and projections for climate change, including extremes, to improve “end-to-end” consistency in sectoral, regional, and resilience analyses for NCA4. Such a report will allow NCA4 to focus more heavily on observed and projected risks, impacts, adaptation options, regional storylines, and implications (e.g., avoided risks) of known mitigation actions.

The CSSR will be prepared by a team of scientific experts chosen by a Federal Science Steering Committee (SSC), and will undergo public and Subcommittee on Global Change Research (SGCR, the Federal steering committee for USGCRP) review, as well as peer review by the National Academy of Sciences. This report will be aimed at a technical audience. The report will adhere to the Information Quality Act requirements (http://www.cio.noaa.gov/services_programs/info_quality.html) for quality, transparency, and accessibility as appropriate for a Highly Influential Scientific Assessment (HISA).

Consistent with a previous SGCR decision for the sustained assessment activity (<http://scenarios.globalchange.gov/announcement/1158>), this physical science report will use the full range of Representative Concentration Pathways (RCPs) adopted by the Intergovernmental Panel on Climate Change (IPCC) for the Fifth Assessment Report (AR5) and Coupled Model Intercomparison Project Phase 5 (CMIP5) products. A separate USGCRP Climate Scenarios Task Force (CSTF), established in June 2015, is working to develop quantitative and qualitative climate scenarios and projections for NCA4. The CSTF’s recommendations – for example, on methods for downscaling and user-relevant impacts measures – will also be used as the basis of this physical science report to ensure consistency across assessment products. Similarly, the team will account for any other findings from the sustained assessment process – for example, from another USGCRP special report under development, the State of the Carbon Cycle Report - 2 (SOCCR-2).

CSSR will similarly also interact with other USGCRP task forces (e.g., on sea-level rise and related processes) with the Sea-Level Rise Task Force and on human dimensions of climate change with the Social Science Coordinating Committee.

A challenge for this report will be to keep the size and scope manageable. There were 100 pages of climate science content in the Third National Climate Assessment (a single chapter, a science supplement, and FAQs). While the fundamental science should be explored anew for this update, the previous material provides a good starting point and a good reference for size of individual sections (see outline below, and provisional page and figure allocations).

CSSR development will be planned carefully to inform and support the full NCA4, rather than detract resources from the broader effort. Ways to ensure that both reports are complementary and achieve the USGCRP’s broader goals follow:

- After finishing the special report, writing team members will work with NCA4 authors to ensure consistency across regions and sectors in analyses, interpretation, and explanation.
- The report will be technical and delivered electronically (PDF and/or web), to facilitate linking to existing material rather than recapturing established science.
- The report will support development of derivative communications materials for the full NCA4 launch (e.g., web site, web features, FAQs, brochures).
- The special report will develop full metadata for climate figures, which will support documentation for derivative figures in the full NCA4.

The next section lists the broad disciplinary expertise sought for the author team, followed by the draft outline itself, provisional page counts and production milestones, and process for author team engagement.

Disciplinary Experts

The writing team will consist of approximately 20-25 authors, with expertise across multiple disciplines, with drafting and consolidation of material undertaken by three Federal coordinating lead authors who possess broad understanding of climate science and associated issues. Representative climate science expertise sought includes:

- Climate datasets and trends
- Climate processes and feedbacks
- Paleoclimate
- Global climate models and associated projections
- Climate extremes
- Polar processes, including cryosphere
- Attribution studies for climate change
- Attribution for climate connection to weather events
- Statistical downscaling
- Regional modeling
- Ocean processes, including sea level
- Existing analyses of mitigation options, including geoengineering / climate intervention
- Biosphere / terrestrial interactions.

Provisional Outline and Page Counts

Draft Outline

Executive Summary: Brief overview of CSSR purpose and relationship to the NCA4, including a graphic listing key messages

Chapter

1. Introduction: The changing climate
 - a. Report builds upon the previous NCAs and other assessments to examine the current state of the science related to climate change effects on the United States
 - i. The focus is on what's new: how has the knowledge evolved since NCA3
 - ii. Draw upon work of Scenarios and Extremes working groups
 - b. Overview of the changes occurring globally

- i. Observed datasets
 - ii. Indicators of a globally changing climate
 - iii. Global temperature
 1. Long-term changes
 2. Short-term variability
 - iv. Global precipitation
 - v. Global trends in extreme weather
 - vi. Land processes, including changes in carbon cycle
 - vii. Sea ice, glaciers, and land ice
 - viii. Sea level (global trend)
 - ix. Comparison to paleoclimates
 2. The scientific basis for a human cause for climate change
 - a. Greenhouse effect
 - i. History
 - ii. Observations supporting the greenhouse effect
 - iii. Sidebar on why the greenhouse effect does not break 2nd law of thermodynamics
 - b. Earth's energy balance
 - c. Past emissions and concentrations of gases and particles
 - i. Discussion on human drivers (including population, economics, land use, technology, and policy)
 - ii. Carbon budget
 - iii. Other gases
 - iv. Black carbon
 - v. Sulfates and other particles
 - d. Radiative forcing
 - e. Other forcings, e.g., from land-use change
 3. Attribution and climate feedbacks
 - a. Physical climate feedbacks
 - b. Biological / terrestrial feedbacks and forcings on climate (not impacts)
 - i. Ecosystem shifts
 - ii. Land-use, land-cover
 - iii. Hydrology changes
 - iv. Carbon cycle implications
 - c. Attribution studies
 - i. Trends in average and extreme quantities
 - ii. Regional attribution
 - iii. Individual extreme events
 4. Projections of climate change
 - a. Basis
 - b. Modeling tools (how evaluated and tested)
 - c. Scenarios
 - i. Two RCP scenarios (4.5 and 8.5) as primary focus
 - ii. Other RCP and related scenarios
 - iii. Alternative scenarios, then use simple climate models to summarize
 - d. Global projection analyses
 - i. Tools used (CMIP5 and selections by Climate Scenarios Task Force)
 - ii. Climate sensitivity
 - iii. Uncertainties

- e. Regional analyses (capabilities and how evaluated)
5. Temperature changes in the U.S.
 - a. Observed changes and variations
 - i. Datasets (including uncertainties and the significance of trends)
 - b. Projections
 - c. Temperature extremes
 - i. Heat waves
 - ii. Hottest and coldest days
 - iii. Days above 95°F, 100°F, or other
 - iv. Heat and humidity
 - v. Days below 32°F or other
 - vi. Connections to large scale weather patterns
 - d. Lengthening growing season
 6. Precipitation change in the U.S.
 - a. Past trends (rain, snowfall)
 - i. Datasets (including uncertainties)
 - b. Projections
 - c. Precipitation extremes
 - i. Observed changes in seasonal heavy precipitation
 - ii. Projected changes in seasonal heavy precipitation
 - iii. Wettest day of the year or other analyses
 7. Droughts and floods
 - a. Past trends and projections for droughts
 - i. Factors in drought formation
 - b. Past trends and projections for floods
 - i. Factors in flood formation
 8. Extreme weather (severe storms)
 - a. Hurricanes (trends and projections)
 - b. Tornadoes (trends and projections)
 - c. Hail (trends and projections)
 - d. Wind storms
 - e. Winter storms
 9. Changes in climate variability
 - a. ENSO
 - b. Other effects and relationships
 10. Other physical indicators of climate change in the U.S. (not impacts)
 - a. Glaciers
 - b. Lake ice
 - c. Early melting of snowpack
 - d. Reduced lake levels
 - e. Wildfires
 - f. The Great Lakes
 - g. Natural land and ecosystem changes
 11. Polar changes and their effects on Alaska and rest of U.S.

- a. Largest changes occurring in Arctic but changes in Antarctic important too
 - b. Feedbacks on climate change in the lower 48 and globally
 - i. Changes in jet stream
 - 1. Newest evidence
 - 2. Stationary pressure events
 - ii. Melting sea and land ice (freshwater) effects on ocean circulation
 - iii. Thawing permafrost potential effects on CO₂ and CH₄ emissions
12. Sea-level rise
- a. Recent past trends (20th and 21st centuries)
 - i. Paleo sea levels
 - b. Projected sea-level rise
 - c. Effects on U.S. coasts accounting for land rise and fall
13. Ocean acidification and ocean biogeochemistry
- a. Basis; why concerned
 - b. Past trend
 - c. Projected change
14. Mitigation pathways
(focus on effects of various scenarios on resulting climate using simple models)
- a. Ways to reduce climate change / emission pathways
(possibly including issues associated with intervention)
 - i. Status of intervention studies with global models (uncertainties, etc.)
 - b. Inherent delays in the climate system (science on timing of mitigation action)
15. Uncertainties in climate change science

Target Page Counts

In an effort to capture what is new since the NCA3, writing team guidance will consist of an initial limit of 80 pages of narrative and 54 graphics (tables and figures). References do not count against the total. The chapter-level breakdown follows:

- 1. Intro - 5 pages, 5 figures
- 2. Scientific Basis - 5 pages, 4 figures
- 3. Energy Balance - 6 pages, 4 figures
- 4. Climate Change Projections - 7 pages, 4 figures
- 5. Temperature Change - 6 pages, 5 figures
- 6. Precipitation Change - 6 pages, 5 figures
- 7. Droughts and Floods - 5 pages, 4 figures
- 8. Extreme Weather - 7 pages, 4 figures
- 9. Climate Variability - 5 pages, 3 figures
- 10. Other Indicators - 7 pages, 4 figures
- 11. Polar - 6 pages, 4 figures
- 12. Sea Level Rise - 4 pages, 3 figures
- 13. Ocean Acidification - 4 pages, 2 figures
- 14. Mitigation Pathways - 4 pages, 2 figures
- 15. Uncertainties - 3 pages, 1 figure

Production Milestones

March 2016: Publish Federal Register Notice soliciting nominations for technical contributors

April 2016: Appoint writing team members

April 2016: CSSR First Lead Authors Meeting (LAM1)

April - July 2016: Prepare zero-order draft

August 2016: Science Steering Committee initial review

August - September 2016: Response to comments

October 2016: SGCR initial review of first-order draft

October - November 2016: Response to comments

November 2016: CSSR LAM2

November 2016: Literature cutoff date

December 2016 - January 2017: Public Comment Period

December 2016 - February 2017: NRC Review

February - March 2017: Response to NRC and public comments

April 2017: Agency review

May - June 2017: Response to comments

June 2017: LRM Review

June - July 2017: Response to comments

August - September 2017: Production

October 2017: Launch (PDF and web)

Author Team Engagement

As the lead agency for this USGCRP Report, NOAA has established working procedures to ensure that the Report can be developed by a collaborative team of physical climate scientists in accordance with applicable provisions of the Federal Advisory Committee Act (FACA). These procedures, outlined below, will govern the activities of the following groups charged with development of the Report. NOAA will make training on FACA provisions available to the Report's participants.

Federal Steering Committee: In consultation with the SGCR, the report's Federal Science Steering Committee will make decisions about the report and is responsible for the report's development, production, and content. The Science Steering Committee responsibilities include a range of decisions and actions related to planning, scoping, selecting authors for, and producing the report and associated documents. Three Federal convening lead authors (CLAs) will be appointed from among the Science Steering Committee members to work with the authors of the Report. The CLAs and Science Steering Committee will be responsible for ensuring that all team members adhere to NOAA's working procedures.

Authors: Authors may be Federal and/or non-Federal employees, and will be invited by the Science Steering Committee as informed by a public call for nominations. Authors will contribute individually by developing draft content for section(s) of the report to which they are assigned, for consideration of the CLAs. The CLAs will consult with the authors for individual input and information throughout the report development process. While authors may discuss scientific topics with others in the field, authors will neither develop a consensus position on a document or topic, nor will they deliver consensus advice or recommendations to the CLAs or the Science Steering Committee.