AGU 2018 TOWN HALL:

International Climate Science in the Next Decade

WCRP World Climate Research Programme

U.S. Global Change Research Program

The National Academies of SCIENCES ENGINEERING MEDICINE

International Climate Science in the Next Decade

- **Introduction**
  Pavel Kabat, Chief Scientist and Director Research WMO
- **WCRP Highlights, Challenges and Opportunities**
  Guy Brasseur, Chair, WCRP Joint Scientific Committee
- **The Future of WCRP: A Strategic Plan**
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- **Update on USGCRP & Strategic Planning**
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- **The National Academies of Sciences, Engineering, and Medicine: in support of International Climate Science**
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WORLD CLIMATE RESEARCH PROGRAMME

Highlights, Challenges and Opportunities

Guy Brasseur, Chair
Joint Scientific Committee

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The World Climate Research Programme

- Established in 1980
- Sponsors
  - World Meteorological Organization (WMO)
  - International Science Council (ISC, previously ICSU)
  - International Ocean Commission (IOC) of UNESCO
- Joint Scientific Committee
  - 18 members representing the scientific community
- Joint Planning Staff (Programme Office)
  - Established at WMO in Geneva, Switzerland

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The World Climate Research Programme

JOINT SCIENTIFIC COMMITTEE (JSC)

WCRP MODELLING ADVISORY COUNCIL (WMAC)

WCRP DATA ADVISORY COUNCIL (WDAC)

WORKING GROUPS ON:

- COUPLED MODELLING (WGCM)
- NUMERICAL EXPERIMENTATION (WGNE)
- SUBSEASONAL TO INTERDECADAL PREDICTION (WGSIP)
- REGIONAL CLIMATE (WGRC)

JOINT PLANNING STAFF (JPS)

CLiC	CLIVAR	GEWEX	SPARC	WCRP CORDEX
CRYOSPHERE-CLIMATE	OCEAN-ATMOSPHERE	LAND-ATMOSPHERE	TROPOSPHERE-STRATOSPHERE	REGIONAL CLIMATE DOWNSCALING

GRAND CHALLENGES

The World Climate Research Programme

Grand Challenges

2015: A Landmark Year

- Over 190 countries signed up to reduce emissions, with the target to constrain global average warming below 2°C.

- 15-year agreement for the substantial reduction of disaster risk and losses through disaster response and disaster risk reduction.

- 2030 agenda to end poverty and hunger, improve health and education, make cities more sustainable, combat climate change, and protect oceans and forests.

Understanding, quantifying and projecting weather and climate underpin these goals.

Science Requirements are Changing

Climate variability and change cannot be understood in isolation.

The world is interconnected, though

- physical, chemical and biological processes
- flow of people, capital, goods and services

Exposure to extreme weather and climate events threatens to derail the sustainability of economic development and social welfare across the globe.

Multidimensional, multidisciplinary, multiscale approaches are needed.

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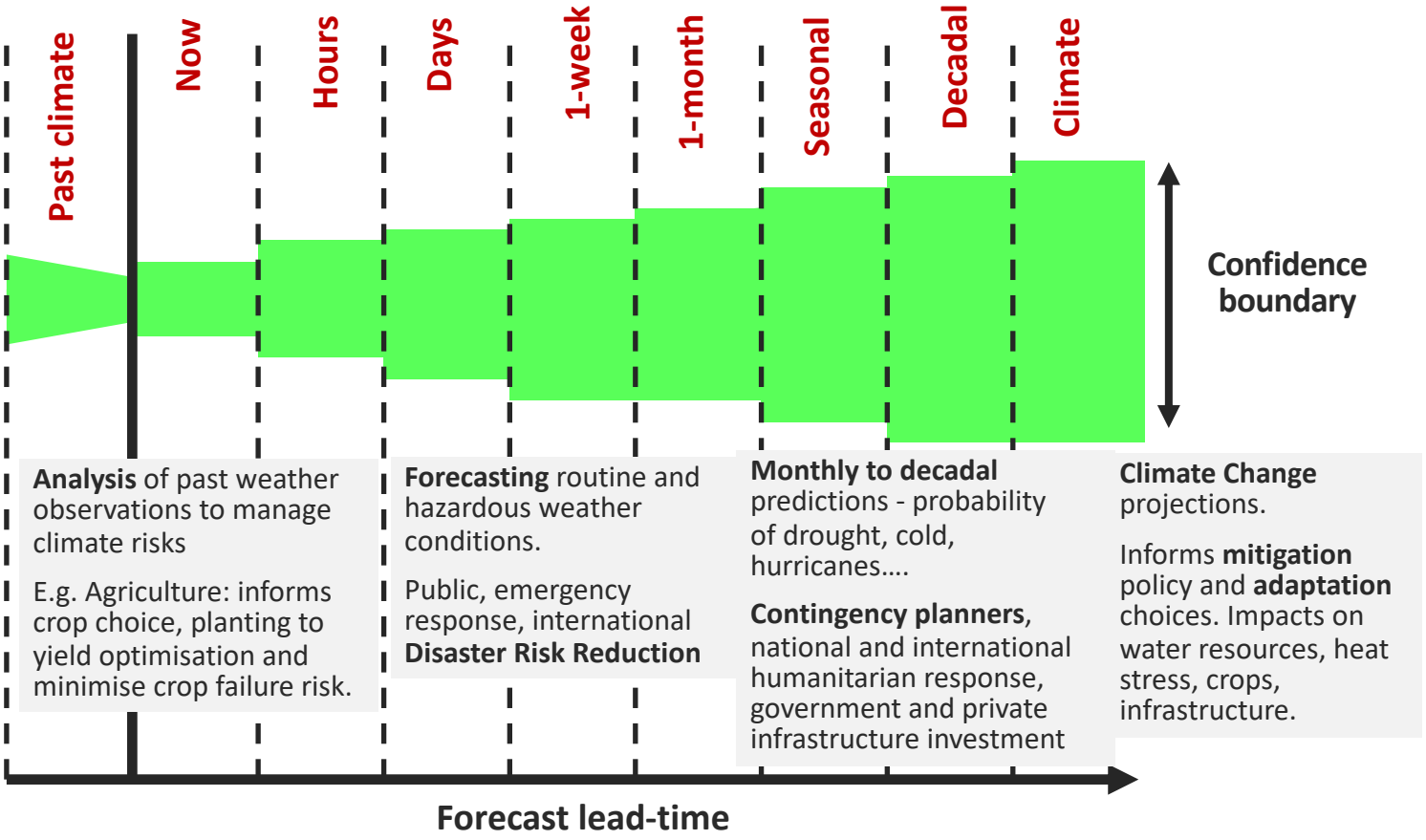
New Tools in the Toolbox

Across time…



Analysis of past weather observations to manage climate risks

E.g. Agriculture: informs crop choice, planting to yield optimisation and minimise crop failure risk.

Forecasting routine and hazardous weather conditions.

Public, emergency response, international **Disaster Risk Reduction**

Monthly to decadal predictions - probability of drought, cold, hurricanes….

Contingency planners, national and international humanitarian response, government and private infrastructure investment

Climate Change projections.

Informs **mitigation** policy and **adaptation** choices. Impacts on water resources, heat stress, crops, infrastructure.

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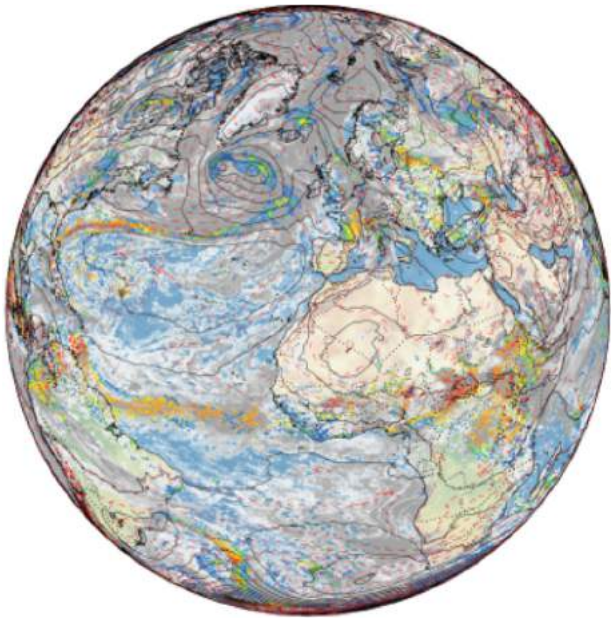
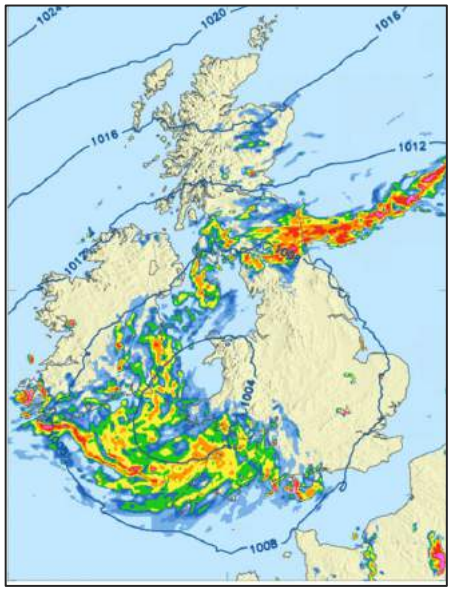
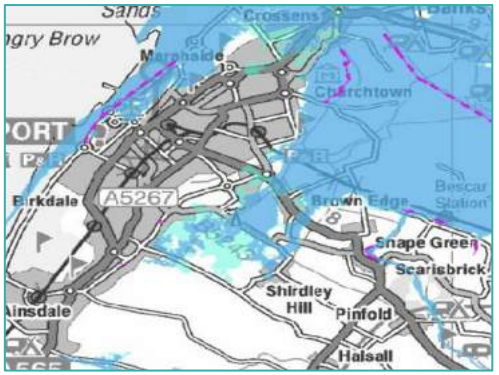
New Tools in the Toolbox

…and space







N x Global predictions at ~10km with lead times of days to years:

Synoptic drivers

<N x Regional predictions at <1km with lead times of hours to years:

Local meteorology

Probability of local hazards:

Impact Scenarios & Narratives

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The Future of WCRP

Does the current structure serve the scientific community?

- WCRP review found it unwieldy, complex and confusing.
- Where is whole system approach? Scattered throughout.
- How do we understand extremes, variability and change as interlinked phenomena?
- How do we best support next generation model development?
- Where is the pathway to climate services?
- How do we forge partnerships with other communities, such as WWRP and Future Earth?

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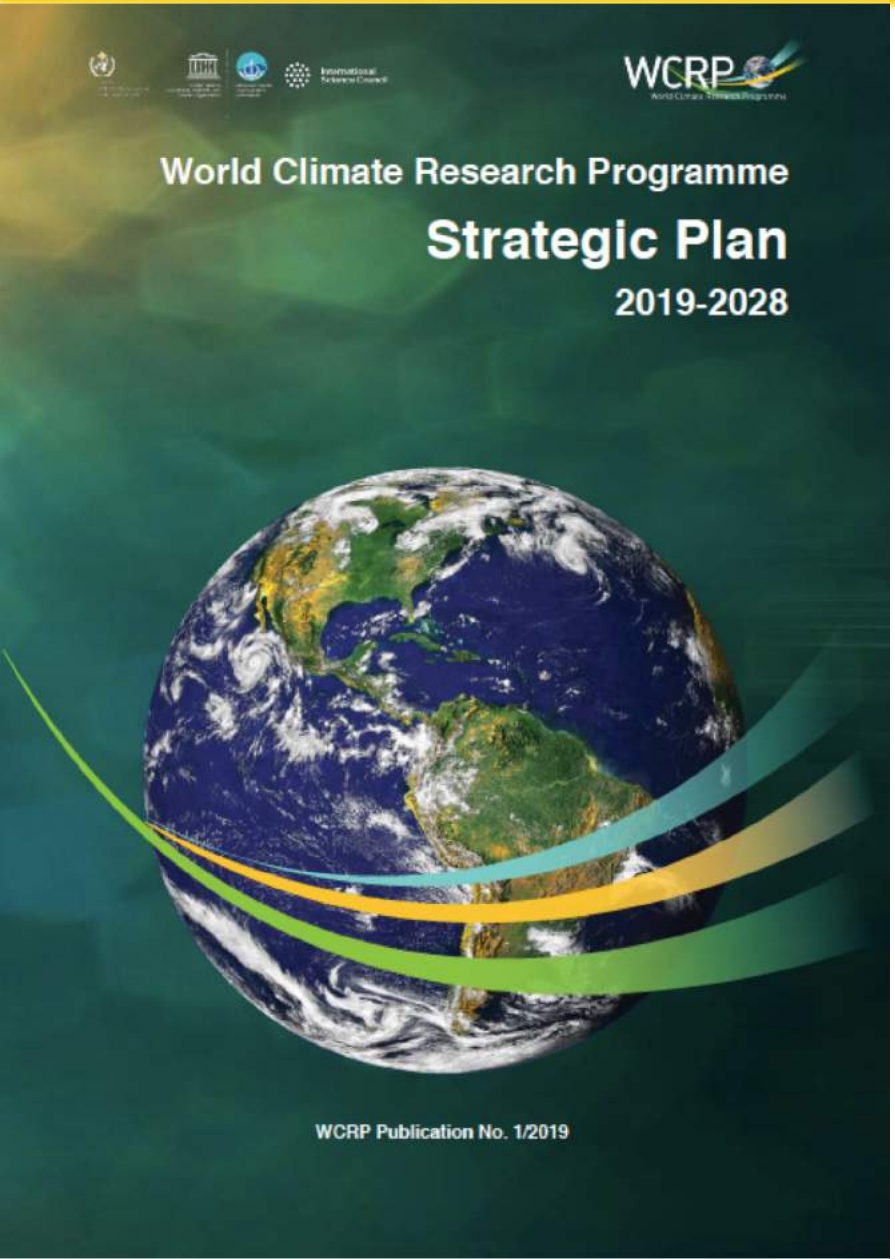
The Future of WCRP: A Strategic Plan



Vision

A world that uses sound, relevant and timely climate science to ensure a more resilient present and sustainable future for humankind.

Mission

The World Climate Research Programme coordinates and facilitates international climate research to develop, share and apply the climate knowledge that contributes to societal well-being.

Amanda Lynch, Vice Chair
Joint Scientific Committee

A Community-driven Plan

- Informed by the WCRP Co-sponsors Review
- A one year process of extensive community and public consultation
- Identified the core business of WCRP and the scientific priorities of the community

General Considerations

1. Strategic Plan = the 'what'
   - Evolving context
   - Vision and mission
   - Scope and relevance
   - Identify new directions

2. Implementation Plan = the 'how'
   - Prioritization of research targets
   - Milestones and measures of success
   - Assessment of risks
   - Enabling structure
   - Building new resources

Critical Aspirations

- We support a research community that is geographically, disciplinarily, culturally and socially diverse.
- Training, capacity building, higher education, and facilitated collaboration are of paramount importance.
- Joint strategic planning, joint execution of coordinated experiments, and the sharing of data and information require a well networked research community.
- Broad enabling of collaborations between the natural sciences and the social sciences is needed.
- Open engagement with civil society, governments, and the private sector – across regions and in United Nations processes, programs, and activities – is central.
- Effective communication of scientific advancements, with a variety of stakeholders, is key for well supported national programmes.
- High-level and vigorous research dialogues through widely inclusive and open science conferences sustains the research community.

Scientific Objectives

1 *Fundamental understanding of the climate system*

We will support and facilitate the advancement of scien that enable an integrated and fundamental understan of the climate, its variations and its changes, as part of coupled physical, biogeochemical, and socio-economic system.

2 *Prediction of the near-term evolution of the climate system*

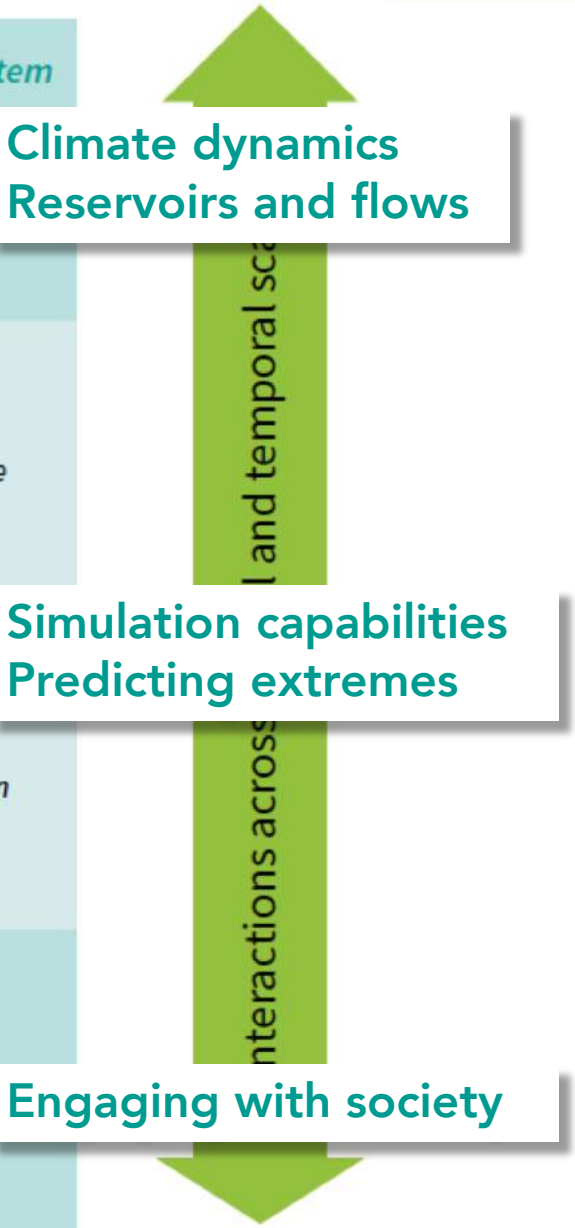
We will push the frontiers of predictions and quantify the associated uncertainties for sub-seasonal to decadal time scales across all climate system components.

3 *Future evolution of the climate system*

We will quantify the responses, feedbacks and uncertainties intrinsic to the changing climate system on longer timescales.

4 *Bridging climate science and society*

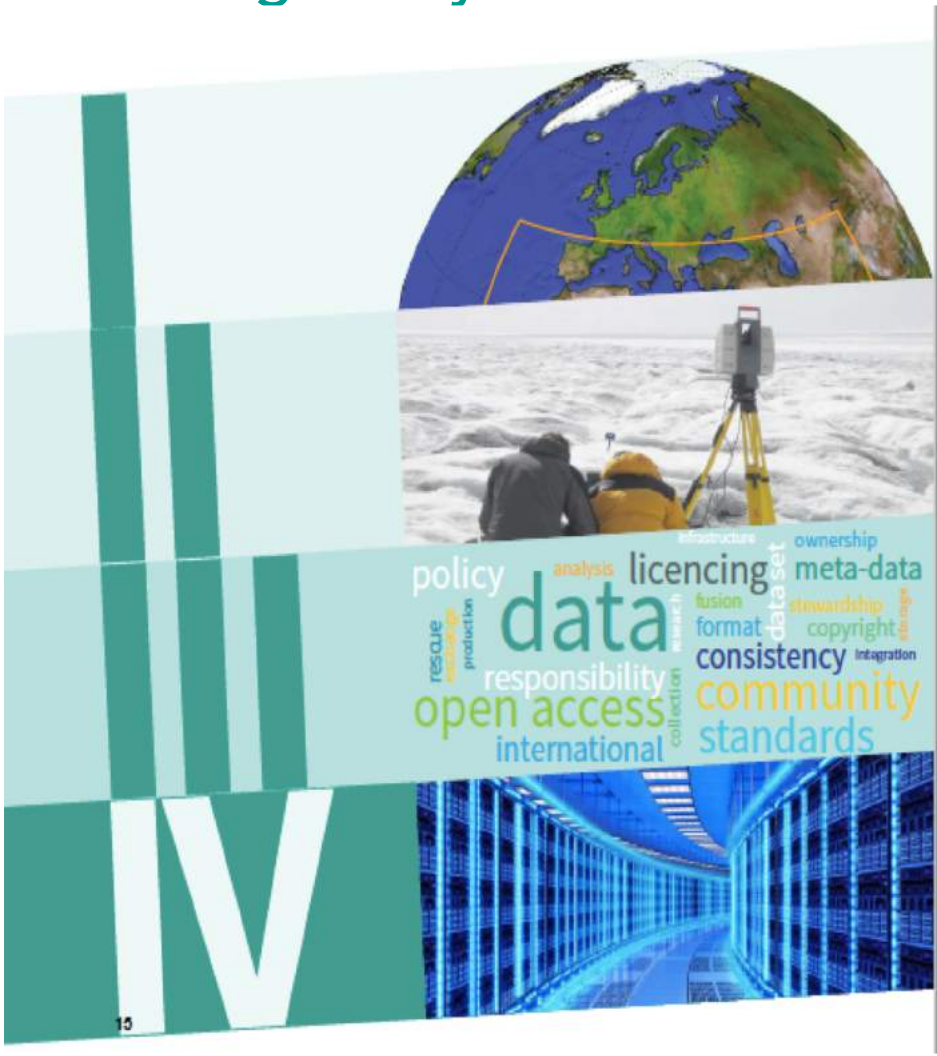
We will support innovation in the generation of decision-relevant information and knowledge about th evolving Earth system.



Critical Infrastructure

Building the capacity needed to execute globally coordinated climate science:

1. A hierarchy of simulation tools
2. Observations for process understanding
3. Sustained observations
4. High-end computing and data management



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Thank You

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Update on USGCRP & Strategic Planning

U.S. Global Change Research Program

Mike Kuperberg, Ph.D. | Executive Director, USGCRP

December 2018

U.S. Global Change Research Program

U.S. Global Change Research Program (USGCRP)

- Began as a Presidential Initiative in 1989, codified in law in 1990 "to assist the Nation and the world to understand, assess, predict and respond to human-induced and natural processes of global change"
- Comprises 13 agencies with responsibilities in global change
- Major coordination through Interagency Working Groups, supported by the National Coordination Office (NCO)
- FY2017 budget crosscut $2.565 billion (essentially flat since 2009)

What USGCRP does

Through USGCRP, member agencies work together to:

- Coordinate and **advance global change research** across the government
- Use research results and products to **inform decisions** relating to risk management in a changing climate
- **Deliver products mandated** by the GCRA (i.e., National Climate Assessment, Our Changing Planet, Strategic Plan)
- Foster **international research cooperation**

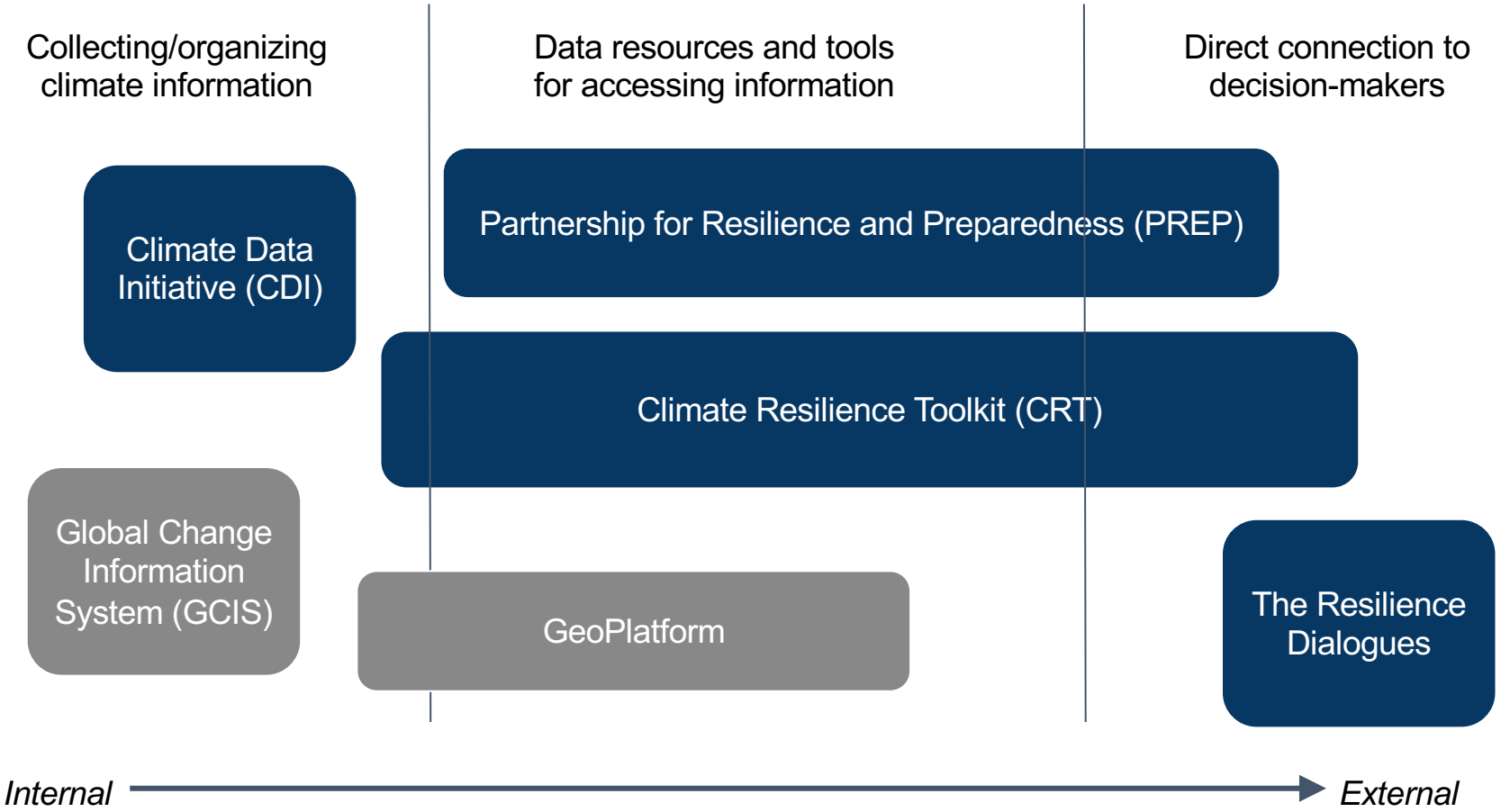
- **Also Note, things that USGCRP does <u>not</u> do**

Advancing Global Change Research

- Focus on activities that require or benefit from the engagement of multiple agencies, for example
  - Arctic, Water cycle extremes, Carbon cycle: methane
- In addition, USGCRP recognizes key enabling capabilities upon which the program depends
  - Observations, Modeling, Actionable science
- Currently exploring a societally-oriented set of focus areas
  - Infrastructure, Coasts, Urban

Informing Decisions

Elements of the Climate Resilience Enterprise



International role

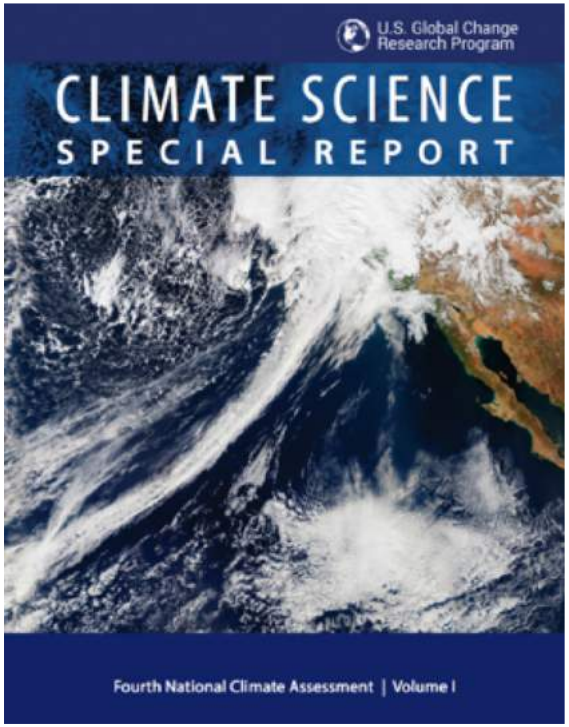
- **Promote international cooperation** on global change research
- **Coordinate the activities** of the United States with the programs of other nations and international organizations
- **Involve developing country** scientists and decision makers in this research while also **building capacity abroad** in the realm of global change science

USGCRP provides foundational support to Future Earth, START, and WCRP

USGCRP provides travel support to US scientists involved in international assessments

Mandated Products

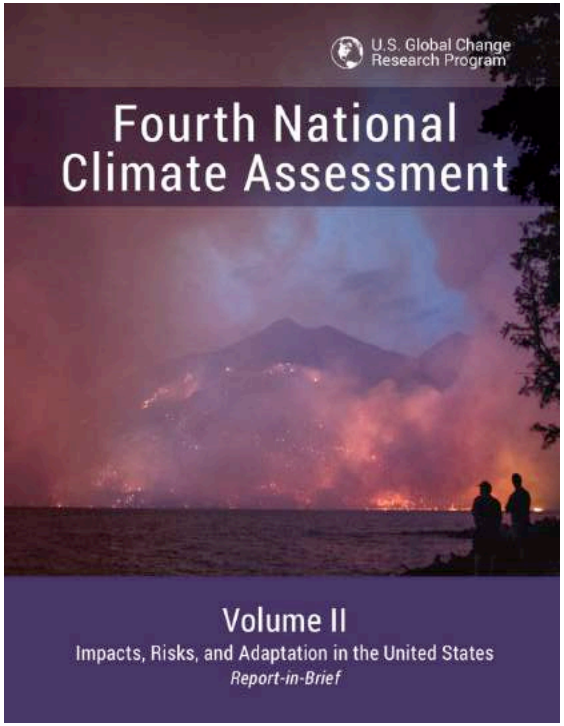
Scientific Assessments & Annual Report to Congress



Fourth National Climate Assessment

Vol. I: Climate Science Special Report

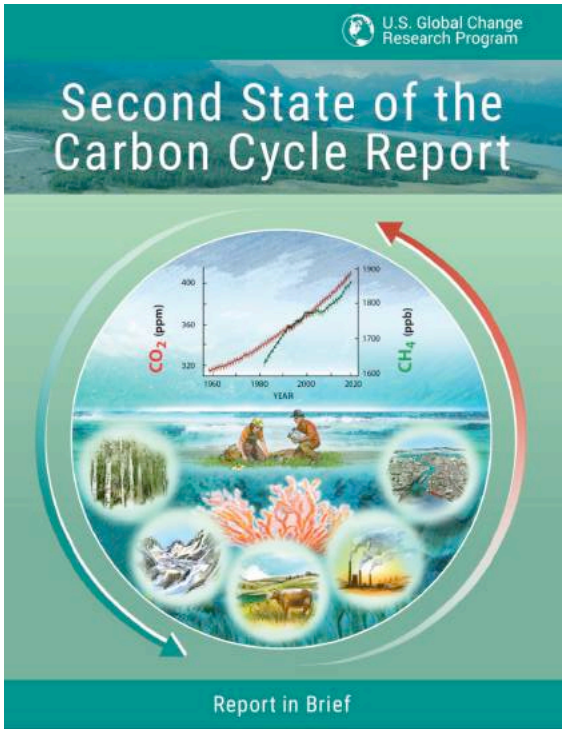
science2017.globalchange.gov



Fourth National Climate Assessment

Vol. II: Climate Change Impacts, Risks, and Adaptation in the U.S.

nca2018.globalchange.gov



Second State of the Carbon Cycle Report

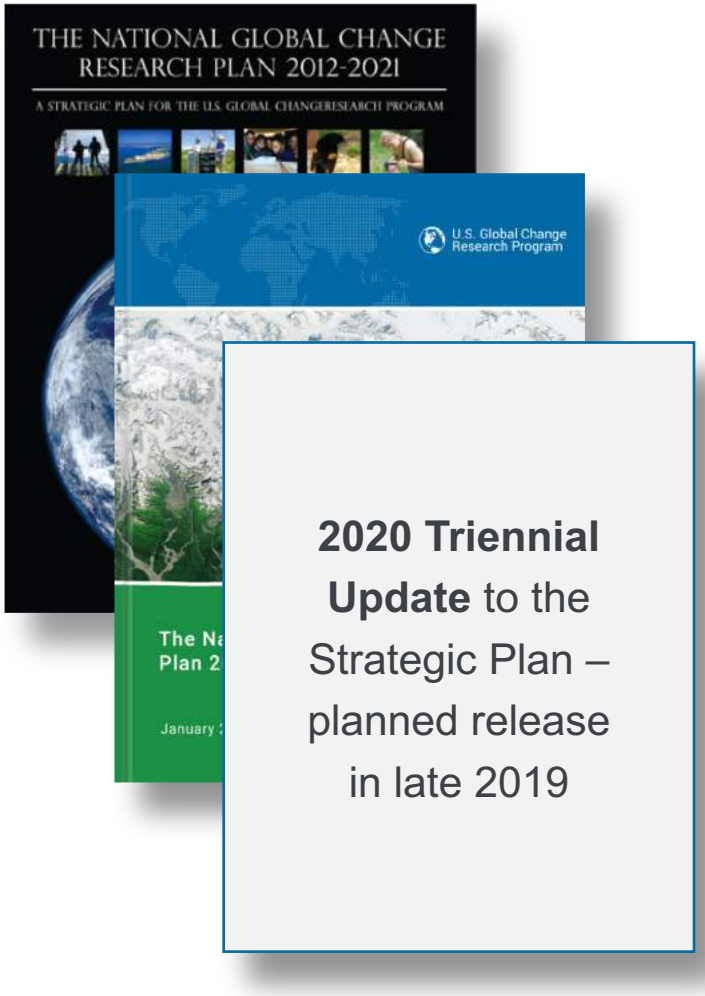
carbon2018.globalchange.gov

Mandated Products

Strategic Plan

2012-2021 strategic plan goals

1. **Advance Science:** Advance scientific knowledge of the integrated natural and human components of the Earth system.
2. **Inform Decisions:** Provide the scientific basis to inform and enable timely decisions on adaptation and mitigation.
3. **Conduct Sustained Assessments:** Build sustained assessment capacity that improves the Nation's ability to understand, anticipate, and respond to global change impacts and vulnerabilities.
4. **Communicate & Educate:** Advance communications and education to broaden public understanding of global change and develop the scientific workforce of the future.



THANK YOU

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The National Academies of Sciences, Engineering, and Medicine
in support of International Climate Science

Amanda Staudt, Ph.D.

Director, Board on Atmospheric Sciences and Climate

The National Academies of SCIENCES ENGINEERING MEDICINE

Who are we?

- Private, nongovernment, nonprofit organizations—three honorific societies (NAS, NAE, and NAM) and an operating arm
- Established by Congress under President Lincoln in 1863 to advise the nation on matters of science, engineering, and medicine

We marshal the energy and intellect of the nation's critical thinkers to respond to policy challenges with science, engineering, and medicine at their core.

C. D. (Dan) Mote Jr.
President, National Academy of Engineering

Marcia McNutt
President, National Academy of Sciences

Victor J. Dzau
President, National Academy of Medicine

Advising the Nation. Advancing the Discussion. Connecting New Frontiers.

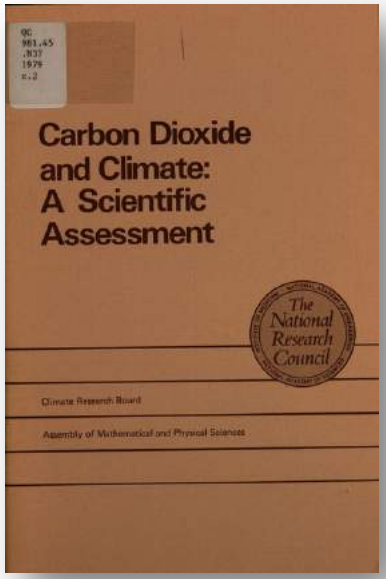
Consensus studies

Committees of the nation's leading experts established to write consensus reports on some of the toughest issues across sciences, engineering, and medicine.

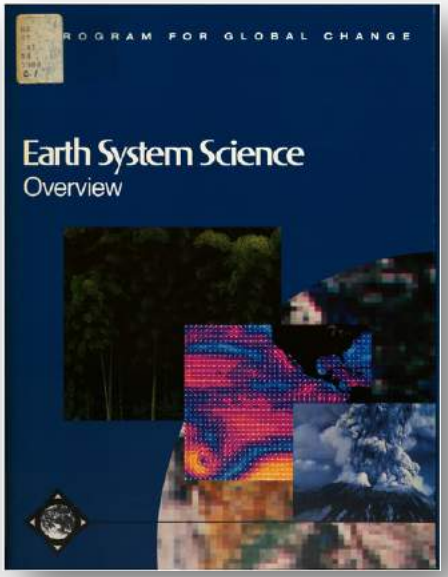
Convening thought leaders and decision makers

Workshops, symposia, and other events bring together experts and practitioners to consider issues related to science, engineering, and medicine and their implications for policy and practice.

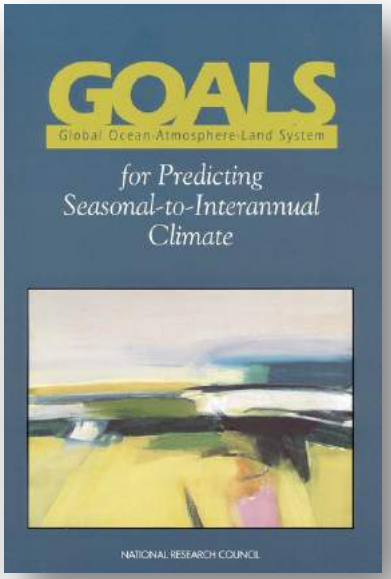
A History of Shaping Global Change Research



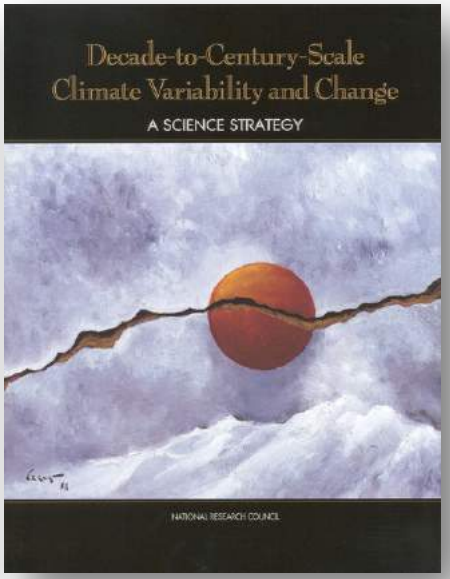
1979



1986



1994



1998

Shaping Today's Research → Agendas

Support for the USGCRP and the WCRP

- Reviews of USGCRP draft strategic plans and updates
- Reviews of National Climate Assessments and assessment products
- Ongoing strategic advice and a forum for community discussion through a standing Advisory Committee
- US National Committee to WCRP

Convening & Connecting

Recent Board and Committee meeting discussion topics:

- Subseasonal-to-seasonal forecasting for water use and management
- Fire weather and air quality impacts
- Airborne facilities for atmospheric sciences and climate research
- Scoping a research agenda for adaptation science

Connect with us!

Sign up for our newsletter at http://nas.edu/climate.

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@NASEMClimate

A big thank you to

Guy Brasseur

for your hard work and dedication as Chair of the WCRP Joint Scientific Committee

We wish you all the best for the future!

Thank you

Questions?

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