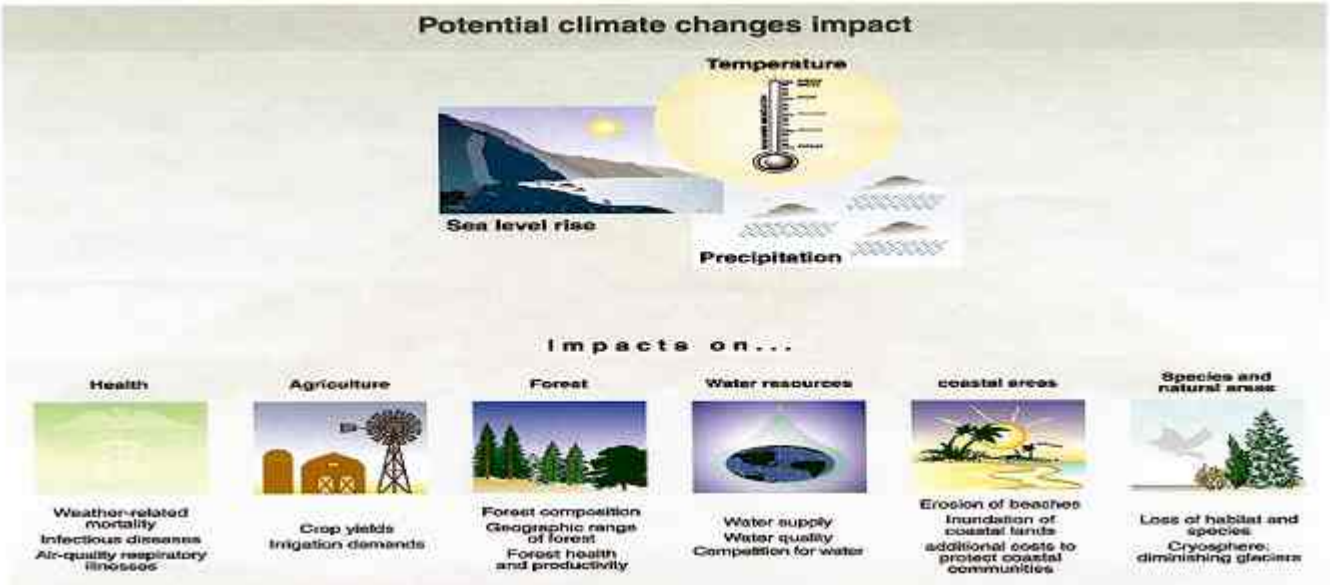
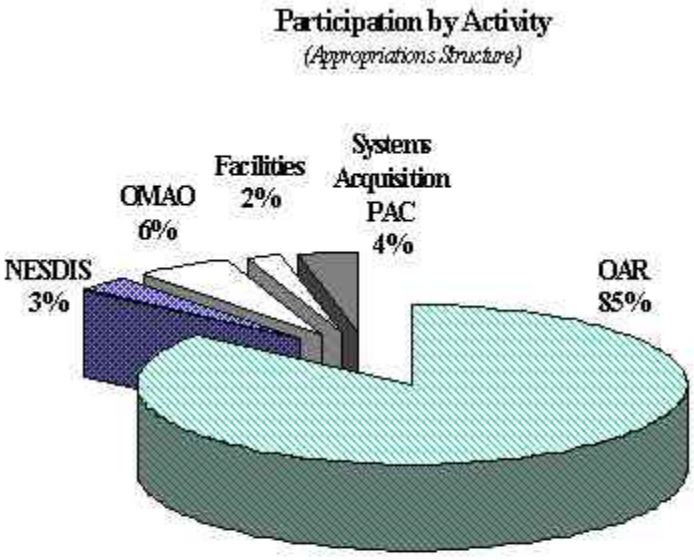



# Predict and Assess Decadal to Centennial Climate Change

## Total Request: $101,584,000

**Vision** - NOAA and its research partners will provide science-based information for improving the predictive understanding and impacts of decadal-to-centennial changes in the global environment, specifically for: long-term climate change and greenhouse warming, ozone layer depletion, and air quality improvement.




**Challenge** - Our planet is a place of natural and human-induced change. Human activities are now recognized as impacting the global heat balance and climate system, thinning of the stratospheric ozone layer, and atmospheric pollution. While these changes increasingly promise to impact our

societal systems and natural environments, they challenge the world scientific community to improve its prediction and assessment capabilities. Explanatory environmental models must be strengthened through better understanding of the atmospheric and oceanic processes so that we may meet the challenges of understanding and foreseeing climate variability and long-term change in approaching decades. Sound economic and social decisions depend upon assessed scientific information as a touchstone.

**Implementation Strategy** - The objectives of this goal are:

- to characterize the agents and processes that force decadal to centennial climate change;
- understand the role of the ocean as a reservoir of both heat and carbon dioxide to address a major source of uncertainty in climate models;
- ensure a long-term climate record by enhancing domestic and international weather networks, observing procedures, and information management systems. Document present and past changes and variations in the climate system, including extreme events, and rapid climate changes, exploiting national and international observing networks, satellites, and paleoclimatic data;
- guide the rehabilitation of the ozone layer by providing the scientific basis for policy choices associate with ozone-depleting compounds and their replacements;
- provide the scientific basis for improved air quality by improving the understanding of high surface ozone episodes in rural areas and by strengthening the monitoring network to detect cleaner air quality and improving the characterization of airborne fine particles; and
- develop models for the prediction of long-term climate change (including extreme events and rapid climate changes), carry out scientific assessments, and provide human and biophysical impacts information.

**Benefits** - Nations have committed to eliminating production of compounds that deplete the ozone layer. Research is not only helping define "ozone-friendly" replacement compounds and monitoring the atmospheric decline in ozone-depleting substances, but also documenting that the recovery of the ozone layer is as expected. Anticipatory research on global climate change supports sustainable development by providing timely information to society to make sound decisions about the role of human activities in global climate change and variability. NOAA research has identified areas of air quality changes, such as high surface ozone in rural areas, that require the development of a fundamental understanding of their causes. New research is pointing to more effective ways to meet those goals, thereby avoiding costly over-regulation. Providing research results that address key scientific uncertainties, presenting the improvements in understanding in up-to-date assessments, and summarizing this knowledge in policy-relevant terms to government and industrial leaders are the cornerstones of environmental stewardship.

## FY 2000 Accomplishments

NOAA has recognized that a sustained, multi-dimensional program of research is required to understand and monitor the long-term processes and status of the Earth's atmosphere. On-going research involves monitoring and understanding natural and anthropogenic aerosols and greenhouse gases, stratospheric ozone depletion, background atmospheric constituent composition, and reconstructing past climates through the use of historical measurements and paleoclimate data. In FY 2000, NOAA's research documented trends in atmospheric trace gases related to climate, air quality, and the ozone layer (e.g., methane, halocarbons, nitrous oxide, ozone), and analyzed trends in climate-related parameters such as the frequency of heat extremes. The climate-related properties of atmospheric aerosols were elucidated in studies over ocean and land surfaces. FY 2000 research also advanced understanding of the role of the oceans and land surface in the atmosphere's carbon cycle, information that is key to improved model predictions of future climate. A major study of the chemical processes that influence ozone destruction in high latitudes of the northern hemisphere was conducted in FY 2000. In collaboration with university, government and international partners, NOAA continues to provide the scientific basis for sound, science-based information supporting decisions relevant to issues regarding decadal to centennial change. In FY 2000, NOAA played leading roles in assessing the understanding of climate and climate change, as well as ozone pollution. These achievements are realized largely through the efforts of the Office of Oceanic and Atmospheric Research, the National Environmental Satellite, Data, and Information Service, and the National Weather Service.

## Key FY 2002 Activities

- Continue to advance understanding of the natural and human-influenced processes affecting the earth's radiation balance with an emphasis on observations of the coupled ocean-atmosphere system, especially as it relates to the cycle of carbon dioxide, utilization of observations, and assessments of the current understanding that serve as input to public policy formulation.

- Continue the development of a climate reference network; NOAA will continue to place instruments that measure temperature, precipitation, and soil moisture at a number of reference network sites and to implement a means to electronically communicate all data collected in the reference network.

- Continue improving the ways observations and models are used to study and predict the effects of climate changes on a regional scale within the US.

- Continue the improvement of observation systems and extend the capability of models to develop the ability to predict the effects of natural climate cycles with time scales longer El Nino Southern Oscillation (ENSO).

- Further the understanding of the role of the ocean in the climate system by continuing the deployment of the ARGO float network, ongoing field measurement programs and special targeted studies, and refinement of remote sensing capabilities to better understand the role of the ocean in the climate system.

- Advance the understanding of the role of natural and human influenced emissions, including aerosols, in altering the radiation balance of the earth by enhancing ongoing monitoring programs and conducting new field measurement programs.

- Continue the ongoing archival and analysis of climate data to assess current and future impacts and to provide critical data and services to other Federal Agencies, state and local government, private commercial groups, and the public.

- Continue monitoring the recovery of the stratospheric ozone layer

## Key Performance Measures

The scientific community has in place a regular process for evaluating, on a several-year time scale, the major scientific advances in climate science. This process is the periodic assessment of the state of scientific understanding of the climate system. NOAA's measure of performance is that 90% of the research in relevant areas of endeavor be incorporated into these assessments, namely, the vast majority of NOAA's results are deemed by our scientific peers to be major advances in understanding. Three to five years is the period generally used to expect substantial overall advancements in a field such that a new state-of-understanding assessment could be justified. Those products take 2 ½- to 3-years to produce.

| Performance Measure | 1998 act. | 1999 act. | 2000 act. | 2001 est. | 2002 est. |
|---|---|---|---|---|---|
| Document the "turnover" of CFC source gases in order to verify the effectiveness of global policy action | N/A | 1 | N/A | N/A | 1 |
| Publish updated trend results of air quality measurements | N/A | 1 | N/A | 1 | N/A |
| Lead development of a peer reviewed initial assessment of regional ozone in North America, including summarizing results for customers | N/A | 1 | N/A | N/A | N/A |
| Results of 90% of the research activities cited in the 2001 IPCC third Assessment of Climate Change | N/A | N/A | N/A | 90% cited | N/A |
| Results of 90% of the research activities cited in the 2002 Scientific Assessment of Stratospheric ozone depletion. | N/A | 90% cited | N/A | N/A | 90% cited |
| Results of 90% of the research activities cited in the 2000 US National assessment of the Potential Consequences of Climate Variability and Change | N/A | N/A | N/A | 90% cited | N/A |