

ENVIRONMENTAL PROTECTION AGENCY



Principal Areas of Focus

EPA's Global Change Research Program has its primary emphasis on evaluating the potential consequences of global change (particularly climate variability and change) on air quality, water quality, ecosystems, and human health in the United States. This includes improving the scientific basis for evaluating effects of global change in the context of other stressors, and evaluating the risks and opportunities presented by global change. EPA uses the results of these studies to investigate adaptation options to improve society's ability to effectively respond to the risks and opportunities presented by global change. The program is multidisciplinary and emphasizes the integration of the concepts, methods, and results of the physical, biological, and social sciences into decision support frameworks. This work is consistent with and closely coordinated with the *CCSP Strategic Plan*.

The planning and implementation of EPA's program is integrated by the CCSP with other participating Federal departments and agencies to reduce overlaps, identify and fill programmatic gaps, and add value to products and deliverables produced under the CCSP's auspices. EPA coordinates with other CCSP agencies to develop and provide timely, useful, and scientifically sound information to decisionmakers. This includes support for the production of CCSP synthesis and assessment products called for in the *CCSP Strategic Plan*, and the development of decision support tools for resource managers and decisionmakers. Also, as called for by the National Research Council in 2001, EPA supports and fosters projects that link knowledge producers and users in a dialog that builds a mutual understanding of what is needed, what can credibly be said, and how it can be said in a way that maintains scientific credibility.

EPA's program also makes significant contributions to the high-level interagency bilateral climate dialogs that are led by the Department of State. EPA's program supports research on climate impacts and adaptation in China, Italy, Canada, and India. These activities focus on evaluating the potential consequences of climate change and adaptation strategies.

EPA's program has four areas of emphasis: air quality, water quality, ecosystems, and human health. The results of studies done in these areas are integrated at particular places (such as watersheds).

Air Quality

Few studies have investigated the effect of global change on air quality. Studies are planned that will examine the potential consequences of global change on air quality in the United States. The long-term goal of this focus area is to provide the approaches, methods, and models to quantitatively evaluate the potential effects of global change on air quality, and to identify technology advancements and adaptive responses and quantify their effect on air quality.

Water Quality

Water quality is affected by changes in runoff following changes in precipitation and evapotranspiration and/or changes in land use. The program is investigating the possible impacts of global change (climate and land-use change) on water quality using a watershed approach. The water quality studies will contribute to and benefit from human health and ecosystems studies.

Ecosystems

EPA's mission is not only to protect human health but also to safeguard the natural environment. EPA provides environmental protection that contributes to making communities and ecosystems diverse, sustainable, and economically productive. Consistent with this goal, EPA's Global Change Research Program has planned three research activities that evaluate the effects of global change on aquatic ecosystems (which include lakes, rivers, and streams; wetlands; and estuaries and coastal ecosystems), invasive nonindigenous species, and ecosystem services. EPA's investigations of the effects of global change on aquatic ecosystems will use as input the research being done by other CCSP agencies on marine and terrestrial ecosystems. Therefore, EPA's ability to successfully complete its assessments depends crucially upon the ability of other CCSP agencies to complete their related research activities.

Human Health

Since health is affected by a variety of social, economic, political, environmental, and technological factors, investigating the potential health impacts of global change is a complex challenge. As a result, health studies in EPA's Global Change Research Program go beyond basic epidemiological research to develop integrated health evaluation frameworks that consider the effects of multiple stresses, their interactions, and human adaptive responses. Along with health sector studies conducted in conjunction with other CCSP agencies, there are research activities focused on the possible consequences of global change on weather-related morbidity and vector- and water-borne diseases. In addition, the results from air quality studies will be used to evaluate health consequences.

Intramural and extramural research contribute to all of EPA's investigations. In an attempt to capitalize on expertise in the academic community, a significant portion of the program's resources is dedicated to extramural research grants administered through the Science to Achieve Results (STAR) program. The STAR program focuses on science to support investigations of the consequences of global change for air quality, ecosystems, and human health in the United States. EPA will continue to coordinate closely with other CCSP agencies doing human dimensions research to identify the specific topics that should be emphasized within the STAR program.

Program Highlights for FY 2006

EPA will continue to make significant contributions to the ongoing research activities of the CCSP. EPA strives to understand relative risks in the context of multiple stressors, at multiple scales and multiple levels of biological and institutional organization. EPA-sponsored investigations will continue to be conducted through public-private partnerships that actively engage researchers from the academic community, decisionmakers, resource managers, and other affected stakeholders. Highlights of specific activities that will be undertaken by EPA in FY 2006 follow:

- Support the CCSP commitment to generate 21 synthesis and assessment products by leading or co-leading three analyses and supporting seven others.
- Support the high-level interagency bilateral climate dialogs with China, Italy, Canada, and India that are being led by the Department of State.
- Produce a report that identifies those threatened and endangered species that may be at greater risk from climate change.
- Evaluate the effects of climate-related stressors on coral reef ecosystems. Research will be conducted in American Samoa and the Florida Keys.

Appendix

- Study the management implications of global change and interacting stressors on the establishment and expansion of invasive species.
- Conduct case studies of climate change effects on bioindicators and biocriteria programs.
- Investigate the effects of changes in climate and land use on non-point source pollution in estuaries.
- Study current land conservation practices and provide a tool for projecting future distributions of land protection as a climate change adaptation mechanism to restore or maintain ecosystem services.
- Produce a report that examines the possible implications of global change for combined sewer overflow events.
- Develop a synthesis report detailing the health effects of airborne allergens associated with climate change.

Related Research

In addition to focused CCSP activities, EPA conducts research that contributes to the characterization and understanding of risks to ecosystems and to human health. The ecosystems-based research is designed to understand and predict ecosystem exposure, responses, and vulnerabilities to high-risk chemicals and non-chemical stressors (e.g., invasive species, genetically altered organisms) at multiple scales of biological organization and geographic scales. The research in human health is oriented toward assessing the cumulative health risks to humans (e.g., cancer, reproductive, cardiovascular)—including high-risk subpopulations (e.g., children)—from chemical stressors emanating from multiple sources. Both of these major research areas can be affected by climate change.