ENVIRONMENTAL PROTECTION AGENCY

Principal Areas of Focus

EPA's Global Change Research Program has its primary emphasis on evaluating the potential consequences of climate variability and change on air quality, water quality, ecosystems, and human health in the United States. This entails: (1) improving the scientific basis for evaluating effects of global change in the context of other stressors; (2) conducting evaluations of the risks and opportunities presented by global change; and (3) investigating adaptation options to increase resiliency to change and improve society's ability to effectively respond to the risks and opportunities presented by global change. EPA's program 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 integrative value to products and deliverables generated under the CCSP's auspices. EPA coordinates with other CCSP agencies to develop and provide useful and scientifically sound information to decisionmakers in a timely manner. This includes the development of decision support tools for resource managers and decisionmakers. Also, as called for by the National Research Council, EPA supports and fosters projects that link knowledge producers and users in a dialogue 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 has four areas of emphasis: air quality, water quality, ecosystems, and human health.

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 urban areas in the United States. The long-term goal of this focus area is to provide the approaches, methods, and models to quantitatively assess the effects of global change (climate change, land-use change, and UV radiation changes) on urban air quality, and to identify technology advancements and adaptive responses and quantify their effect on air quality.

Water Quality

Water quality can be 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 both 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 promotes environmental protection that contributes to making communities and ecosystems diverse, sustainable, and economically productive. Consistent with this goal, EPA's Global Program has planned three research activities that investigate the effects of global change on aquatic ecosystems (which may

include lakes, rivers, and streams; wetlands; and estuaries and coastal ecosystems); invasive non-indigenous 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 investigations 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 health impacts of global change is a complex challenge. As a result, health studies in EPA's Global Program go beyond basic epidemiological research to development of 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 the Global Program's air quality assessments will be used to evaluate health consequences.

Intramural and extramural research contributes 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 consequences of global change for air quality and ecosystems in the United States. EPA will continue to coordinate closely with other CCSP agencies to identify the specific topics that should be emphasized within the STAR program.

Program Highlights for FY 2004 and FY 2005

EPA will continue to make significant contributions to the ongoing assessment 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. The 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 2004 and FY 2005 include:

- Support the CCSP commitment to generate 21 synthesis and assessment products by leading or co-leading three analyses and supporting seven others.
- Investigate the potential consequences of climate change for human health.
- Develop best-available scientific information about the potential consequences of climate variability and change for the Gulf Coast, Great Lakes, and Mid-Atlantic regions.
- Evaluate the feasibility of adaptation strategies that might be employed to respond to the direct and indirect impacts of global change on human health in the United States.
- Investigate the potential effects of global change on waterborne diseases in the United States.
- Evaluate the potential global change impacts on water quality (pollutants and pathogens).
- Develop socioeconomic scenarios for use in EPA's global air quality studies and in related CCSP studies.

Related Research

In addition to the 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 will be impacted by and are inextricably interrelated with climate change.