Overview of EPA's Air Pollution Research Program

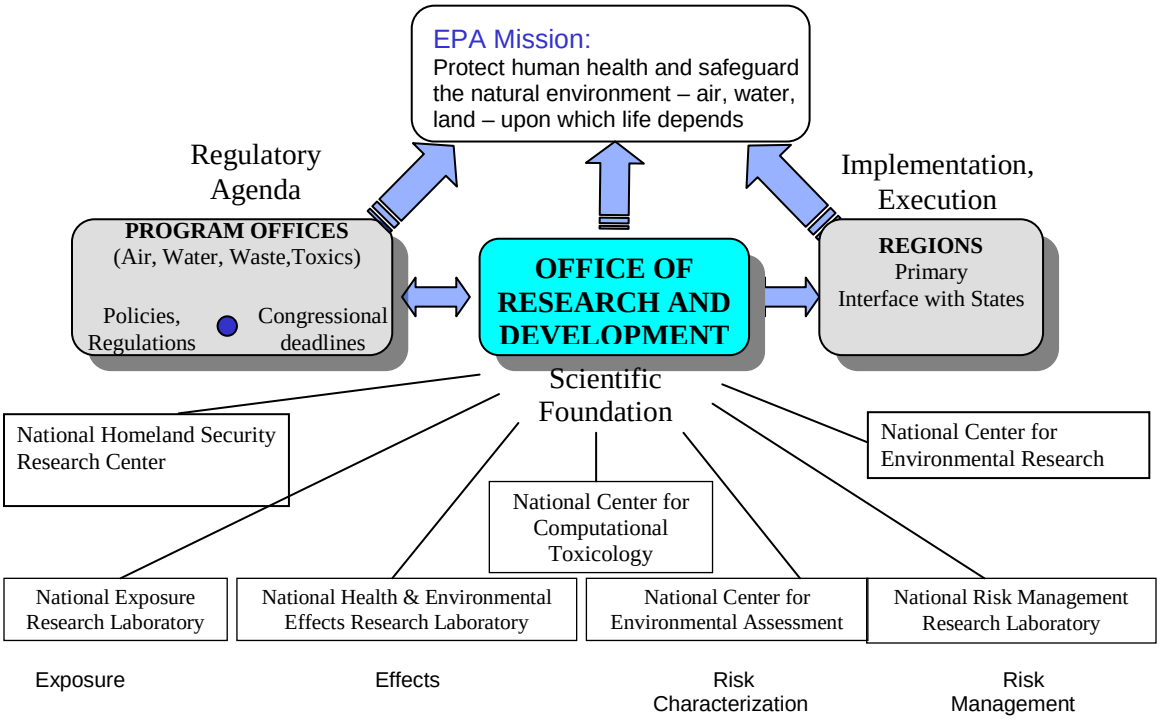
EPA's Regulatory Context for Air Pollution Research

Under the Clean Air Act (CAA), Particulate Matter (PM), Ozone (O3), Carbon Monoxide (CO), Nitrogen Dioxide (NO2), Sulfur Dioxide (SO2) and Lead (Pb) represent the six major air pollutants for which EPA has established National Ambient Air Quality Standards (NAAQS). The CAA mandates periodic reviews of the scientific basis or "criteria" for these standards and requires EPA to prepare a comprehensive scientific assessment of the state-of-the-knowledge for each criteria air pollutant. Following the promulgation of the NAAQS, States must use analytical tools to assess how to comply with the new standards and continue attaining them over time. Monitoring data coupled with atmospheric models and emissions information are used to develop State Implementation Plans (SIPs) that propose combinations of emissions reductions that are predicted to be most effective in reaching attainment of the standards. There will be varying degrees of challenges associated with NAAQS compliance depending on the air pollution sources and the atmospheric conditions in different regions of the country.

Mission and Organization

The mission of the Office of Research and Development (ORD) is to conduct and sponsor research to support the Agency's program offices in meeting their current and future regulatory mandates and providing informed guidance to the public. As such, ORD managers and staff develop air research priorities in close cooperation with our primary internal clients: EPA's Office of Air and Radiation (OAR) and EPA's Regional Offices. ORD's role is to provide the critical science for environmental decision-making. Through the development of technical information and scientific tools, ORD's research strengthens EPA's science base, providing the Agency's Program Offices and Regional Offices with sound data for use in developing and implementing tenable environmental policies, regulations, and practices. Comprising three National Laboratories and four National Centers across the country, ORD's broad scope encompasses efforts to assess and manage both human health and ecological risks. Figure 1 provides an overview of that structure.

Environmental Protection Agency



Rationale for Multipollutant Research

Over the past 40 years EPA research has provided effective solutions to high-priority environmental problems. These solutions were necessarily achieved using 20th century approaches, such as assessing risk or developing controls to emissions by focusing on a single pollutant and its impact on a single target organ or species. However, such single-pollutant, source-specific, and end-of-pipe approaches are limited in their ability to address the increasing complexity of 21st century environmental challenges with solutions that are effective, efficient, and sustainable – solutions that meet current needs without compromising the future. As EPA transforms its research capability to more fully understand these complex interactions and the implications of policy choices to develop more sustainable solutions, it recognizes that further advances in air pollution sciences and air quality management will require the adoption of multipollutant approaches. These approaches would bring the strengths and insights of the health and atmospheric sciences into closer alliance. This integrated effort will provide a framework for self-assessments and mid-course corrections and ensure progress – accountability.

The move towards a multipollutant or “one atmosphere” concept will of necessity consider the criteria and the Air Toxic pollutants, the latter of which is currently a separate, but relatively small program. EPA is currently in the process of developing plans to conduct a multipollutant science assessment whereby the health effects of exposures to mixtures of air pollutants, particularly the criteria air pollutants, may be systematically evaluated. Further, EPA is developing the analytical and conceptual

methods through which information from multipollutant epidemiologic and exposure studies may be applied to risk and exposure assessments conducted as part of the periodic reviews of the national ambient air quality standards (NAAQS). These multipollutant initiatives are rooted in future research that will best inform and characterize the health effects of exposure to real-world mixtures of air pollutants including the criteria air pollutants, other hazardous air pollutants (HAPs), and pollutants or stressors associated with climate change.

Overview of EPA's Air, Climate, and Energy Research Program

American communities face serious health and environmental challenges from air pollution and the growing effects of climate change, both of which are intricately linked with current and future energy options. Improving air quality, reducing greenhouse gas (GHG) emissions, and developing adaptation strategies to address climate change are central to the Agency's mission to protect public health and the environment. To more fully understand the interplay between air, climate change, and the changing energy landscape and subsequently develop innovative and sustainable solutions to improving air quality and addressing climate change EPA's Office of Research and Development (ORD) is in the process of designing a new, integrated research program for Air, Climate and Energy (ACE). This program will build upon the highly successful, policy relevant research the Agency has conducted in the areas of air pollution and climate change.

Over the past decades, air quality in the U.S. has improved significantly. During this time period ORD research has played a central role in demonstrating that exposure to air pollution remains a major health concern, as it can lead to damage to the cardiovascular, respiratory, immune, nervous and reproductive systems, as well as, cancer and death. These findings have provided the scientific basis of the statutory requirements of the Clean Air Act (CAA) and directly contributed to the Office of Management and Budget's (OMB) estimates that the benefits of air pollution regulations far exceed their costs. Despite this progress in improving air quality, millions of people still live in counties that do not meet air quality standards for one or more pollutants.

Global GHG emissions continue to rise and have been shown to lead to a range of major and potentially adverse effects on the environment and public welfare. In response to the 2009 Endangerment and Cause or Contribute Findings for GHGs, ORD has the responsibility to produce the scientific information needed to respond to the Agency's efforts to meet its legal, statutory, and policy requirements in a changing climate, including informing climate mitigation and adaptation choices towards sustainable, resilient solutions.

The impacts of air quality and climate change are heavily influenced by the energy choices of the U.S. and the world. As the demand for energy increases, along with shifts to clean energy alternatives, it is necessary to understand the interaction between air quality and climate change in this changing energy landscape, and the potential impacts on human and environmental health. The recognition of this interaction between air, climate, and energy paves the way for research that examines the multipollutant nature of air pollution and contributes to creating more sustainable air quality management strategies that simultaneously improve air quality and reduce GHG emissions.