

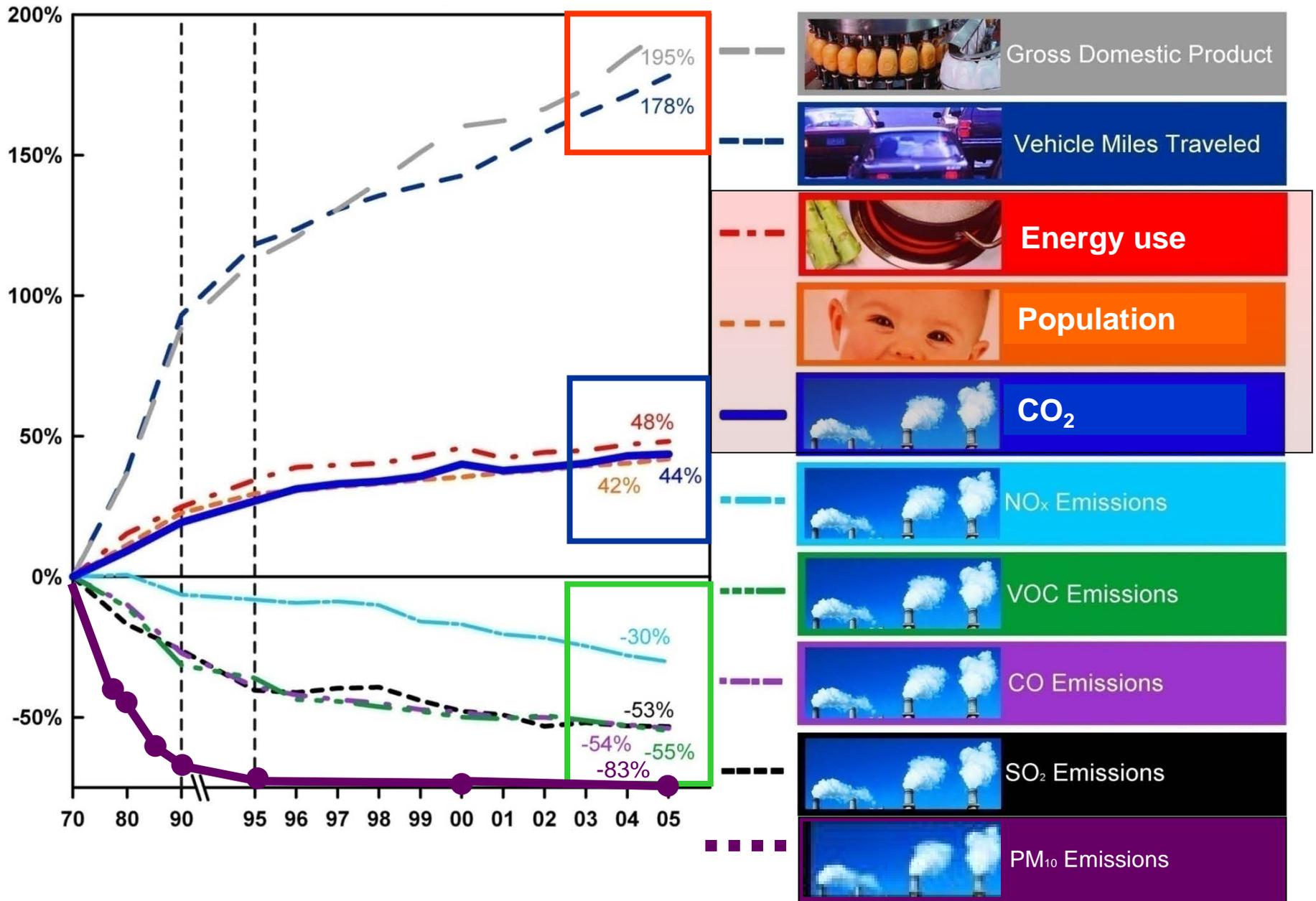
Air Climate & Energy

A Presentation to the EPA Science Advisory Board

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Why Air, Climate, and Energy (ACE)?





Problem Statement:

Protecting health and the environment from the impacts of climate change and air quality are central 21st century challenges. These challenges are complicated by the interplay between air quality, the changing climate, and emerging energy options.

Vision:

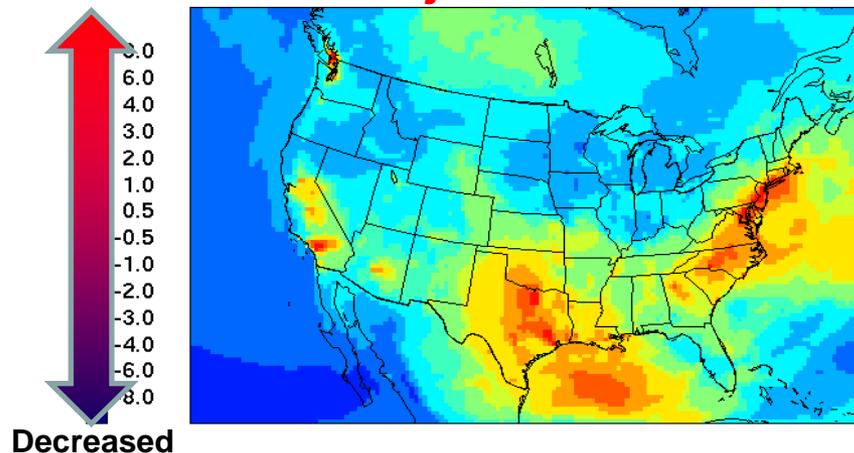
The ACE program will provide cutting-edge scientific information and tools to support EPA's strategic goals to protect and improve air quality and take action on climate change.

- Despite gains, air pollution remains a significant health concern
 - ORD supports the statutory requirements of the Clean Air Act: NAAQS & HAPs (PM - >40% of pubs in *Int. Sci. Assess.*, ORD)
 - Most emissions way down: ~127 million people still live in counties that do not meet AQ standards for one or more pollutants.
- OMB estimates that the benefits of air pollution regulations far exceed their costs
 - Air regs (PM) account for ~80% of all regulatory benefits
- Report estimates that NAAQS will create approximately 1.5 million jobs over the next 5 years (CERES, 2011)

- *“Endangerment and Cause or Contribute Findings for Green House Gases” (GHGs) (2009)*
 - ORD science supported with assessments of impacts to health and environmental damage caused by climate change
 - ORD continues its responsible to produce science that supports the Agency’s efforts to meet legal, statutory, and policy requirements in a changing climate

GHG emissions continue to rise and will likely lead to a range of major and potentially adverse effects on the environment and public health and welfare

Increased **2050 Projections for Ozone**



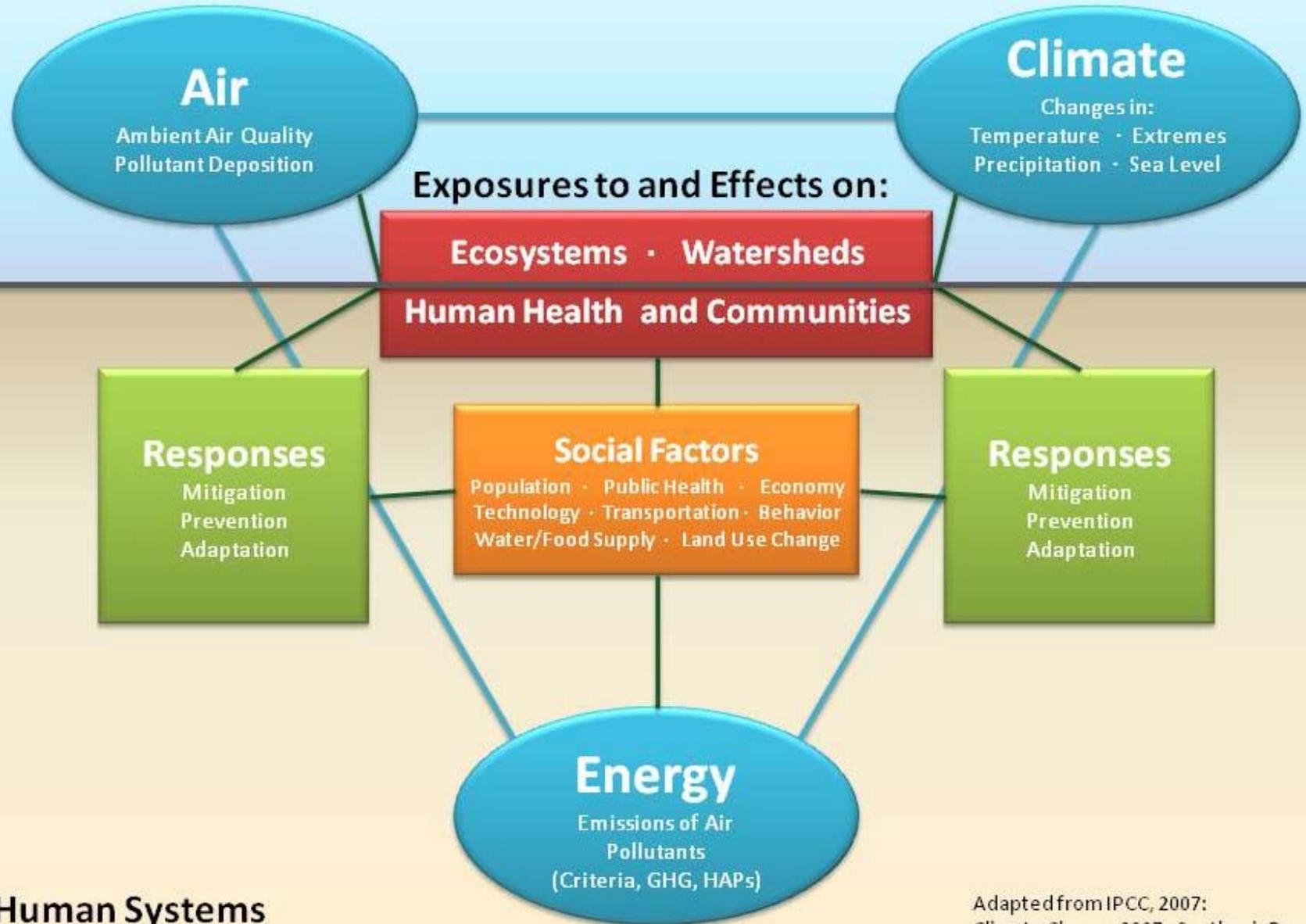
- 2007 Energy Independence and Security Act (EISA)
- 2009 American Clean Energy Leadership Act (ACELA)
 - Both require EPA to conduct research to examine the impacts and develop new standards for alternative energy options
 - President's 2035 goal for 80% of electricity from clean energy.
 - Energy production & use results in broad impacts requiring systems thinking approaches.
 - Life-cycle analysis: coal-electricity accounts for ~80% of U.S. CO₂ emissions as well as NO_x, SO₂, PM, & Hg - economic, ecological, and human health effects (Epstein et al. 2011)



Energy options of the future are unclear, but it is evident that the U.S. faces a rapidly changing energy landscape that will impact human health and the environment.



Earth Systems



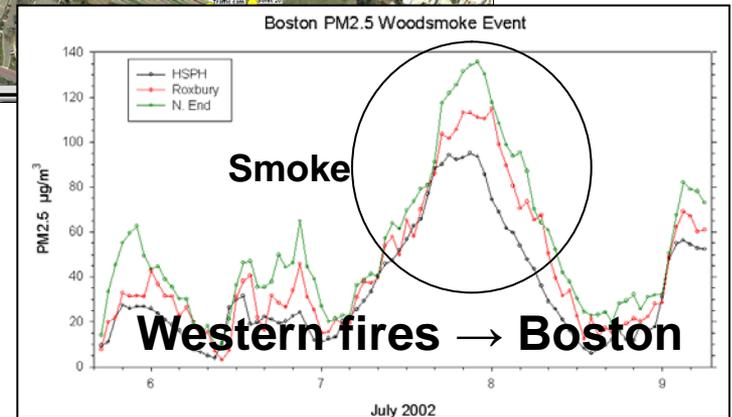
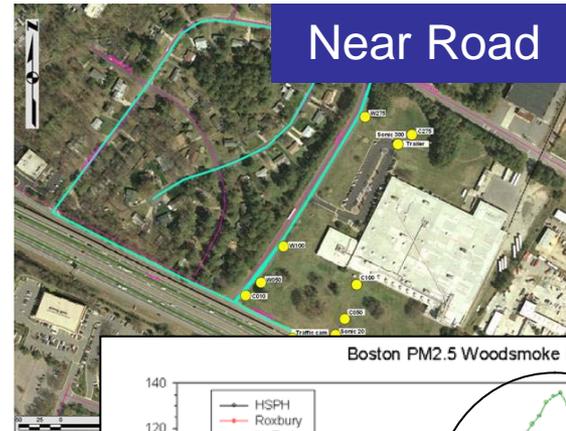
Human Systems

Adapted from IPCC, 2007:
Climate Change 2007: Synthesis Report.

ACE: Research Themes 1 & 2

Assess Impacts

Assess human and ecosystem exposures and effects associated with air pollutants and climate change at individual, community, regional, and global scales



Prevent and Reduce Emissions

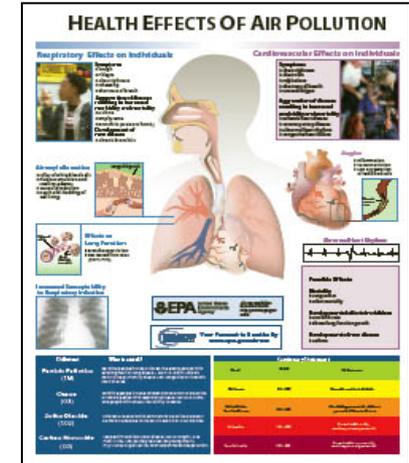
Provide data & tools to develop and evaluate approaches to prevent and reduce emissions of pollutants to the atmosphere, particularly environmentally sustainable, cost effective, and innovative multipollutant and sector-based approaches



ACE: Research Theme 3

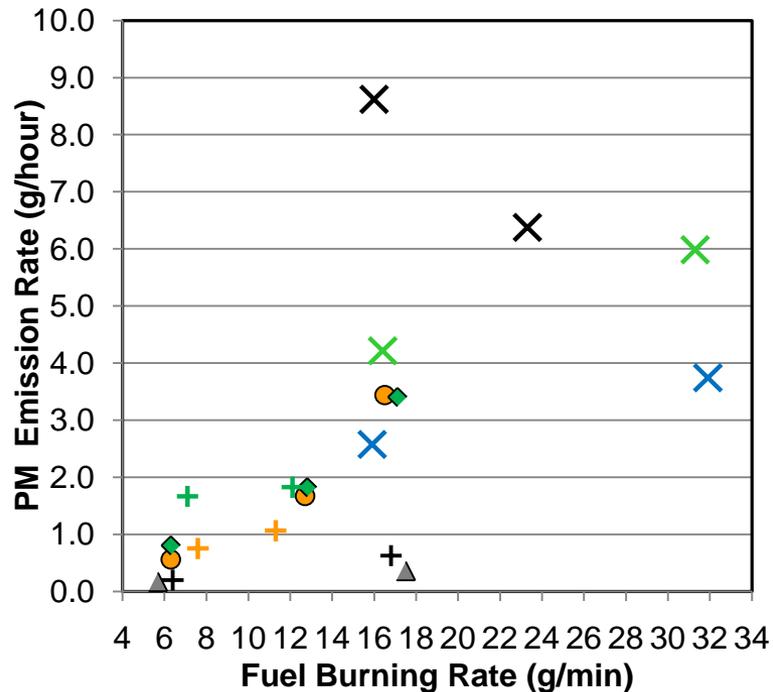
Respond to Changes in Climate & Air Quality

Provide human exposure and environmental modeling, monitoring, metrics and information needed by individuals, communities, and governmental agencies to adapt to the impacts of climate change and make informed public health decisions regarding air quality

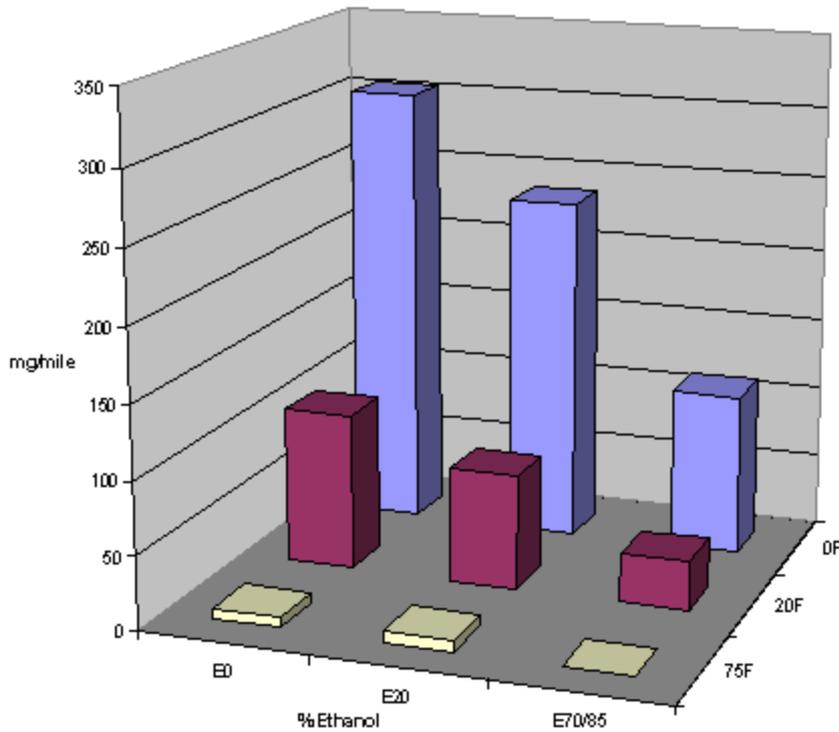


ACE Research: Cookstove Testing

- Tests of cookstove emissions using standardized protocol
- Supporting UN Foundation Global Alliance for Clean Cookstoves



ACE Research: Biofuels Emissions

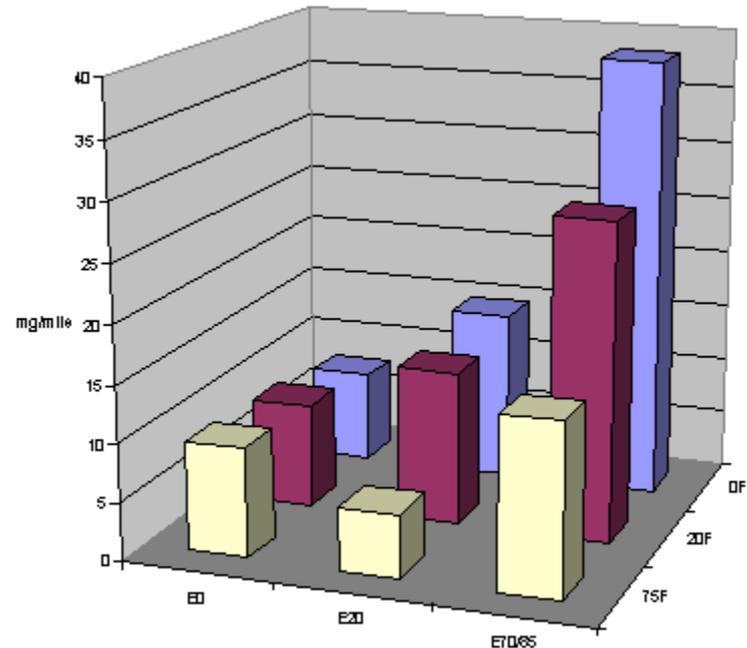


PM mass emissions

Ethanol blend gasoline can reduce PM impacts and imported oil needs.

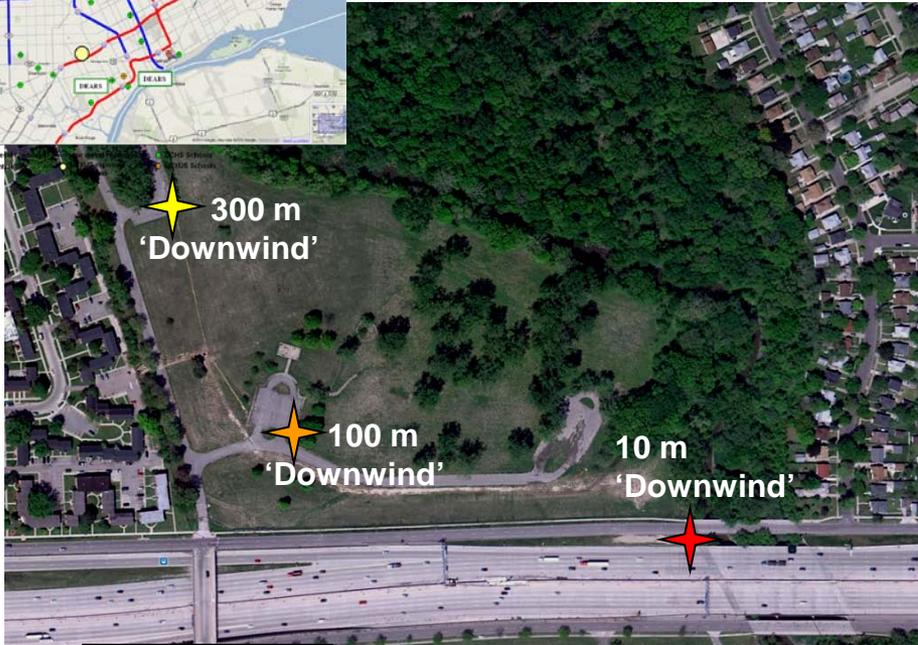
Ethanol blends can increase aldehyde concentrations, with potential health & AQ impacts

Acetaldehyde emissions



Long, Baldauf, Snow (2009)

Detroit



ACE Research: Near Road / NEXUS

Long-Term Monitoring

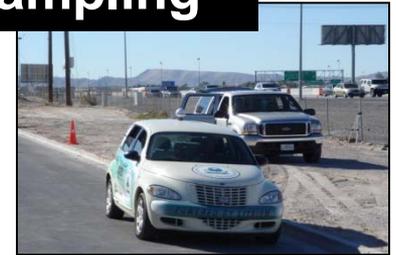
FHWA/EPA Collaboration Sites:



Sampling

Intensive Spatial Monitoring

Vehicle sampling:



Schools



100 m
'Upwind'



Homes



Toxicology

ACE: Expected Accomplishments – 2012

- Comparative toxicity framework & ranking of the relative potency of PM components, sources
 - Multicity (or Regional) PM Source and Toxicity Assessment
- Early life exposures to fuel vapors linked to later life neuro & immuno dysfunction
- Identify health effects associated with multipollutant exposures - ambient PM & gases.
- Mechanisms – pathways, oxidative stress, iron.
- Combustion (DE) emissions related to near road.

ACE: Expected Accomplishments – 2012

- Coarse PM - health outcomes
- PM, BC, other emission factors from open burning of biomass using ground and aerial measurement
- Draft report synthesizing / summarizing the effects of climate change & emissions changes on regional air quality
- Models: global to urban scales changes in mercury atmospheric processes & deposition due to climate change & other factors.
- Draft report on the vulnerability of Pacific Coast estuarine ecosystems to global climate change.

ACE: Expected 5- Year Accomplishments (Selected)

Research Theme 1:

- Support to the NAAQS review and implementation process
- Summary of near-road health effects, micro-area models
- Multipollutant Science: Clean Air Centers – AQ-health
- Improved models for integrated climate-air quality assessments
- Support to the Global Climate Assessments to Congress

Research Theme 2:

- Assess future energy technology impact on GHG & AQ emissions.
- Enhanced ambient and source monitoring methods in support of national, state, local, and community needs
- Biofuel report to Congress

ACE: Expected 5- Year Accomplishments (Selected)

Research Theme 3:

- Evaluation of water utility adaptation options
- Evaluation of adaptation / mitigation options (e.g., vegetative barriers)
- Public tools for personal decision making

Embedded critical issues:



environmental justice



Communities



susceptible populations



FY 2012 Budget Highlights

Air, Climate and Energy (ACE)

(FY 2010 Enacted \$111.4M, FY 2012 PB \$108.0M, Change -\$3.4M)

- A robust monitoring network is vital to the nation's air quality because it measures and tracks pollutants, identifies pollutant sources, and provides information on how Americans are exposed to air pollutants. In 2012, we are requesting **\$3.0M** to support the development, improvement, and demonstration of air pollution monitoring and measurement technologies.
 - Current air pollution monitoring is very expensive; has limited spatial and temporal coverage
 - Innovative, new methods are needed— focus on versatility, reliability and cost, able to detect a variety of chemical species,
 - New electronic and nano technologies open intriguing possible applications for air quality monitoring
 - Multifunctional - air quality management, health / eco research.

FY 2012 Budget Highlights

Air, Climate and Energy (ACE)

(FY 2010 Enacted \$111.4M, FY 2012 PB \$108.0M, Change -\$3.4M)

- Completion of several biofuel research projects and a new approach to mercury regulation in 2011 provides an opportunity to support the fiscal challenges this country faces. Reductions include:
 - Biofuels research: submission of 2010 Report to Congress and completion of research regarding the safety of storing high ethanol blend gasoline in underground storage tanks (\$2.2M)
 - Mercury research need has been reduced due to the Agency's decision to move forward with technology-based mercury standards (\$2.4M)