

FIFTH NATIONAL CLIMATE ASSESSMENT

Air Quality Advisory Committee, January 30, 2024

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National Climate Assessment

- Mandated by Global Change Research Act, 1990
 - Integrates, evaluates and interprets findings of US Global Change Research Program;
 - Analyzes effects on natural environment, energy, land and water resources, transportation, human health, social systems, biological diversity;
 - Analyzes current trends in global change, human induced and natural, and projects major trends.

NCA5

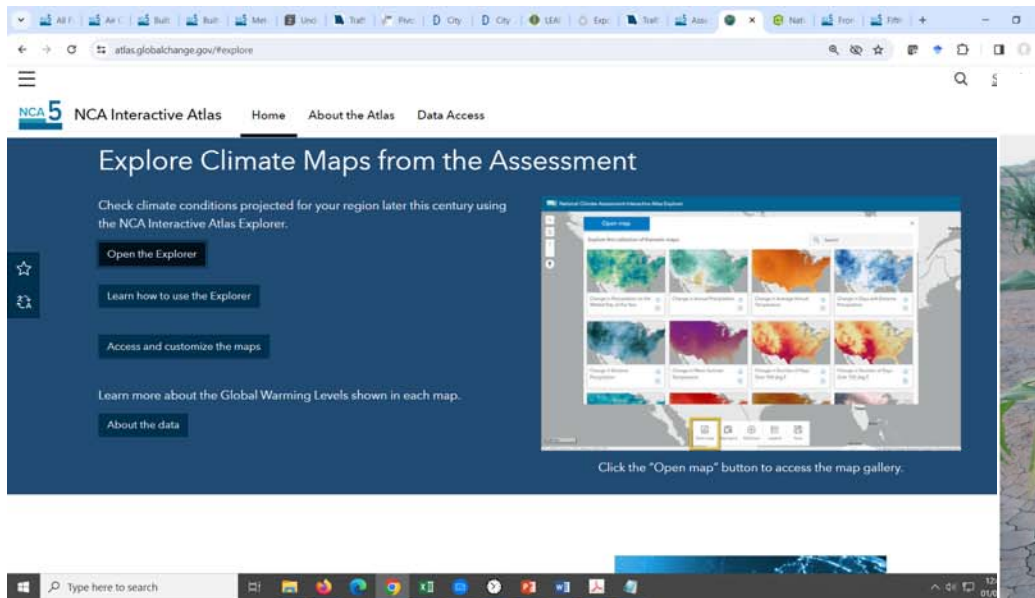
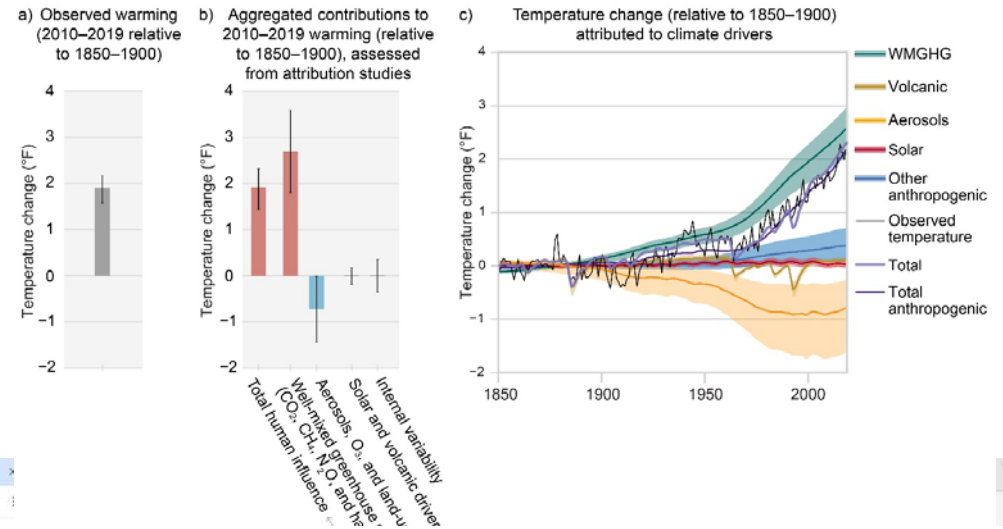
- 32 Chapters
- >750 authors, editors, contributors
- 34 workshops/>7000 attendees
- Over 900 comments
- Review coordinated by National Academies of Science, Engineering and Medicine



What's new in NCA5?

- Improved attribution
- Incorporating indigenous knowledge
- Connecting justice
- Visualization

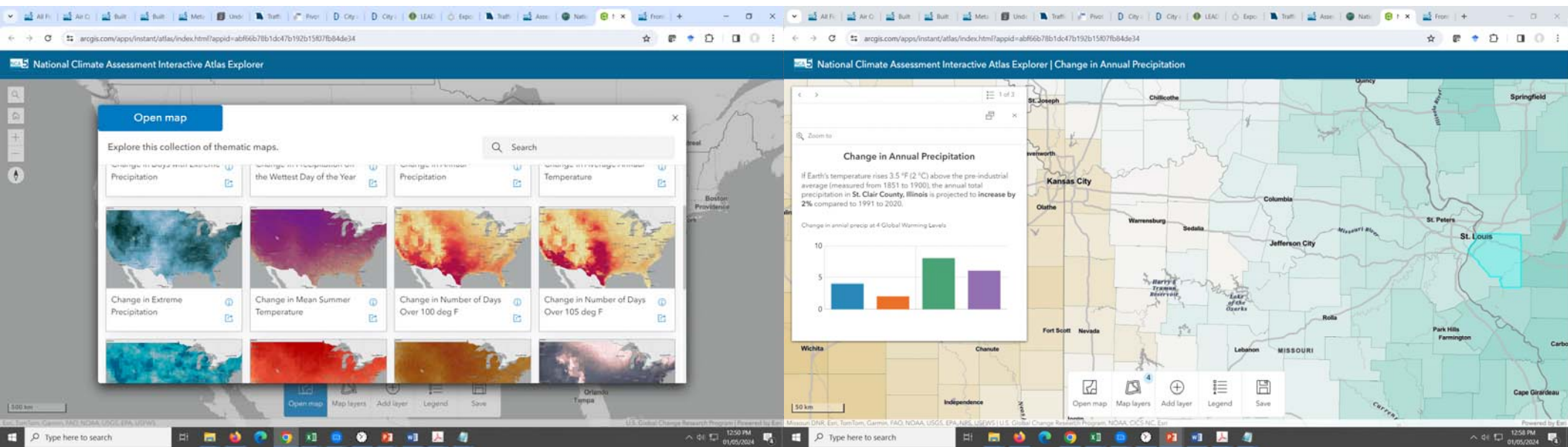
Observed Global Warming and Attribution to Climate Drivers

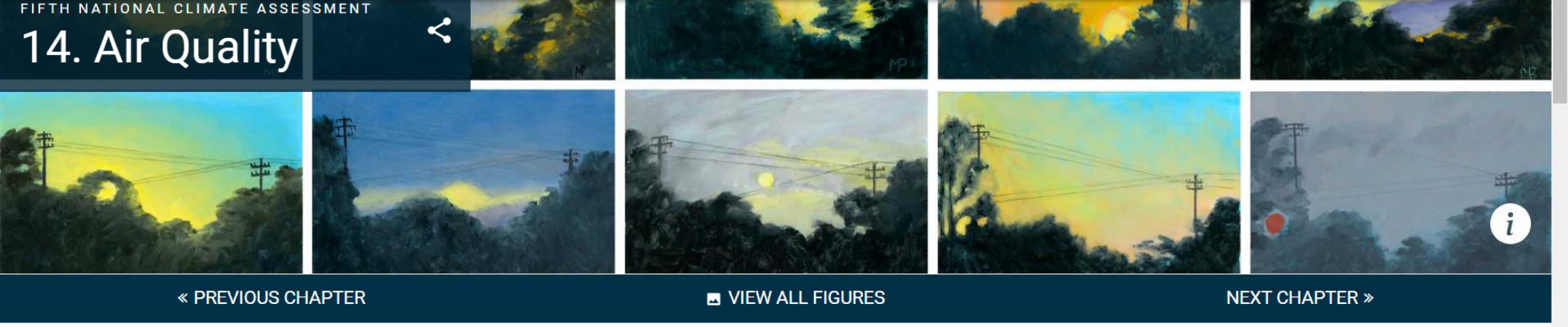


Indigenous Ingenuity the Hopi Way



NCA5: Improved Visualization





Climate change can worsen air pollution, including by increasing wildfire smoke and pollen, impacting human health and h... efforts to reach air quality goals. Air pollution disproportionately affects communities of color and low-income communiti... actions can be focused to increase equity despite climate hazards. Coordinated actions can sharply reduce greenhouse ga... while greatly improving air quality and health.

INTRODUCTION

Good air quality is vital to human health and the environment. Ozone and fine particulate matter (PM_{2.5}) are air pollutants with widespread health and environmental effects that derive from emissions

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14.2.	Increasing Wildfire Smoke
14.3.	Air Quality and Equity
14.4.	Pollen Exposure
14.5.	Benefits of Emissions Reductions
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Air Quality

Key Message 1: Climate change will hamper efforts to improve US air quality.

Climate change is projected to worsen air quality in many US regions (*medium confidence*), thereby harming human health and increasing premature death (*very likely, high confidence*). Extreme heat events, which can lead to high concentrations of air pollution, are projected to increase in severity and frequency (*very likely, very high confidence*). Reducing air pollution concentrations will unequivocally help protect human health in a changing climate.

Climate Change Impacts on Ozone and Fine Particulate Matter (PM_{2.5}) over the United States



Wildfires

Ozone: +
PM_{2.5}: +

Increasing wildfires will degrade air quality.



Heatwaves

Ozone: +
PM_{2.5}: +

High temperatures and clear skies can increase pollution.



Temperatures

Ozone: +
PM_{2.5}: +

Overall, pollution concentrations will increase as temperatures rise.



Drought

Ozone: +
PM_{2.5}: +

Drought will decrease uptake of ozone by vegetation and increase dust PM_{2.5}.



Biogenic emissions

Ozone: +
PM_{2.5}: +

Warmer temperatures will increase pollutant sources from vegetation and soil.



Precipitation

Ozone: Little change
PM_{2.5}: -

Higher precipitation may wash out PM_{2.5}.



Regional transport

Ozone: ?
PM_{2.5}: ?

Transport of pollution may change, but the trends are unclear.



Humidity

Ozone: -
PM_{2.5}: +

Higher humidity will reduce ozone but increase PM_{2.5}.



Stagnation

Ozone: ?
PM_{2.5}: ?

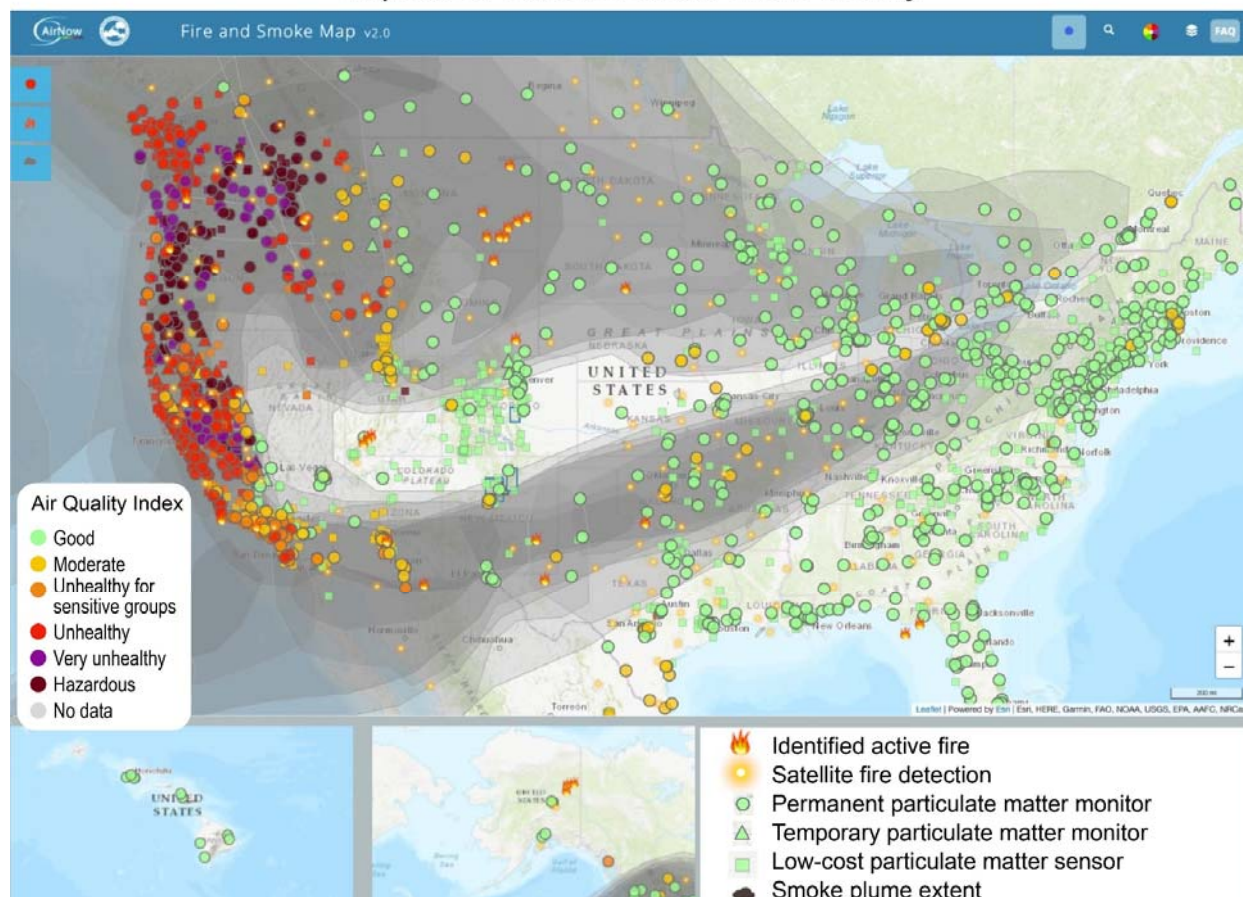
Pollutants accumulate during stagnant periods, but trends in stagnation are uncertain.

Air Quality

Key Message 2: Increasing wildfire smoke is harming human health and catalyzing new protection strategies.

Wildfires emit gases and fine particles that are harmful to human health, contributing to premature mortality, asthma, and other health problems (*very high confidence*). Climate change is contributing to increases in the frequency and severity of wildfires, thereby worsening air quality in many regions of the contiguous US and Alaska (*likely, high confidence*). Although large challenges remain, new communication and mitigation measures are reducing a portion of the dangers of wildfire smoke (*medium confidence*).

Impacts of Wildfire Smoke on Air Quality



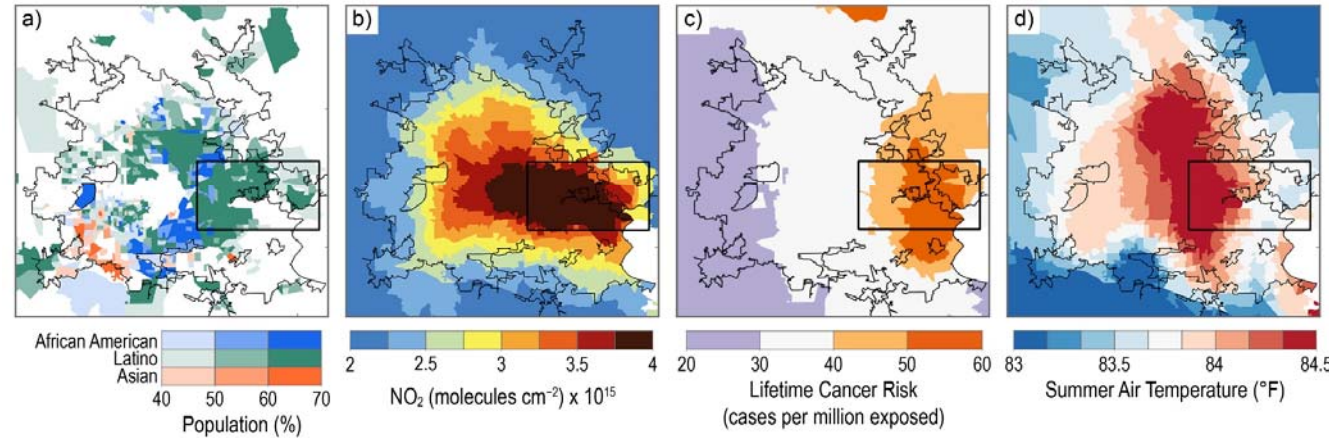
Air Quality



Key Message 3: Air pollution is often worse in communities of color and low-income communities.

Communities of color, people with low socioeconomic status, and other marginalized populations are disproportionately harmed by poor air quality (*very high confidence*). In the coming decades, these same communities will, on average, face worsened cumulative air pollution burdens from climate change-driven hazards (*very likely, high confidence*). Decision-making focused on the fair distribution of air quality improvements, rather than on overall emissions reductions alone, is critical for reducing air pollution inequities (*high confidence*).

Air Pollution and Temperature Inequalities in Houston, Texas



Air Quality

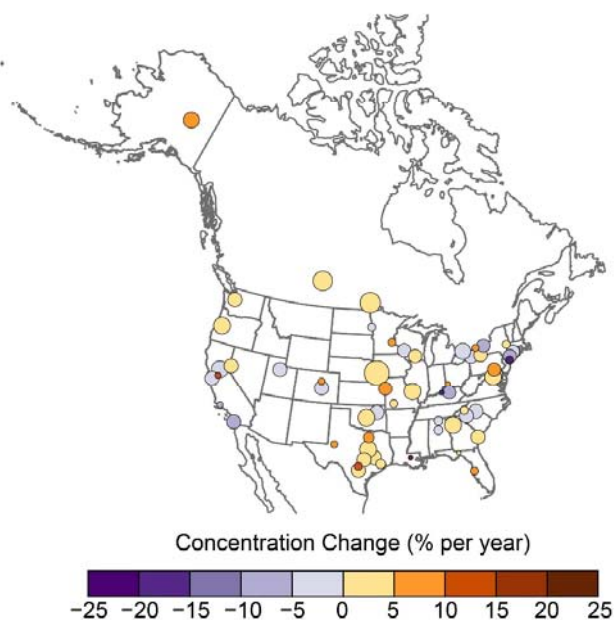


Key Message 4: Climate change is worsening pollen exposures and adversely impacting health.

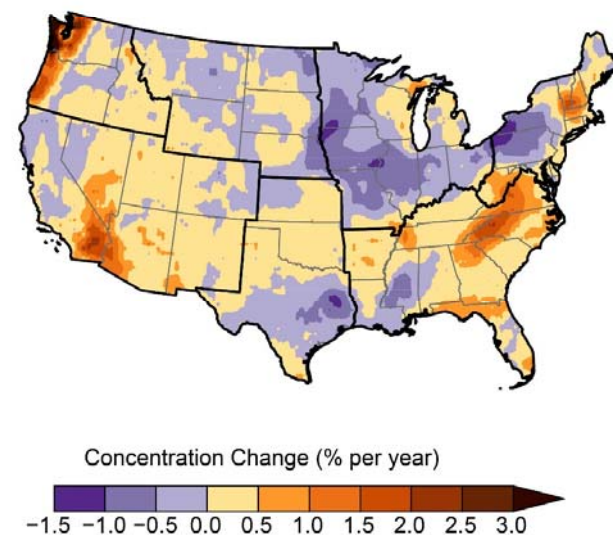
Increased allergen exposure damages the health of people who suffer from allergies, asthma, and chronic obstructive pulmonary disease (*very high confidence*). Human-caused climate change has already caused some regions to experience longer pollen seasons and higher pollen concentrations (*very likely, high confidence*), and these trends are expected to continue as climate changes (*very likely, high confidence*). Increasing access to allergists, improved diagnosis and disease management, and allergy early warning systems may counteract the health impacts of increasing pollen exposure (*high confidence*).

Observed and Projected Pollen Changes Under Climate Change

a) Observed long-term pollen trends



b) Projected changes in ragweed pollen concentrations

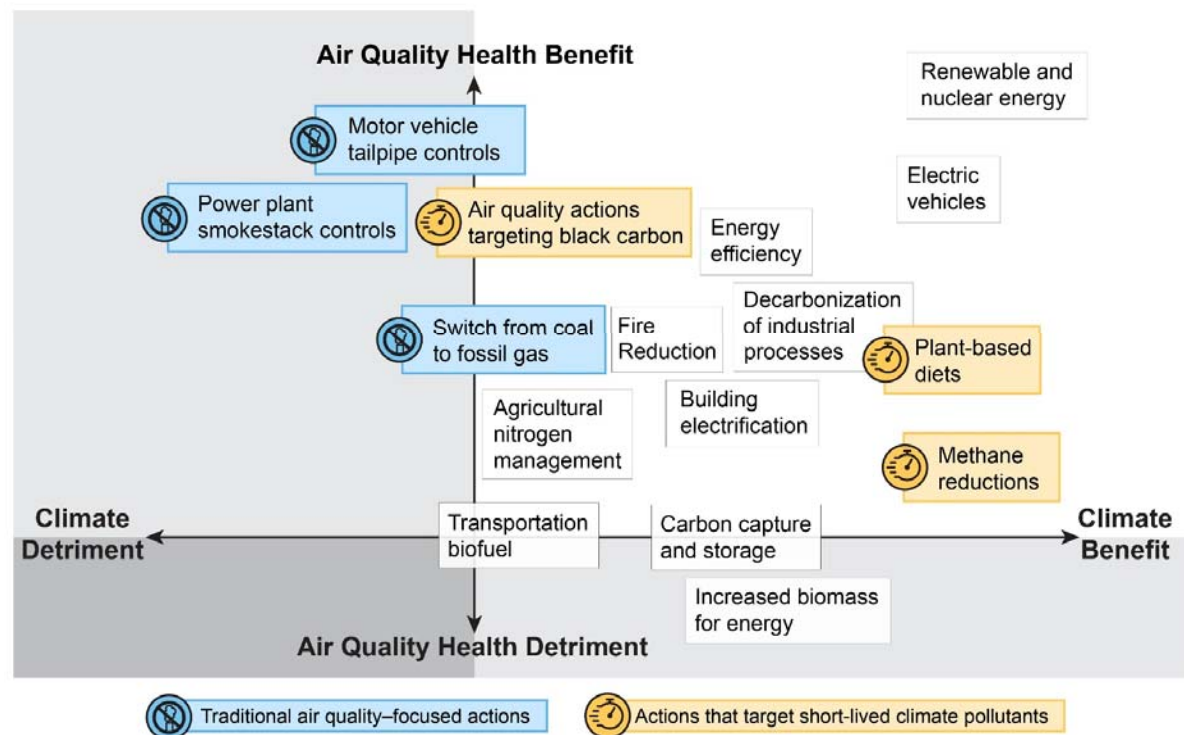


Air Quality

Key Message 5: Policies can reduce greenhouse gas emissions and improve air quality simultaneously.

Substantial reductions in economy-wide greenhouse gas emissions would result in improved air quality and significant public health benefits (*very likely, high confidence*). For many actions, these benefits exceed the cost of greenhouse gas emission controls (*likely, high confidence*). Through coordinated actions emphasizing reduced fossil fuel use, improved energy efficiency, and reductions in short-lived climate pollutants, the US has an opportunity to greatly improve air quality while substantially reducing its climate impact, approaching net zero CO₂ emissions (*high confidence*).

Potential for Emissions-Reduction Actions to Achieve Air Quality and Climate Benefits





Recommended chapter citation

West, J.J., C.G. Nolte, M.L. Bell, A.M. Fiore, P.G. Georgopoulos, J.J. Hess, L.J. Mickley, S.M. O'Neill, J.R. Pierce, R.W. Pinder, S. Pusede, D.T. Shindell, and S.M. Wilson, 2023: Ch. 14. Air quality. In: *Fifth National Climate Assessment*. Crimmins, A.R., C.W. Avery, D.R. Easterling, K.E. Kunkel, B.C. Stewart, and T.K. Maycock, Eds. U.S. Global Change Research Program, Washington, DC, USA.
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