Air Quality

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Key Message 14.1

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*), and the risk of exposure to airborne dust and wildfire smoke will increase with warmer and drier conditions in some regions (*very likely, high confidence*). Reducing air pollution concentrations will unequivocally help protect human health in a changing climate.

Key Message 14.2

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*).

Key Message 14.3

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*).

Key Message 14.4

Climate Change Is Worsening Pollen Exposures and Adversely Impacting Health

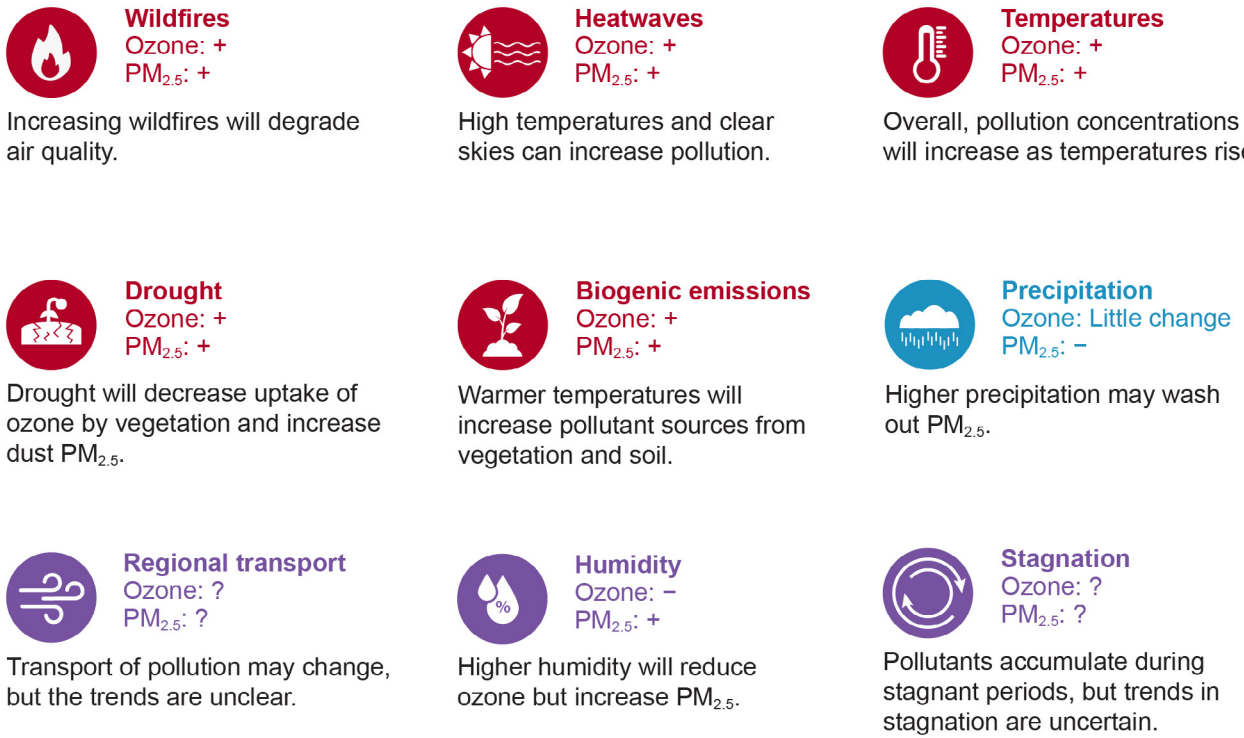
Increased allergen exposure damages the health of people who suffer from allergies, asthma, and chronic obstructive pulmonary disease (COPD) (*very high confidence*). Human-caused climate change has already caused some regions to experience longer pollen seasons and higher pollen concentrations (*very 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*).

Key Message 14.5

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 CO_2 emissions (*high confidence*).

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



Climate change will have varying effects on ozone and fine particulate matter ($PM_{2.5}$) concentrations, including through impacts on weather-sensitive emissions.

Figure 14.1. Climate change is projected to alter concentrations of two key US air pollutants, ozone and $PM_{2.5}$, through several processes. Red icons signify increased ozone and $PM_{2.5}$, and the blue icon denotes decreased $PM_{2.5}$. Plus and minus signs indicate the expected pollutant response to climate-driven changes in meteorology. Question marks and purple icons denote uncertainty in either the response or in how the meteorological process will change with climate change. Given uncertainties and regional differences in pollution responses, the magnitude of these responses is not presented. Key Messages 14.1 and 14.2 provide more detailed descriptions of the mechanisms involved. Adapted from The Royal Society 2021 [CC BY 4.0] (see full chapter for detailed citation).

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