

Will Clean Air Fade Away?

Government-sponsored research and regulations enabled western U.S. states to clean up their air, despite industrial and population growth. Proposed funding cuts could undo this progress.



A brown layer of smog covers downtown Los Angeles on 17 January 2007. Even though California's strict regulations have produced significant improvements in air quality, the work is not done. Credit: steinphoto/E+/Getty Images

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In the proposed budget for the U.S. government for fiscal year 2018, the U.S. Environmental Protection Agency's (EPA) research spending is cut by as much as 40% [*Cornwall*, 2017]. This reduction in funding could jeopardize progress in environmental quality, cost America its environmental leadership role, and allow polluted air and water to once again become commonplace in U.S. cities.

EPA's research-based regulations have fostered significant strides in environmental improvement in the United States and inspired analogous endeavors around the globe. Notably, [air quality has improved](https://gispub.epa.gov/air/trendsreport/2017/#highlights) (<https://gispub.epa.gov/air/trendsreport/2017/#highlights>) over North America and Europe in recent decades, and China and India are making concerted efforts to protect the health of their citizens and environment.

Despite this progress, the United States plans to defund research and pollution control efforts. We call for action from the scientific community, public, nongovernmental organizations, Congress, and the U.S. government. The scientific community should effectively engage in increasing public awareness about the detrimental effects of air pollution, and the public should work with their representatives and senators to strengthen EPA's efforts to promote healthy air quality.

Societal Implications of Air Pollution

Clean air is fundamental for human survival, yet it is often compromised in urban areas, and megacities emit enormous quantities of pollutants into the air. Clean air is fundamental for [human survival](https://eos.org/articles/atmospheric-chemists-should-tackle-risks-to-society-report-says) (<https://eos.org/articles/atmospheric-chemists-should-tackle-risks-to-society-report-says>), yet it is often compromised in urban areas, and [megacities](https://www.wmo.int/pages/prog/arep/gaw/documents/GAW_205_DRAFT_13_SEPT.pdf) (https://www.wmo.int/pages/prog/arep/gaw/documents/GAW_205_DRAFT_13_SEPT.pdf) emit enormous quantities of pollutants into the air. Air pollution, mostly by particulate matter less than 2.5 micrometers in diameter (PM_{2.5}), causes an estimated 3.3 million premature deaths worldwide each year, and air quality–related mortality rates could double by 2050 under the business-as-usual climate scenario [Lelieveld et al., 2015].

Air pollution is associated with reduced life expectancy and a range of health problems, including cardiovascular diseases, cancer, respiratory diseases, and cognitive diseases such as Alzheimer’s and dementia [Baccini et al., 2017; Pope et al., 2009; Lin et al., 2017; Gordon et al., 2014; Power et al., 2016]. In addition, poor air quality harms infrastructure, damages iconic art and architecture, and impairs visibility. Polluted air also disrupts regional and global energy balances by altering the ratio of solar energy that Earth absorbs to the energy it radiates back into space [Liu et al., 2015].

Bucking a Global Trend

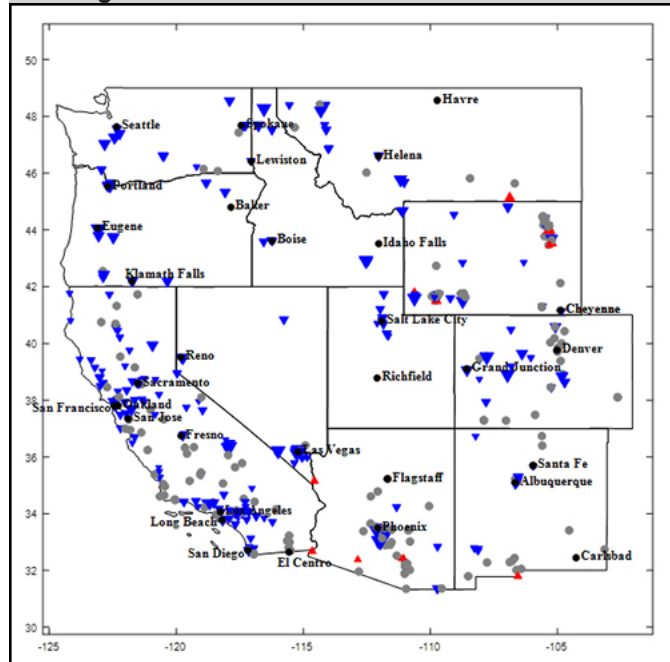


Fig. 1. Trends of mean annual coarse particulate matter (PM₁₀) levels for the western United States from 1997 through 2015. Blue triangles signify downward trends at the 5% significance level, red triangles display upward trends, and gray circles represent no trend. The size of the triangles is proportional to the slope of the linear regression model fitted to the data; that is, larger triangles represent stronger trends.

A recent study by the World Health Organization (WHO) analyzed coarse and fine particle (PM₁₀ and PM_{2.5}) intensities in 795 cities in 67 countries from 2008 through 2013 and concluded that the global urban air pollution level rose 8% during this period [WHO, 2016]. Our analysis of air quality in the western United States, however, shows a *declining trend* in PM₁₀ and PM_{2.5} levels between 1997 and 2015 (Figure 1). This analysis is preliminary and has not been formally published or peer reviewed.

We found that of 425 air monitoring stations that provided a relatively long record (more than 10 years), 232 showed a significant downward trend, 175 displayed no significant trend, and only 18 stations were associated with a significant upward trend in PM₁₀. Trend analysis of annual mean PM_{2.5} levels yielded a similar pattern.

Given these preliminary findings, one key question emerges: How did the western United States manage to go against the global trend?

One reason rises to the top: Despite rapid population growth and industrial expansion, air quality in the western United States has likely improved because of the regulatory efforts of the U.S. EPA to control pollution sources [Samet, 2011]. This trend is similar to the [EPA’s findings](https://gispub.epa.gov/air/trendsreport/2017/#highlights) (<https://gispub.epa.gov/air/trendsreport/2017/#highlights>) for the United States overall.

Broad Regulation Efforts

The U.S. Air Pollution Control Act of 1955 was the first federal legislation to recognize the detrimental effects of poor ambient air quality on human well-being and to provide funding for research and technical assistance to control air pollution. However, it was the Clean Air Act (CAA) of 1963 that empowered EPA to enforce regulation of air pollution at the source. Subsequent legislation has recognized the right for state agencies to establish environmental regulations specific to their needs, leading to more stringent regulations in states such as California.

Scientific publications of the 1990s that describe the air quality status of the nation corroborate the effectiveness of EPA’s execution of the Clean Air Act in coordination with state, local, and tribal governments. According to one study [Cramer, 1998, p. 45], in the 1980s and 1990s, California suffered from “notoriously polluted air,” which posed “perhaps the most urgent environmental problem” facing the state. The study noted, however, that the air quality condition was improving “due to aggressive regulatory efforts.”

Western U.S. Air Quality: A Work in Progress

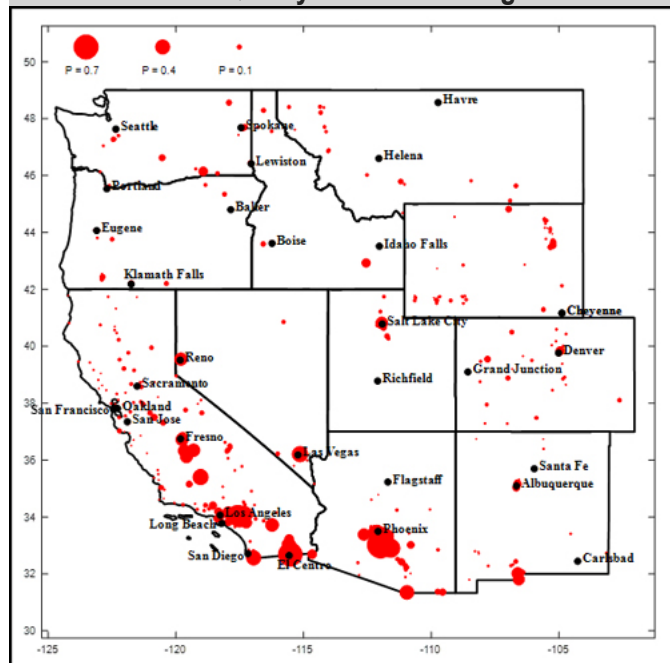


Fig. 2. Probability of daily PM_{10} levels exceeding the WHO healthy air threshold of $50 \mu\text{g}/\text{m}^3$ from 1997 through 2015. Larger circles are associated with greater probability values on a linear scale. Data here are preliminary—they have not been formally peer reviewed or published.

Despite the effectiveness of the EPA’s regulatory measures to reduce air pollution since the CAA went into effect, major metropolitan areas still suffer from poor air quality, assuming that the air quality at monitoring stations is a good representative of the cities where they are located. Our quick calculations show that between 1997 and 2015, the probability of daily PM_{10} values exceeding the threshold for healthy air as established by WHO, 50 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$), reached disturbing values for some large cities in the western United States (Figure 2).

We also found that in **Los Angeles** (<https://eos.org/features/urbanization-air-pollution-now>) and Phoenix, residents breathe unhealthy air on average 84 and 170 days per year, respectively. Even worse, Maricopa, Arizona, 55 kilometers (34 miles) south of Phoenix, experiences unhealthy PM_{10} levels on average 278 days per year. Other major cities, such as San Diego, Salt Lake City, Las Vegas, Reno, and Denver also experience unhealthy air quality on a regular basis (Figure 2).

Thus, even though EPA’s endeavor to ensure healthy air quality has been effective (Figure 1), even more stringent regulations may be required in select areas and circumstances (Figure 2). However, we note that the current administration is not likely to embrace these added regulations, given that they have their sights set on dismantling current regulations.

EPA’s Research Programs’ Fate

EPA relies heavily on **accountability research programs** (https://cfpub.epa.gov/si/si_public_record_report.cfm?dirEntryId=160347&keyword=Accountability&actType=&TIMSType=+&TIMSSubTypeID=&DEID=&epaNumber=&ntisID=&archiveStatus=Both&ombCat=Any&dateBeginCreated=&dateEndCreated=&dateBeginPublishedPresented=&) to assess the impact of pollution mitigation and intervention actions on human health [Özkaynak et al., 2009]. To develop targeted source reduction measures and to maintain air quality standards, EPA and its collaborating local agencies conduct and support research and simulations. Research and scientific discovery are the founding pillars of the agency’s endeavor to justify the regulations for protection and improvement of the country’s environmental conditions.

The proposed budget by President Trump’s administration, however, has cut EPA’s Office of Research and Development’s spending by 40% [Cornwall, 2017]. This reduction will limit the EPA’s ability to provide a safe and healthy environment for current and future generations. The **proposed budget** (<https://eos.org/articles/environment-and-labor-groups-push-to-protect-epa-budget>) threatens the already insufficient mitigation and intervention actions of EPA.

Cost-Benefit Analysis of Air Quality Regulation

The 28 March 2017 **executive order** (<https://www.whitehouse.gov/presidential-actions/presidential-executive-order-promoting-energy-independence-economic-growth/>) to roll back the Clean Power Plan only adds to the concerns of the scientific community about the future health of Americans because fuels have long been identified as a

major source of toxic PM_{2.5}. Decreased air quality will most certainly increase medical costs associated with the treatment of illnesses caused by air pollution, likely offsetting or exceeding any possible savings to government spending from these cuts.

A recent study concluded that “monetized human health benefits associated with air quality improvements can offset 26–1,050% of the cost of U.S. carbon policies” [Thompson *et al.*, 2014, p. 917]. So although the current administration argues that relaxing regulations is necessary for economic growth and enhancing competitiveness of American industries, costly environmental side effects that threaten American lives will have a major economic toll.

The robust growth of California’s economy over the past decades in spite of, or perhaps because of, stringent air quality standards proves that EPA’s regulations do not impede economic growth.

But we also take issue with the very premise of the current administration’s argument for deregulation of air quality. We believe that EPA’s regulations do not impede economic growth. In fact, the robust growth of California’s economy over the past decades in spite of, or perhaps because of, stringent air quality standards proves otherwise.

Likewise, China now recognizes the benefits of pollution control and has proposed a plan to replace coal with [cleaner energy sources](https://www.reuters.com/article/us-china-renewables-waste/china-aims-to-stop-renewable-energy-being-wasted-by-2020-idUSKBN1DD136) (https://www.reuters.com/article/us-china-renewables-waste/china-aims-to-stop-renewable-energy-being-wasted-by-2020-idUSKBN1DD136) and to reduce energy consumption. When Chinese Premier Li Keqiang addressed the National People’s Congress on 5 March 2017, he noted that “having reached the current stage of development, China can now advance only through reform and innovation,” adding that “we will strengthen research on the causes of smog to improve the scientific basis and precision of the steps taken” [McLaughlin, 2017].

The U.S. government’s 2018 budget is still being debated in Congress, with government agencies being funded at 2017 levels through a series of [continuing resolutions](https://www.washingtonpost.com/powerpost/after-passing-tax-overhaul-gop-returns-to-infighting-as-shutdown-deadline-looms/2017/12/21/dfad1890-e659-11e7-ab50-621fe0588340_story.html?utm_term=.5f6313735218) (https://www.washingtonpost.com/powerpost/after-passing-tax-overhaul-gop-returns-to-infighting-as-shutdown-deadline-looms/2017/12/21/dfad1890-e659-11e7-ab50-621fe0588340_story.html?utm_term=.5f6313735218). We implore Congress to reverse the proposed budget cuts and keep EPA at the forefront of international endeavors for environmental protection.

Clean air is a basic need for livable cities, vibrant communities, and healthy populations. We can’t afford to let our clean air fade away.

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