

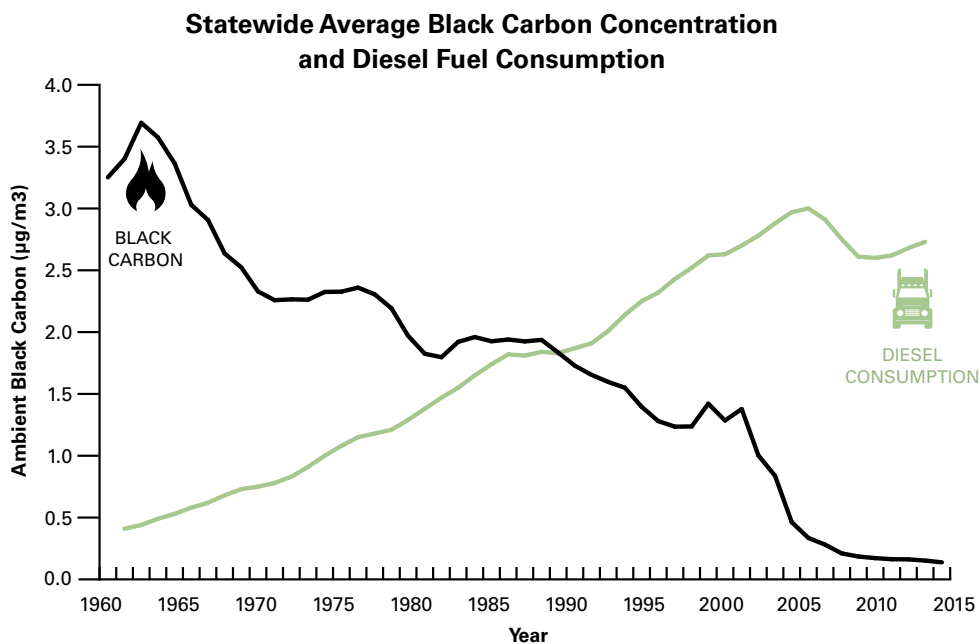


CARB is actively studying the effects of black carbon on our environment. This research note summarizes results from several recently completed research projects.

How California is Giving Soot the Boot!

Cutting black carbon provides near-term benefits for climate and health

California's clean air rules reduced black carbon emissions by 90% since the 1960s, providing immediate climate and health benefits. Ongoing efforts will cut the remaining amount in half by 2030.



The chart shows a 3-year moving average of long-term trends in ambient black carbon concentrations in California since the early 1960s, compared to diesel fuel combustion in the state, which is the largest human-made source of these emissions (modified from Kirchstetter et al, Atmospheric Environment, 2017).

What you should know about black carbon (soot)

Black carbon (BC) is a light-absorbing particle in the air, commonly known as soot (think of the smoke you see coming out of a chimney). It results from the incomplete burning of fuels and biomass, particularly from older diesel engines and forest fires. Because soot is black, it absorbs the sun's rays and warms the air. It can also have a damaging effect on California's snowpack (which provides much of the state's water supply) because when it lands on top of snow, it makes the snow melt more quickly. Decades of research have linked particles—including black carbon—to negative health effects. Control measures that reduce particles and black carbon pollution lead to fewer deaths, lung cancers, asthma and cardiovascular related hospital visits, and fewer missed days of work and school.

NEW RESEARCH FINDINGS

Black Carbon Emissions in Decline in California

- Black carbon emissions have fallen about 90% since the 1960s, in spite of diesel fuel use increasing fivefold (see chart on the previous page).
- This is preventing approximately 5,000 premature deaths per year, and results in a climate benefit equivalent to removing about six million cars from the road each year.
- The California Air Resources Board (CARB) now requires that large trucks and buses that operate in California install particle filters or upgrade their engines; these requirements have significantly reduced emissions and exposure to toxic diesel soot, especially in communities adjacent to the state's major ports in Los Angeles and Oakland.

IMPORTANCE OF FUTURE RESEARCH

Control Measures, Natural Sources, and Brown Carbon

- Research on issues related to black carbon will focus on ensuring that our regulations to control this pollutant are successful and cost-effective, and will inform future mitigation strategies such as forest management to minimize forest fires.
- Brown carbon (termed "brown carbon" to reflect its brownish appearance in the air), primarily from biomass burning, is emerging as another potentially important climate pollutant, and is underestimated in climate models. CARB-funded research will improve our understanding of how brown carbon is formed and will help determine the potential climate benefit of reducing brown carbon emissions in California.

ONGOING EFFORTS TO CONTROL BLACK CARBON

- California's Short-Lived Climate Pollutant Strategy lays out a range of approaches to reduce black carbon emissions. These include continued implementation of requirements for particle filters or upgraded engines for large trucks and buses; cleaner fuels; improved transportation system efficiency; market signals to reduce emissions through cap-and-trade and the low carbon fuel standard; incentives to encourage zero emission vehicle purchases and to reduce residential wood-burning (e.g., changing out fireplaces and woodstoves), and other measures to reduce BC emissions from agriculture and commercial cooking.
- Collectively, these measures will reduce BC emissions by 50% below 2013 levels by 2030, and Senate Bill 1383 (Lara) requires California to continue reducing black carbon emissions with a focus on disadvantaged communities.
- California's success in reducing emissions from trucks and buses has inspired similar efforts in other states and countries.

FOR MORE INFORMATION

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Research project information can be found at:

Characterization of black carbon source emissions (Contract 04-307) <http://bit.ly/2jxGE6e>

Black carbon and the regional climate of California (Contract 08-323) <http://bit.ly/2jxIsMQ>

Global warming benefits attributed to black carbon controls (Contract 09-337) <http://bit.ly/2jFzpqJ>

California Energy Commission, final project report <http://bit.ly/2kC1dAs>

Short-lived climate pollutants website has information on the black carbon inventory www.arb.ca.gov/slcp

Drayage truck regulatory activities: www.arb.ca.gov/msprog/onroad/porttruck/porttruck.htm

Truck and bus regulatory activities: www.arb.ca.gov/msprog/onrdiesel/onrdiesel.htm