



Reducing Black Carbon Impacts on Air Pollution and Climate through Wood Combustion Measures

Summary

Black Carbon (BC) is a source of local air pollution and a major contributor to global warming. Black Carbon is generated by incomplete combustion sources, including diesel engines, vehicles emissions, residential wood burning and forest fires. Reducing BC emissions could greatly reduce climate impacts on the short and medium term, while improving human health along with multiple co-benefits. The California Air Resources Board (CARB) has already addressed BC emissions effectively, and by 2030 the major emissions sector is projected to be residential wood combustion. CARB should further enforce new measures for reducing BC emissions from the residential wood burning. **We recommend a public education program for the correct use of residential devices and a program to promote the shift to less polluting fuels and efficient technologies.** Both measures could yield important BC emissions reduction thereby improving air quality and reducing negative impacts on climate.

Background

Black Carbon (BC) is a local air pollution derived from combustion processes, like vehicle emissions, industrial fuel burning and residential wood combustion (more detail on fig. 2 on next page). The main BC emissions sources for BC are generated by incomplete combustion of diesel and wood. In California, the **most relevant sectors** are on-road and off-road vehicle emissions, residential fireplaces & woodstoves and fuel combustion at the industrial level (see fig. 1).

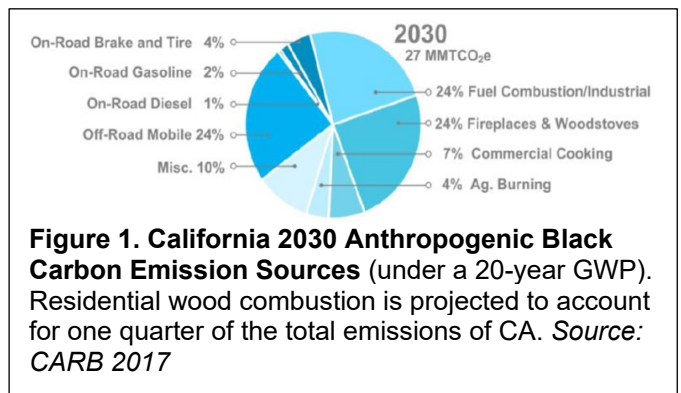
BC is considered a very fine particulate matter (with a diameter less than 0.1 μm) and is commonly called soot. BC has a heating effect on the atmosphere but a short life, it remains in the atmosphere for days to weeks, so it is classified as a short-lived climate pollutant (SLCP).

The emission of a single ton of BC has a high warming potential, estimated to be equivalent to 900 tons of CO₂. **BC emissions are one of the greatest sources of positive radiative forcing on earth, only behind carbon dioxide.** This net radiative forcing potential comes from different heating mechanisms (see fig. 2 on next page):

1. **Absorption** of solar radiation due to its black surface.
2. Interference with **cloud formation**.
3. Modification of the **albedo** of snow and ice covers

As a local air pollutant, BC also affects precipitation patterns, human health, water storage and agricultural production. Benefits of reducing BC emissions are felt locally and by those the bear the cost of mitigation, and include the following:

- Immediate climate effect in reducing global warming impacts
- Improvements to local air quality and to human health





Mitigation Efforts

California has developed extensive policies to address BC emissions, which have been highly effective. For the transportation sources it has developed plans to lower emission standards, clean fuel requirements, investments in research & technology and the promotion of zero-emissions vehicles (ZEVs). For the residential wood combustion sector there have been actions to reduce the limit of emissions, wood burning devices replacements and restricting wood burning in new houses. For the industrial sector there are several policies, under the cap-and-trade program, to accelerate the transition from coal to less pollutants fuels.

These policies have been effective in reducing BC emissions, but **by 2030 residential wood combustion is expected to be the major source of emissions**. New measures are needed to address residential BC sources, to further mitigate climate change impacts. Higher rates of wood burning are associated with low-income communities. Thus, it is imperative to design policies to provide economic assistance to most disadvantage communities to shift away from wood burning.

Policy recommendations

The California Air Resources Board (CARB) oversees regulations of air pollutants that may damage human health or contribute to climate change. To ensure the protection of the population CARB can empower local air districts to take measures and has the authority to communicate to the population relevant information.

There are two additional measures that CARB should take to further enhance BC emissions reductions in the residential wood combustion sector:

- **Implement a public education program regarding the correct use and maintenance of woodstoves.** Unnecessary emissions of BC occur if the equipment is poorly maintained operated, or wet wood is used.
- **Incentivize shift to cleaner fuels and more efficient equipment.** This may include providing subsidies to upgrade equipment, and to low-income groups that uses wood regularly.

Further reading

- CARB (2017). Short-Lived Climate Pollutant Reduction Strategy. *California Air Resources Board (CARB)*.
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- ACAP (2014). Reduction of Black Carbon Emissions from Residential Wood Combustion in the Arctic: Black Carbon Inventory, Abatement Instruments and Measures. *Arctic Contaminants Action Program (ACAP)*.

Authorship

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