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“Residential wood burning is an important source of black carbon (BC) and organic carbon (OC). These particles have an impact on climate through the emission of BC and OC to alter the radiative balance through a complex process.”

Senem Ozgen, et al. *Emission Factors from Small Scale Wood Burning*

## Wood Burning and Our Climate

There is a belief that wood burning doesn't contribute to climate change. But this simply isn't true.

Living trees absorb carbon dioxide ( $\text{CO}_2$ ) from the air as part of the photosynthetic process and store the carbon as cellulose and other carbon-containing carbohydrates.

When the wood is burned, the  $\text{CO}_2$  is released back into the atmosphere. This is a major source of  $\text{CO}_2$  emissions.

*We need to emit less in the short term, not more.*



In the sense that trees can be replanted, wood burning has been described as renewable. However, we are facing a climate change crisis. We don't have decades to wait while new trees grow to compensate for the CO<sub>2</sub> that was emitted by their burned predecessors.

The harvest, storage and transportation of the wood also results in greenhouse gas emissions from fossil fuels.

## It's Not Just About CO<sub>2</sub>

But CO<sub>2</sub> isn't the only problem. As we've mentioned, burning wood also emits short-lived climate pollutants including soot, carbon monoxide, and volatile organic compounds such as methane. Soot is the second largest contributor to global climate change, and methane is the [third](#). CO<sub>2</sub> concentrations are now about 50% above pre-industrial levels, while methane concentrations [have tripled](#).

## Preventing Climate Destabilization

By tackling the 50% of global warming from short-lived climate pollutants, we prevent future warming by slowing the melting of glaciers (allowing them to continue reflecting radiation back into space) and preventing permafrost and

under-sea ice from melting and at the same time releasing the super-pollutant methane. The three experts warned: “Cutting CO<sub>2</sub> emissions remains imperative, and cannot be delayed ... the parallel strategy of reducing super pollutants is perhaps even more important to avert disastrous consequences in the near-term.”

## UN: Phase Out Log-Burning Stoves to Reduce Global

**Warming** ~~and help keep the global temperature rise below 1.5°C.~~

Phasing out log-burning stoves in developed countries was one of a package of 16 measures recommended by the UN Environment Program and World Meteorological Organization to improve health and help keep the global temperature rise below 1.5°C.

## Black Carbon

Particles in the air can absorb light from the sun or scatter it, depending upon the particles' characteristics. Particles that absorb light warm the earth, whereas particles that scatter light help cool it.

The terms black carbon and elemental carbon both refer to the portion of carbon particles that are most light absorbing. The difference in terms reflects the different methods used to measure them.

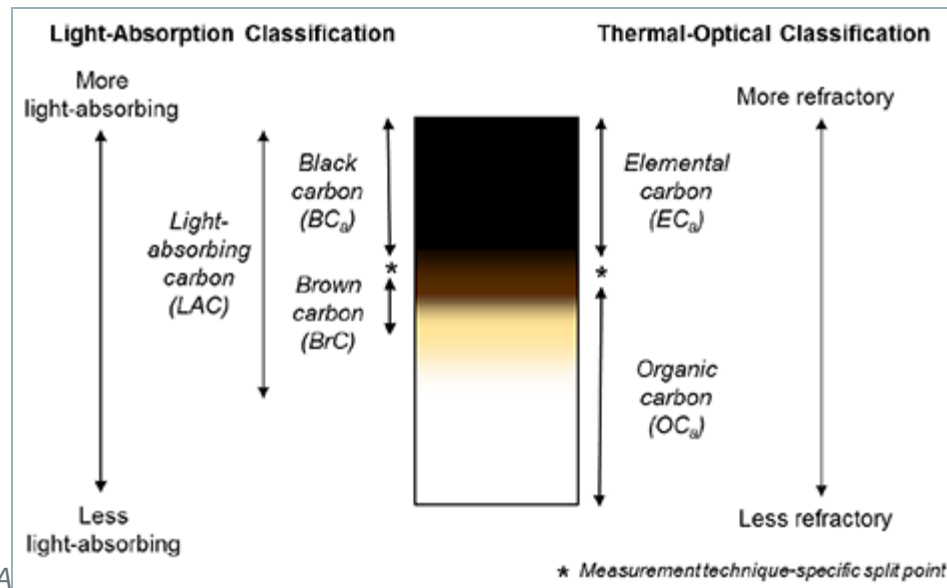


Image: US EPA

Black carbon is the [most strongly](#) light-absorbing component of particulate matter. Per unit of mass in the atmosphere, black carbon [can absorb](#) a million times more energy than CO<sub>2</sub>. In the atmosphere, it warms clouds and affects the size and distribution of cloud droplets, which in turn can affect rain patterns and alter the amount of solar energy that is reflected back into space.

Once black carbon particles have fallen back to earth, they absorb the sun's energy on the ground. If they land in areas covered with snow or ice, the resulting darkening of the snow's surface and the absorption of the sun's solar radiation promotes melting. This is an especially serious problem in Arctic nations, but can affect all snow-bound places.

Wood burning is a significant source of black carbon emissions. For example, [a study](#) from Switzerland found that, at the sites that were measured, wood burning contributed up to 33% of black carbon emissions. It was noted that, "This is a noticeable high fraction as the contribution of wood burning to the total final energy consumption is in Switzerland less than 4%."

In Canada, an official black carbon [emissions inventory](#) found that residential wood burning is responsible for 90% of black carbon emissions from non-industrial fuel combustion, which includes electrical power generation by

utilities. In 2014, all of Canada’s electric generation, including coal, was responsible for 0.5% of Canada’s black carbon emissions, while residential wood burning was responsible for 27%. All industrial sources, including petroleum production, were responsible for 8.5% of Canada’s black carbon emissions, while vehicles on the highway contributed 20% (2% for gasoline cars and 18% for diesel).

## Brown Carbon and Organic Carbon

When wood is burned, it also produces organic carbon, which is a complex mixture of compounds. Recent research shows that some organic carbon particles are highly absorbing in the near-UV spectrum, and that this affects the global climate balance. For example, [this study](#) in coastal California provided evidence that the light-absorbing properties of organic carbon “in atmospheres burdened with residential wood smoke” are secondary to those of black carbon, “but not insignificant.”

## Methane



[According to](#) law professor Christopher Ahlers, methane emissions from the residential burning of wood are four times greater than those of industry, in

spite of the fact that greenhouse gas emissions from residential burning are half those of industry. This suggests, according to him, that “the industrial sector is more efficient at extracting or limiting the emissions of methane,” which is a valuable commercial product. “This highlights the wasteful nature of residential wood-burning.”

*Air free of wood smoke is good for both people and the planet.*



**Newer Wood Stoves Won't Fix the**

**Problem**

**Save Lives as Well as the Planet**

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**Environment and Climate References**