



# Climate Change and Black Carbon

## What it means for Alaska Native Villages and what you can do

### What is black carbon?

Black carbon (BC) is produced as a result of the incomplete combustion of fossil fuels including coal or diesel (e.g., diesel-powered vehicles and diesel generators), biomass (e.g., forests and fire wood, yard trimmings, solid waste burning), and biofuels. BC is emitted directly from combustion sources into the atmosphere as tiny particles of solid carbon, which fall under the fine particulate matter (PM-2.5) class of air pollutants regulated by the US Environmental Protection Agency (EPA). As an air pollutant, BC can contribute to adverse impacts on human health, ecosystems, and visibility. In addition, there is a strong consensus within the scientific community that BC is contributing to climate change at both the global and regional levels.

### Why does it matter?



### Impacts on Alaska and Alaska Native Villages

Alaska and the Arctic region as a whole—home to glaciers and sea ice—are particularly sensitive to BC's direct warming and melting effects on snow and ice. Studies indicate that BC contributes to the melting of snowpack earlier in the spring, thereby reducing the amount of snowmelt that would normally occur later in the spring and summer. This has implications for the availability of freshwater in regions of the United States like Alaska and the Pacific Northwest that are dependent on snow-fed or glacier-fed water systems. Overall, observed climate change is causing severe socio-cultural impacts in Alaskan Native Villages. These impacts include forced relocation due to coastal erosion, threats to food security as permafrost melts and underground food storage becomes unsafe, and changes to traditional ways of life as species habitat ranges and sea ice patterns rapidly shift.

### Where does black carbon come from?

In the United States, most BC emissions come from transportation, especially diesel-powered vehicles. Diesel-powered generators are a related source of BC

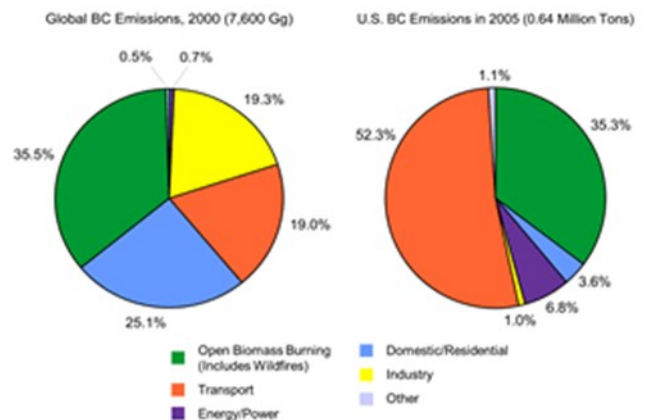
emissions that are used widely throughout rural Alaska.

Open biomass burning, including wildfires, is another significant domestic source of BC. Globally, most BC emissions come from open burning and residential heating and cooking, although emissions from industrial facilities and diesel-reliant transportation sectors are also important contributors. Emission sources and ambient concentrations of BC in the atmosphere vary geographically and throughout the year. Consequently, the climate and health effects of BC pollution also vary regionally and seasonally.

### What can you do?

There are many simple actions that individuals, municipalities, and the global community at large can adopt to reduce and eliminate BC pollution in the atmosphere. According to the US EPA, BC's "short atmospheric lifetime...combined with its strong warming potential, means that targeted strategies to reduce BC emissions can be expected to provide climate benefits" within the very near future. This should serve as both a reason for hope and a call to action. Studies have identified several areas, including the transportation sector, residential heating, and biomass burning as prime focal areas for mitigation efforts that can help to protect the unique beauty and natural wonders of Alaska and the Arctic.

One option for those seeking to initiate or become involved in efforts to reduce BC pollution is to conduct an emissions inventory (EI) to identify local sources of



PM-2.5 and BC. The results of an EI can then inform an evaluation of air quality impacts and development of a mitigation plan. For instance, using basic smoke

management practices or adopting a smoke management plan to minimize air pollutant emissions enables communities to perform prescribed burning without significantly degrading air quality in downwind communities.

There are several existing programs to reduce emissions of PM-2.5 and BC pollution in your home and your community:

#### EPA Grants for Diesel Retrofits

The Diesel Emissions Reduction Act (DERA) National Funding Assistance Program provides funding to states, tribes, and municipalities to retrofit outdated, dirty technologies and reduce their air pollution emissions. For example, the Tanana Chiefs Conference in Fort Yukon, Alaska received a grant to upgrade an old diesel generator that the village relied on for electricity and heat. The new generator meets EPA Tier III emission standards and is estimated to achieve the following lifetime air pollutant emission reductions: approximately 33 tons of NOx, 1.5 tons of particulate matter (PM), and 5.1 tons of CO<sub>2</sub>. In addition, the upgraded generator is estimated to save approximately 22,000 gallons of diesel fuel annually, with a lifetime savings of approximately 154,000 gallons.

<http://www.epa.gov/diesel/prgnational.htm#tools>

#### EPA Burn Wise's Great American Wood Stove Changeout

The Great American Wood Stove Changeout has already been implemented successfully in several communities:

- ◇ The Swinomish Indian Tribal Community replaced approximately 120 woodstoves, resulting in a 30% reduction of PM-2.5.
- ◇ The Makah Tribe replaced 44 polluting woodstoves, resulting in an immediate improvement in ambient and indoor air quality (IAQ)
- ◇ The Nez Perce Tribe replaced 16 non-EPA certified stoves, successfully improving IAQ through a ~50% reduction in PM<sub>2.5</sub> in homes.

#### Burn Wise

#### **Resources**

- 1) EPA. Black Carbon: <http://epa.gov/blackcarbon/>
- 2) EPA. Report to Congress on Black Carbon, March 2012: [http://www.ipcc.ch/publications\\_and\\_data/ar4/wg2/en/ch14s14-4-4.html](http://www.ipcc.ch/publications_and_data/ar4/wg2/en/ch14s14-4-4.html)
- 3) UNEP. Integrated Assessment of Black Carbon and Tropospheric Ozone: [http://www.unep.org/dewa/portals/67/pdf/BlackCarbon\\_report.pdf](http://www.unep.org/dewa/portals/67/pdf/BlackCarbon_report.pdf)

#### **For more information, contact:**

Nikki Cooley, Climate Change Program Co-Manager, Institute for Tribal Environmental Professionals, [Nikki.Cooley@nau.edu](mailto:Nikki.Cooley@nau.edu)

Karen Cozzetto, Climate Change Program Co-Manager, Institute for Tribal Environmental Professionals, [Karen.Cozzetto@nau.edu](mailto:Karen.Cozzetto@nau.edu)

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Burn Wise is a partnership program that emphasizes the importance of burning the right wood, the right way, and in the right wood-burning appliance to protect your family's health and the air we breathe. <http://www.epa.gov/burnwise/tribal.html>

*Images (below) from the Makah Tribe's Woodstove Change-out Report*



Woodstove prior to change out.



Woodstove stack prior to change out.



Woodstove after change out.



Woodstove stack after change out.

*To learn tribal change and the*

*more about climate initiatives*

*development of adaptation plans, please visit the Tribes & Climate Change website at <http://www4.nau.edu/tribalclimatechange/index.asp>.*

*All photos and graphics provided courtesy of the US Environmental Protection Agency.*

