Center for American Progress

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Saving the Arctic

The Urgent Need to Cut Black Carbon Emissions and Slow Climate Change

By Rebecca Lefton and Cathleen Kelly August 2014

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Contents

1 Introduction and summary

3 Where does black carbon come from?

6 Future black carbon emissions in the Arctic

9 Why cutting black carbon outside the Arctic matters

13 Recommendations

19 Conclusion

20 Appendix

24 Endnotes

Introduction and summary

The Arctic is warming at a rate twice as fast as the rest of the world, in part because of the harsh effects of black carbon pollution on the region, which is made up mostly of snow and ice.[1] Black carbon—one of the main components of soot—is a deadly and widespread air pollutant and a potent driver of climate change, especially in the near term and on a regional basis. In colder, icier regions such as the Arctic, it peppers the Arctic snow with heat-absorbing black particles, increasing the amount of heat absorbed and rapidly accelerating local warming. This acceleration exposes darker ground or water, causing snow and ice melt and lowering the amount of heat reflected away from the Earth.[2]

Combating climate change requires immediate and long-term cuts in heat-trapping carbon pollution, or CO2, around the globe. But reducing carbon pollution alone will not be enough to avoid the worst effects of a rapidly warming Arctic—slashing black carbon emissions near the Arctic and globally must also be part of the solution. Unlike regular carbon pollution, which remains in the atmosphere for a century or longer, black carbon emissions dissipate in just a few days or weeks but pack a more powerful punch: Black carbon emissions are hundreds to thousands of times more potent than carbon pollution.[3] For this reason, immediate reductions of black carbon pollution combined with reductions in CO2 can deliver measurable decreases in temperatures in the near term, slow the loss of sea ice and Arctic melting, protect public health, and save millions of lives.

This report explains the sources of black carbon pollution, the numerous benefits of reducing black carbon, and the feasibility of ambitious black carbon-reduction targets. Additionally, it calls for the United States to lead ambitious national, regional, and global efforts to address rapid warming in the Arctic and other glaciated regions when U.S. Secretary of State John Kerry becomes chair of the Arctic Council in 2015.

As the incoming Arctic Council chairman, Secretary Kerry should work with the members of the Arctic Council to achieve the following goals:

- Establish climate change as the overarching theme of the 2015–2017 Arctic Council agenda
- Secure strong commitments from all Arctic Council nations in 2015 to set national goals and a regionwide target to limit black carbon pollution

In addition, Secretary Kerry and Arctic Council members should encourage accelerated action from observer nations and drive action to reduce black carbon on a global scale through the following initiatives:

- Secure commitments from Arctic Council observer nations to adopt ambitious voluntary national targets and undertake new initiatives to reduce black carbon emissions
- Launch a Global Ice Preservation and Security Initiative to slow dangerous levels of warming in the Arctic and other cryosphere regions—the Earth's frozen surface areas

The United States is well positioned to lead ambitious national, regional, and global efforts to address rapid warming in the Arctic and other glaciated regions. Many Arctic nations are already well on their way toward significant emissions reductions. Working together through the council with member and observer nations can mobilize greater ambition among countries to reduce black carbon even further and measurably slow warming in the Arctic.

The Arctic Council was launched in 1996 by eight Arctic nations—Canada, Denmark, including Greenland and the Faroe Islands, Finland, Iceland, Norway, Russia, Sweden, and the United States—to peacefully manage the Arctic's fragile environment, risks, and commercial opportunities.[4] Secretary Kerry will take over the chairmanship of the Arctic Council from 2015 to 2017—a position that rotates among Arctic Council countries every two years. Together, Arctic Council nations and observers[5]—including China, India, Japan, South Korea, Germany, the United Kingdom, and others—produce at least 60 percent of global black carbon emissions. Reducing this super pollutant would help prevent global temperatures from spiking more than 2 degrees Celsius by mid-century. Scientists agree that this is the level necessary to avoid the worst effects of global warming.[6]

Where does black carbon come from?

Global annual emissions of black carbon are estimated to be about 7,600 gigagrams, or Gg, or about 8.4 million tons.[7] Black carbon is produced during the incomplete combustion of fossil fuels, biofuels, and biomass in the transportation sector; wildfires and agricultural burning; domestic stoves for cooking and heating; diesel power generators; the oil- and gas-production industries; and brick kilns. Of these sources, black carbon from diesel transportation, combustion of solid fuels for household heating and cooking, agricultural burning, and oil and gas flaring are the biggest drivers of Arctic warming. The United States, Russia, and Canada are the largest emitters of black carbons in the Arctic region. Diesel transportation is the predominant source of black carbon in the United States and Nordic countries, while forest, grassland, and agricultural fires are responsible for the largest share of black carbon emissions from Canada and Russia.[8]

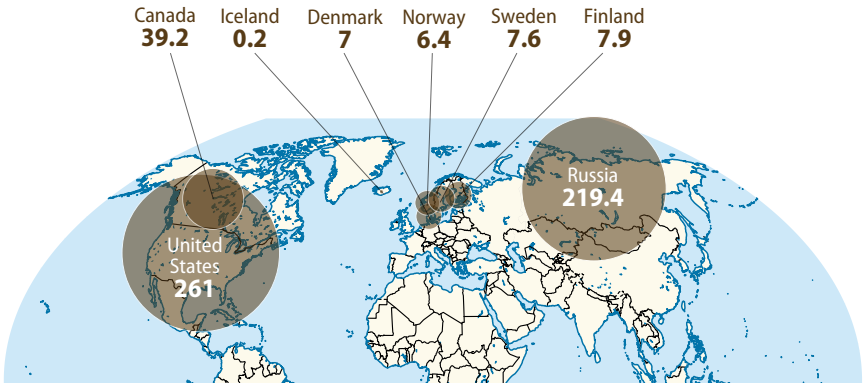
Although the eight Arctic Council nations are responsible for only about 12 percent of global black carbon emissions, those emissions carry nearly half the impact in the Arctic.[9] Having a short lifetime in the atmosphere, black carbon normally does not travel far from its source. For most of the year, the powerful Arctic front zone keeps most pollution from below about 60 degrees north latitude away from Arctic ice and snow. However, it can dip down below 40 degrees north latitude during icy months in winter and spring, allowing black carbon pollution in from areas of the United States that are home to large cities such as Chicago and New York City; in Europe as far south as Madrid and Rome; and in the northern portion of China, including Beijing.[10] Especially at these times, Arctic warming is also driven by black carbon pollution that drifts in from sources outside of the Arctic region. Generally, however, the higher the latitude, the greater the radiative forcing per unit of emission of black carbon.

Radiative forcing occurs when solar radiation reflects off of the Earth's surface and is absorbed by clouds, dark particles, and heat-trapping emissions—also known as greenhouse gases—in the atmosphere. Increased levels of these emissions reradiate the sun's heat both upward and downward, warming the Earth's surface.

Of the Arctic Council nations, the United States and Russia account for the vast majority of emissions—61 percent and 28 percent, respectively. Meanwhile, Canada and the Nordic countries each account for 5 percent.[11] Despite their relatively small contribution to the total amount of black carbon pollution in the Arctic, the Nordic countries play an outsized role in accelerating Arctic warming because of their proximity to the Arctic. Woodstoves in that region are calculated to have the greatest per-unit radiative forcing of any black carbon source.[12]

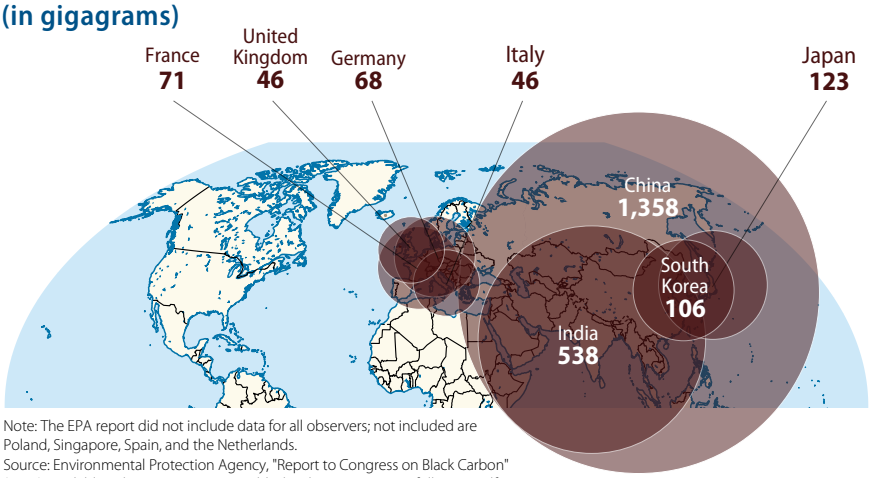
FIGURE 1

Black carbon emissions by Arctic Council members for 2005 (in gigagrams)



Source: Arctic Council, "An Assessment of Emissions and Mitigation Options for Black Carbon for the Arctic Council" (2011), available at http://www.arctic-council.org/index.php/en/document-archive/category/21-task-force-and-contact-group-reports?download=87:sltp-technical-report.

Black carbon emissions by Arctic Council observers in 2000 (in gigagrams)



Note: The EPA report did not include data for all observers; not included are Poland, Singapore, Spain, and the Netherlands.
Source: Environmental Protection Agency, "Report to Congress on Black Carbon" (2012), available at http://www.epa.gov/blackcarbon/2012report/fullreport.pdf.

On the global scale, Arctic Council member and observer nations—including China, India, Japan, South Korea, Germany, the United Kingdom, and others—produce 60 percent of global black carbon emissions.[13] These estimates are conservative, however, as a full accounting of black carbon pollution emitted from Arctic Council member and observer nations that includes all sources of emissions is still being developed and revised, and new sources such as near-Arctic flaring are being used more frequently.

This means, however, that Arctic Council members and observers can play a major role in reducing black carbon emissions not just in the Arctic, but globally.

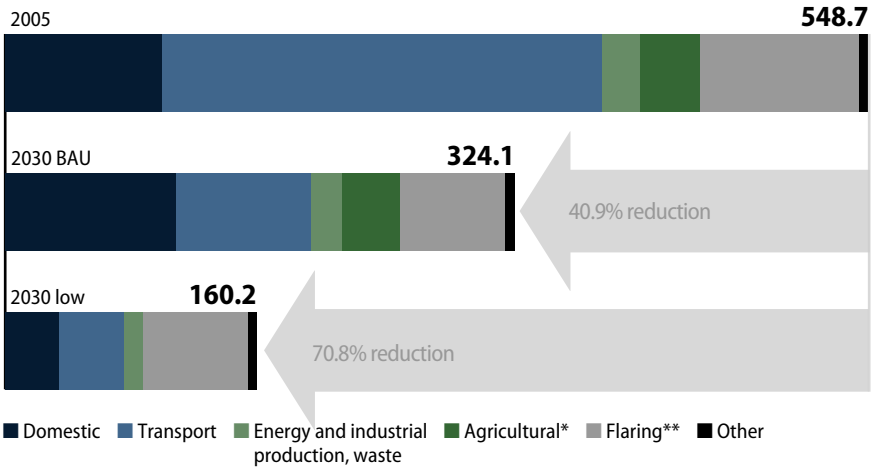
Future black carbon emissions in the Arctic

In 2011, two Arctic Council reports presented data describing the effects of black carbon emissions on the Arctic.[14] The reports, approved by representative experts of all council nations, determined that black carbon emissions from Arctic Council nations are expected to drop by 41 percent—from 548.7 Gg in 2005 to 324.13 Gg in 2030—under policies and regulations already in place, most of which are aimed at improving diesel transport. (see Appendix)[15]

However, the council's modeling shows that countries could achieve even deeper cuts in black carbon if they were to address other, more complicated causes of emissions. In addition to reductions already anticipated from current regulations, black carbon emissions in the region could decline by between 70 percent and 80 percent from 2005 levels by 2030 if countries make use of readily available technologies and practices. (see Figures 2 and 3) There have been advances targeting emissions in the residential sector in some Arctic member nations, yet there are opportunities in countries where these policies have not been introduced. For instance, wide-scale switching from wood and coal to cleaner-burning fuels as well as the replacement of older stoves with more efficient stoves is an effective mitigation strategy.

FIGURE 2

Arctic Council black carbon emissions and emissions reductions potential by sector (in gigagrams)

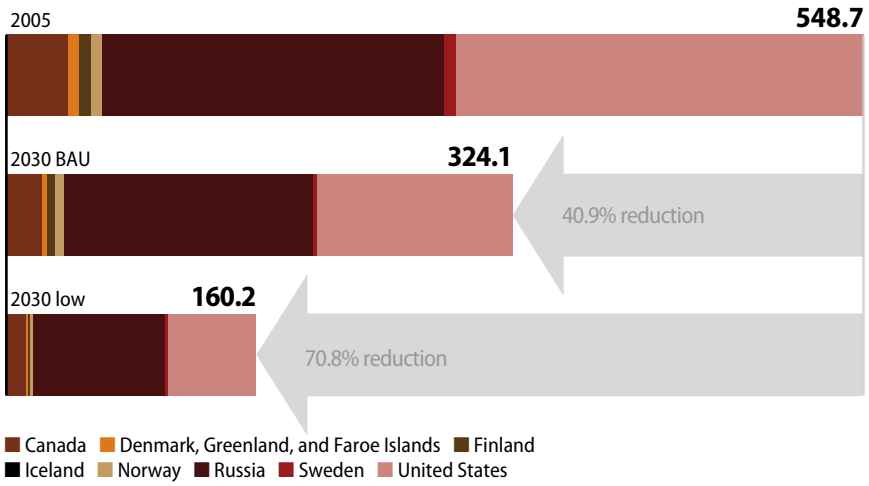


* Does not include emissions from open biomass burning.
** Data on oil and gas flaring are minimal, so emissions estimates are preliminary.
Note: Business as usual, or BAU, estimates black carbon emissions based on current and future emission-control legislation and follows the 2009 reference scenario of the International Energy Agency. The low scenario introduces additional measures in the transport, agricultural, and domestic sectors.
Source: Arctic Council, "An Assessment of Emissions and Mitigation Options for Black Carbon for the Arctic Council" (2011), available at http://www.arctic-council.org/index.php/en/document-archive/category/21-task-force-and-contact-group-reports?download=87:sltp-technical-report.

FIGURE 3

Arctic Council member total black carbon emissions in 2005 and 2030 under current legislation and under additional measures (in gigagrams)

Additional measures to limit black carbon can yield significant reductions in 2030



Note: Emissions from open biomass burning are not included. Business as usual, or BAU, estimates black carbon emissions based on current and future emission-control legislation and follows the 2009 reference scenario of the International Energy Agency. The low scenario introduces additional measures in the transport, agricultural, and domestic sectors.
Source: Arctic Council, "An Assessment of Emissions and Mitigation Options for Black Carbon for the Arctic Council" (2011), available at http://www.arctic-council.org/index.php/en/document-archive/category/21-task-force-and-contact-group-reports?download=87:sltp-technical-report.

While cuts from existing policies are significant, they may be undermined by the increase in black carbon emissions from other sectors such as wood-stove burning, shipping, flaring from oil and gas production, and open field and forest burning. The reduction estimate put forth by the council does not include additional actions that Arctic nations can—and should—take to lower future black carbon emissions from these industries, despite the fact that, for example, recent studies suggest that oil and gas flaring currently deposits the largest amount of black carbon in the Arctic, accounting for about 40 percent of total deposited black carbon.[16] As sea ice disappears and shipping activity increases, black carbon emissions from Arctic marine transport will continue to grow steadily.

The Arctic Council reports did not include the benefits of decreasing burning in the agricultural sector, including intentional agricultural burning, prescribed forest burning, and wildfires. These fires—which often spread to nearby forests and fields—harm soil quality, decrease crop yields, and pose risks to infrastructure and human health and safety. Effective alternative farming practices that do not involve burning or tilling are available, especially in the black-earth regions of Russia, and many large farms have already begun using these methods. Accelerating their adoption by all farms and fostering the effective enforcement of burning bans could cut Russia's total black carbon emissions by more than 50 percent, while increasing food security and avoiding dangerous levels of air pollution, such as those reported during the 2010 summer fires.[17]

Arctic Council nations need to take action to curb black carbon emissions from new and existing sources, focusing on both those in close proximity to Arctic ice and snow as well as others around the globe.

Why cutting black carbon outside the Arctic matters

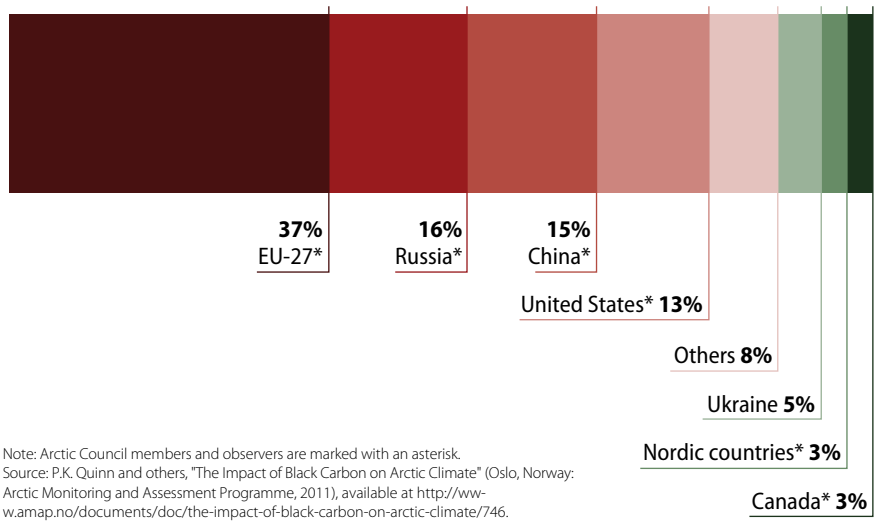
Black carbon emissions from Arctic Council observer countries contribute substantially to Arctic warming.

Data reveal that countries in the European Union that are Arctic Council observer nations are responsible for 37 percent of black carbon emissions that reach the Arctic.[18] China alone is responsible for 15 percent of black carbon in the Arctic.[19] (see Figure 4)

FIGURE 4

Country contributions to anthropogenic black carbon emissions north of 40 degrees north

Black carbon emissions from Arctic Council observer countries contribute substantially to Arctic warming



Note: Arctic Council members and observers are marked with an asterisk.
Source: P.K. Quinn and others, "The Impact of Black Carbon on Arctic Climate" (Oslo, Norway: Arctic Monitoring and Assessment Programme, 2011), available at http://www.amap.no/documents/doc/the-impact-of-black-carbon-on-arctic-climate/746.

Council member and observer nations outside of the Arctic can help slow harmful Arctic warming that has a direct impact on their people and economies through factors such as sea-level rise by also adopting national goals and initiatives to reduce their black carbon emissions. These measures would have direct domestic benefits by cutting local air pollution and reducing associated health risks and crop damage. In fact, curbing global black carbon, methane, and other heat-trapping emissions is essential to securing a safe, sustainable, and prosperous future for the Arctic and the planet.

Modeling by both the U.N. Environment Programme, or UNEP, and the World Bank estimates that additional readily available measures to limit black carbon would reduce Arctic warming by about half of a degree Celsius by 2050.[20] When combined with available methane emission-reduction measures, Arctic warming can be reduced by more than 1 degree Celsius—more than half the projected temperature drop. Without such additional action, Arctic average temperatures may increase by more than 2 degrees Celsius by 2050, greatly increasing the risk for irreversible glacier loss in Greenland and sea ice and permafrost collapse, all of which carry significant global impacts and security risks.

Limiting black carbon pollution will help combat climate change, while supporting economic growth

Curbing black carbon pollution can slow Arctic warming and deliver real environmental, economic, and development benefits around the globe.

The darkening effects of black carbon on snow have global implications. Expansive snow and ice in the Arctic act as a mirror, reflecting heat from the sun and cooling the planet. Driving down black carbon emissions helps preserve the sea ice and snow that reflects this heat from the sun and keeps our global temperatures from rising too quickly.

By the same token, cutting black carbon emissions will temper sea-level rise, which will be increasingly problematic, as the Greenland ice sheet—a slab of ice roughly three times the size of Texas and nearly two miles thick in places—land glaciers, and the Antarctic ice sheets continue to melt.[21] Slowing warming in the Arctic also lowers the risk that massive quantities of heat-trapping methane and carbon currently locked in the Arctic's vast amounts of permafrost will be unleashed as the permafrost melts.[22]

The latest Intergovernmental Panel on Climate Change, or IPCC, assessment projects that average Arctic temperatures—which have already warmed by 2 degrees to 3 degrees Celsius from pre-industrial levels—will rise by an additional 2 degrees Celsius, or 3.6 degrees Fahrenheit, or more by 2050, even with ambitious reductions in carbon pollution.[23] This rapid Arctic warming would contribute to a global average temperature rise of more than 2 degrees Celsius—the maximum threshold temperature change that scientists agree should not be surpassed to avoid the worst impacts of global warming.

A 2013 joint report by the World Bank and the International Cryosphere Climate Initiative, titled "On Thin Ice: How Cutting Pollution Can Slow Warming and Save Lives,"[24] warns that the economic costs of failing to address this rapid Arctic temperature rise will be devastating and would cripple global economies and undermine any efforts to lift the 1 billion people around the world currently living below the extreme poverty line—meaning they subsist on less than $1.25 per day—out of destitution.[25] Permafrost modeling has shown that even a partial sudden release of stored methane could cost $60 trillion in damages from extreme storms, floods, droughts, and other climate change effects over the next 10 years—mostly in developing countries.[26] Reducing Arctic warming will help limit these and other effects that impede economic growth and undermine decades of hard-fought gains in tackling poverty around the globe.

Limiting black carbon pollution saves lives, improves agricultural production, and reduces risk of food-price hikes

Black carbon threatens the health and well-being of people across the planet. Long-term exposure to black carbon or soot, after it enters the lungs and bloodstream, is linked to heart attacks, strokes, respiratory problems, cancer, higher incidence of infant mortality and low birth weight, and premature death.[27] Every year, more than 4 million people globally—mostly women and children—die from breathing in household air pollution simply from cooking their daily meals.[28] The mortality rate from indoor air pollution, including black carbon, is greater than the current annual global death toll from HIV/AIDS, malaria, and tuberculosis combined.[29]

Actions to reduce soot in near-Arctic nations alone can avoid at a minimum roughly 47,800 premature mortalities annually in those countries.[30] Measures to improve cookstoves, which account for one-quarter of global black carbon emissions, could save 1 million lives annually from outdoor air-pollution impacts alone, and perhaps four times that when household or indoor impacts are included.[31]

Reducing black carbon pollution avoids costly and dangerous effects of warming both in and beyond the Arctic. Black carbon and related emissions lower agricultural productivity by raising ground-level ozone, as well as disrupting rainfall patterns such as the Asian monsoon. Measures to reduce black carbon, when combined with methane-reduction measures, can increase yields of staple crops by 10.2 million metric tons in near-Arctic nations, which would lower the risk of food-price increases, as well as crop shortages.[32]

A 2012 study led by an international team of 24 scientists estimated the global benefits of initiating just 14 black carbon and methane-control measures.[33] Combined with aggressive actions to cut overall greenhouse gas emissions, the authors concluded that these measures would reduce projected global warming by half a degree Celsius, or 0.9 degrees Fahrenheit; prevent 2.4 million deaths globally per year on average; and increase global annual crop yields by 53 million metric tons per year on average in 2030 and beyond.

Recommendations

The Arctic Council, and U.S. leadership of the council, provides a potent opportunity to reduce black carbon and safeguard public health and the climate. The U.S. administration must pursue a two-pronged strategy to galvanize action both among Arctic Council members and other nations around the world.

As the incoming Arctic Council chairman, Secretary Kerry should work with the members of the Arctic Council to achieve the following goals:

- Establish climate change as the overarching theme of the 2015–2017 Arctic Council agenda
- Secure strong commitments from all Arctic Council nations in 2015 to set national goals and a regionwide target to limit black carbon pollution

In addition, Secretary Kerry and Arctic Council members should encourage accelerated action from observer nations and drive action to reduce black carbon on a global scale through the following initiatives:

- Secure commitments from Arctic Council observer nations to adopt ambitious voluntary national targets and undertake new initiatives to reduce black carbon emissions
- Launch a Global Ice Preservation and Security Initiative to slow dangerous levels of warming in the Arctic and other cryosphere regions—the Earth's frozen surface areas

The Global Ice Preservation and Security Initiative should aim to protect critical sources of fresh water, reduce sea-level rise, and minimize the risk of conflict tied to water scarcity, food-price spikes, and migration triggered by drought and other extreme weather, among other climate security threats. This global partnership should include Arctic Council member and observer nations, Antarctic Treaty member nations, and countries affected by sea-level rise or water scarcity tied to glacier and ice-sheet loss. The initiative would support climate preparedness and resilient and sustainable economic growth.

Arctic Council actions

Establishing climate change as the overarching theme of Secretary Kerry's chairmanship

Secretary Kerry should announce this fall that climate change will be the overarching theme of the Arctic Council during his 2015–2017 chairmanship term, as recommended in a recent Center for American Progress report, titled "Helping the Arctic Council Find Its True North: Priorities for Secretary Kerry as He Prepares to Take on the Chairmanship of the Arctic Council."[35]

Climate change is the key driver of growing Arctic commercial interests, yet it carries deep environmental and economic risks both regionally and globally. Reducing Arctic warming is critical to avoiding catastrophic global climate change. It is also the key to developing the region sustainably, building resilient and prosperous Arctic communities, and conserving high-value Arctic marine and coastal environments and regional wildlife threatened by rapid rates of climate change. There is no more important issue facing the Arctic today. Moreover, in the context of the Arctic Council's work, a focus on climate change could build effectively on Canada's current focus on responsible Arctic resource development, safe Arctic shipping, and sustainable circumpolar communities.[36]

While Secretary Kerry's chairmanship term does not begin until April 2015, incoming chairs traditionally make their term themes known well in advance to allow time to build support for their priorities and advance their agenda. An opportune moment for a U.S. Arctic Council theme announcement is the September 2014 U.N. Climate Summit in New York City, led by U.N. Secretary-General Ban Ki-moon.[37]

Adopting national black carbon emission-reduction goals in all Arctic Council nations and committing to a regionwide target

Arctic nations should adopt ambitious national and regionwide black carbon emission-reduction goals in 2015 that go beyond the expected emissions reduction by 2030 and are based on the best available science and utilization of cost-effective, existing technologies. To meet a regional emissions-reduction goal, Arctic Council member nations should also adopt national targets for black carbon reductions that are consistent with their own national circumstances and available opportunities to limit emissions growth. Observer nations may also wish to adopt targets at this time.

The Antarctic Treaty was signed in December 1959 by 12 countries with scientists active in the region. There are now 50 parties to the treaty, which designates Antarctica as a "natural reserve, devoted to peace and science." The treaty requires the exchange of information and addressing environmental protection and management.[34]

Black carbon has been examined in depth by the Arctic Council bodies, including the Task Force for Action on Black Carbon and Methane that builds off of the previous Task Force on Short-Lived Climate Forcers in place from 2009 to 2013, as well as the Arctic Monitoring and Assessment Program that provides additional science-based policy assessments and guidance for Arctic policymakers. These Arctic Council task forces and working groups, which informed the findings of this report, provide the foundation for action on black carbon.

Discussions about black carbon action have attracted strong support from Nordic countries supportive of black carbon initiatives. As the current Arctic Council chair country, Canada will play a critical role in advancing action in 2015, and thus far they have demonstrated support and openness for exploring black carbon reductions. Russia historically has opposed action on the grounds that it does not have enough scientific data on the sources of black carbon. One of the largest hurdles to motivating countries, such as Russia, that are currently reluctant to tackle black carbon is to address their lack of investment in monitoring black carbon sources. The United States and Arctic Council members should invest resources and expand partnerships to enhance both the capabilities and commitments in Russia and observer nations to monitor their emissions. In so doing, they will help overcome the political objections to making national and regional black carbon-reduction commitments.

The United States—the largest single emitter of black carbon among Arctic nations—is on track to reduce black carbon emissions by 52 percent from 2005 levels, largely because of existing diesel regulations. By 2030, U.S. black carbon emissions are expected to be 125 Gg, down from 261 Gg in 2005.[38] According to the Arctic Council reports, the United States has a ready opportunity to lead on this issue by taking additional, achievable actions to reduce black carbon that could cut emissions by a minimum of 78 percent from 2005 levels, bringing U.S. black carbon emissions to 56 Gg by 2030. An ambitious plan to further reduce black carbon emissions would put the United States on firm footing to urge other Arctic Council nations to commit to similar actions at the next Arctic Council ministerial meeting in 2015—when Secretary Kerry will formally take on the chairmanship.[39] For instance, in addition to fully implementing fuel-efficiency standards, the United States can promote the retrofitting of heavy machinery with diesel filters or promote incentives for new, more efficient and less polluting machines. Policies to reduce emissions from wood- and coal-burning stoves, such as tax credits for more efficient stoves, would address a second sector with significant emissions reductions potential beyond business as usual. The United States should also continue to work with oil and gas companies to limit flaring in the Arctic. Finally, the United States should continue to invest in and expand programs that address black carbon pollution in developing countries.

Arctic nation leaders have already laid the groundwork for ambitious action on black carbon in 2015. During the Arctic Environment Ministers meeting in Jukkasjärvi, Sweden, in February 2013, ministers concluded that the Arctic Council should prepare a decision for reducing black carbon, including "benchmarks or targets," for review by Arctic states at the next ministerial meeting in 2015.[40] At the Kiruna ministerial meeting in May 2013, ministers decided to "establish a Task Force to develop arrangements on actions to achieve enhanced black carbon and methane emission reductions in the Arctic, and report at the next Ministerial meeting in 2015."

Global actions

Encouraging Arctic Council observer nations to adopt national goals and initiatives to reduce black carbon by 2016

Secretary Kerry and members of the Arctic Council should leverage the existing interest of many Arctic Council observer nations in cutting black carbon emissions to secure commitments and actions from them.

In India and China, for instance, poor air quality due to black carbon is a persistent danger to the health of millions of people. These countries are the major source of black carbon in the Himalayas, which supply drinking water to hundreds of millions of people in each country. Given that both countries are already taking steps to limit black carbon pollution,[41] the Arctic Council should directly engage with them to help build the monitoring capacity and inventories that allow for reporting and disclosure and can serve as the foundation for new national targets and actions.

President Barack Obama should also pledge to host a presidential Arctic summit in 2016 that would include some participation from the Arctic observer nations, where national targets could be announced if they have not been already. Aiming to secure these commitments in 2016 would give the United States and other Arctic Council member nations time to establish their own ambitious black carbon emission-reduction goals and demonstrate the leadership needed to secure commitments from observer nations.

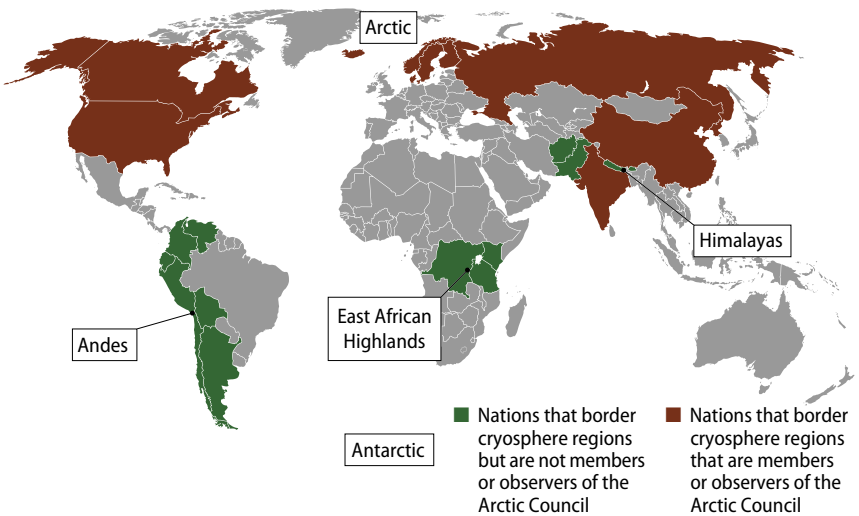
Launching a Global Ice Preservation and Security Initiative

Arctic nations are well positioned to work closely with non-Arctic countries and regions affected by rapidly melting glaciers and ice sheets to slow warming. After all, they all face similar health, agricultural, and water risks associated with black carbon pollution and ice loss and will similarly benefit from action. To this end, the Artic Council should launch a global initiative to conserve freshwater resources, support sustainable economic growth, and reduce the other risks of sea-level rise. This initiative could bring together governments, NGOs, academics, the private sector, and multilateral development banks from the Earth's cryosphere regions and coastal nations vulnerable to sea-level rise to address water scarcity, coastal flooding, and other security risks tied to melting of ice sheets and glaciers.

FIGURE 5

Global cryosphere regions

Arctic Council members and observers make up 10 of the 25 nations located in the world's five cryosphere regions



Arctic Council members and observers make up 10 of the 25 nations located in the world's five cryosphere regions, which include the Andes, Antarctica, Arctic, East Africa, and Himalayas. (see Figure 5)[42] Because Arctic Council nations are present in some other cryosphere regions, the objective to tackle black carbon pollution could easily be expanded beyond the Arctic. Specifically, China and India present a natural opportunity to partner with the Himalayan region. Cryosphere regions where the Arctic Council does not have representation—the Andes and East Africa—will require additional outreach.

The Global Ice Preservation and Security Initiative should provide support for the following:

- Intensification of regional and global scientific work on rates of glacier and ice-sheet loss and how it impacts water supplies, sea-level rise, and national and global security
- Cross-fertilization of science on these issues between different cryosphere regions—on ice-sheet stability in Greenland and Antarctica, for example—and various thresholds for irreversible change
- Recommendations for new regional and national efforts to slow cryosphere climate change—through CO2 measures that also limit black carbon pollution and methane, for example—and sharing of best practices between regions through the Climate and Clean Air Coalition and regional air-quality agreements such as the Convention on Long-range Transboundary Air Pollution and the Malé Declaration
- Work on resilience in human communities and ecosystems in the Arctic and mountain regions

Conclusion

The consequences of a warming Arctic for regional security, global economic stability, and people around the planet are both costly and dire. With Secretary Kerry taking on the 2015–2017 chair of the Arctic Council, the United States has an opportunity to take a stand against climate change in the Arctic region, where warming is more evident than any other place on Earth.

By making climate change the central focus of the U.S. term of the Arctic Council, Secretary Kerry can work with other Arctic countries and observer nations to lead ambitious initiatives to reduce warming in the Arctic and other regions, including efforts to limit black carbon emissions and to protect icy regions and their critical freshwater resources from rapid decline. Doing so would measurably slow Arctic and global warming and protect millions of lives, improve food security, and safeguard our planet for future generations.

Appendix

TABLE 1

Black carbon emissions by Arctic Council member country for 2005 and projected emissions for 2030 (in gigagrams)

Arctic Council members	2005	2030		Percent change (%)	
		BAU	Low	2005 and BAU	2005 and low
Canada	39.2	22.5	12.2	-42.6	-68.9
Denmark, Greenland, and Faroe Islands	7.0	3.8	1.6	-45.7	-77.2
Finland	7.9	4.5	1.1	-43.0	-86.0
Iceland	0.2	0.1	0.1	-50.0	-47.4
Norway	6.4	5.6	2.1	-12.5	-67.3
Russia	219.4	159.6	84.5	-27.3	-61.5
Sweden	7.6	2.8	1.6	-63.2	-79.0
United States	261.0	125.3	56.8	-52.0	-78.2
Total	548.7	324.1	160.2	-40.9	-70.8

Note: Emissions from open biomass burning are not included. Business as usual, or BAU, estimates black carbon emissions based on current and future emission-control legislation and follows the 2009 reference scenario of the International Energy Agency. The low scenario introduces additional measures in the transport, agricultural, and domestic sectors.

Source: Arctic Council, "An Assessment of Emissions and Mitigation Options for Black Carbon for the Arctic Council" (2011), available at http://www.arctic-council.org/index.php/en/document-archive/%20category/21-task-force-and-contact-group-reports?download=87:sltp-technical-report.

TABLE 2

Black carbon emissions and emissions reductions potential by sector (in gigagrams)

Sector	2005	2030		Percent change (%)	
		BAU	Low	2005 and BAU	2005 and low
Domestic	99.6	108.2	33.8	8.6	-66.1
Transport	280.0	86.0	41.7	-69.3	-85.1
Energy and industrial production, waste	23.8	20.0	11.9	-16.0	-50.0
Agricultural*	38.7	36.6	0.0	-5.4	
Flaring**	101.1	67.1	67.1	-33.6	-33.6
Other	5.6	6.3	5.6	12.5	0.0
Total	548.7	324.2	160.2	-17.2	-55.8

* Does not include emissions from open biomass burning.

** Data on oil and gas flaring are minimal, so emissions estimates are preliminary.

Note: Business as usual, or BAU, estimates black carbon emissions based on current and future emission-control legislation and follows the 2009 reference scenario of the International Energy Agency. The low scenario introduces additional measures in the transport, agricultural, and domestic sectors.

Source: Arctic Council, "An Assessment of Emissions and Mitigation Options for Black Carbon for the Arctic Council" (2011), available at http://www.arctic-council.org/index.php/en/document-archive/ category/21-task-force-and-contact-group-reports?download=87:sltp-technical-report.

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