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Avoiding a Full Arctic Meltdown

A Blueprint for Near-Term Global Action

By Cathleen Kelly and Kelsey Schober September 2016

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Introduction and summary

Supplied with new evidence of accelerating Arctic warming and approaching environmental tipping points, the Obama administration will convene science ministers from around the world in September to assess the rate and consequences of Arctic climate change and weigh global strategies for averting its worst effects.[1]

This first-ever White House Arctic Science Ministerial—which will include top science advisers, high-level officials, and Arctic indigenous community leaders—coincides roughly with the one-year anniversary of President Barack Obama's 2015 Alaskan Arctic trip.[2] After his historic visit to the High North, President Obama told *Vogue*, "The looming crisis in the Alaska Arctic is a tangible preview of the looming crisis of the global condition."[3]

The president is right to worry. The Arctic is warming twice as fast as the rest of the planet, setting off a cascade of dangerous changes at the top of the world that include vanishing Arctic snow and ice,[4] thawing permafrost,[5] and melting of the Greenland ice sheet.[6] These changes risk triggering irreversible tipping points with perilous side effects, such as unmanageable sea-level rise and coastal flooding,[7] more frequent extreme weather,[8] and increased warming and carbon emissions.[9] These changes threaten the well-being of people around the globe.

Fortunately, a small window of time remains to avoid a full Arctic meltdown. World leaders and science ministers have a number of opportunities this year to take groundbreaking actions that would help avert cataclysmic Arctic warming and accelerate the transition to the low-carbon global economy. These actions include:

- **Shine a stark light on the latest Arctic science at the White House Arctic Ministerial in September:** Attendees have an opportunity to make a compelling case for urgent global action to fight climate change. They should also launch a high-level panel of leading policy and science experts and establish an early warning system to predict the long-term health of critical Arctic systems under different emission reduction scenarios and help world leaders set future national goals that guide countries away from crossing unsafe Arctic-warming thresholds.[10]

- **Join and build on the Paris Agreement on climate change:** The United States and China both formally joined the Paris Agreement on September 3.[11] Other world leaders must immediately follow suit so that the agreement can take effect this year. World leaders should also build a rock-solid and transparent system to hold countries accountable for meeting and periodically strengthening their climate commitments.[12]

- **Advance other global actions to curb climate change:** These include reaching agreement on an amendment to phase down dangerous and heat-trapping hydrofluorocarbons, or HFCs; creating a strong market-based system to curb aviation emissions; and setting an ambitious goal to cut Arctic black carbon pollution and committing to create a similar regional target for methane.[13]

By taking these doable yet meaningful steps, world leaders and science ministers can help put the world on a low-carbon emissions pathway that avoids the most dire effects of Arctic and global warming.

A path from Paris

Ever since leaders from 195 countries solidified a historic climate agreement in Paris last December, President Obama has worked diligently with other heads of state to set a course for its immediate implementation and secure additional climate commitments. At seven presidential summits and the G-20 leaders' summit this year, President Obama forged new bilateral and multilateral climate commitments with the European Union and 23 nations, including Argentina, Canada, China, Denmark, Finland, Iceland, India, Mexico, Norway, and Sweden, among others.[14] President Obama is making the most of his remaining time in office by bolstering the Paris Agreement and aiming to ensure that enough countries join for it to take effect—ideally, by the end of this year.

The Paris Agreement's purpose is to "strengthen the global response to the threat of climate change," so as to limit global average temperature rise to "well below" 2 degrees Celsius and to aspire to hold warming to no more than 1.5 degrees Celsius.[15] Meeting this aim and avoiding the worst global warming outcomes hinges on whether or not countries meet their current emission reduction goals and commit—at least every five years—to even more ambitious climate targets.[16]

The World Economic Forum rated climate change as the top global risk because it will worsen water shortages, escalate conflict, and force people to migrate.

The economic benefits of climate protection

Scientists and policy leaders have repeatedly concluded that warming the planet more than 1.5 to 2 degrees Celsius will bring high social and economic costs and even threaten the very existence of many low-lying island and coastal nations.[17] The World Bank warns that climate change will send "shock waves" of more intense and frequent devastating floods, persistent droughts, and sea-level rise that will destroy trillions of dollars in assets, upend livelihoods, and push an additional 100 million people into extreme poverty by 2030.[18] This year, the World Economic Forum rated climate change as the top global risk because it will worsen water shortages, escalate conflict, and force people to migrate.[19]

Fortunately, leading international experts have firmly established that curbing climate change is both technically and economically feasible, and doing so can even support equitable and sustainable growth.[20] The Global Commission on the Economy and Climate—an international initiative led by former heads of government and finance ministers and economic and business thought leaders—found that "many of the policy and institutional reforms needed to revitalise growth and improve well-being over the next 15 years can also be critical to tackling climate risk." In particular, the commission concluded that well-designed urban, energy, and land-use policies can cut carbon dioxide, or CO2, emissions and improve air quality while also stimulating "more efficient resource use, infrastructure investment, and innovation."[21]

"This is the only planet we've got. And this may be the last shot we've got to save it."

Recent U.S. emissions and economic trends offer evidence that curbing greenhouse gas emissions can be compatible with economic growth. Between 2005 and 2014, the U.S. economy grew 13 percent, while energy-related CO2 emissions fell 8 percent, a development that reveals the decoupling of economic growth and CO2 emissions.[22] A similar phenomenon is playing out on a global scale.[23] In March, the International Energy Agency, or IEA, reported that during the past two years the global economy grew more than 3 percent, while global CO2 emissions from energy generation and transportation remained flat.[24]

Running out of time?

According to a February article in the journal *Nature Climate Change,* "the next few decades offer a brief window of opportunity to minimize large-scale and potentially catastrophic climate change that will extend longer than the entire history of human civilization thus far."[25] At current levels of global CO2 emissions, the world has roughly 20 years to achieve a global transformation to a low-carbon world economy.[26]

As President Obama put it at the North American Leaders' Summit in June, "This is the only planet we've got. And this may be the last shot we've got to save it."[27]

Rising global temperatures and nearing Arctic tipping points—described below—are stark reminders of the urgent need to take advantage of the small window that still exists. Immediate and substantial global action to curb greenhouse gas emissions is the only way to prevent catastrophic Arctic and global warming and the high costs of doing too little too late.

Record rates of global warming

Last year easily set a new record for highest average global temperature.

According to the authors of an American Meteorological Society, or AMS, report, 2015 shattered a raft of previous Arctic and global climate change records.[28] Based on input from more than 450 scientists from around the world, AMS' "State of the Climate in 2015" report concludes that last year easily set a new record for highest average global temperature.[29] Unlike any other past year, 2015 was hotter than preindustrial times by more than a hefty 1 degree Celsius.[30] In another historic first, the concentration of carbon dioxide in the atmosphere in 2015 exceeded 400 parts per million, or ppm.[31] That same year also recorded the warmest average ocean surface and top layer temperatures, the highest global sea-level rise, the strongest El Niño event, the most Category 3 or above hurricanes in the Northern Hemisphere, the fastest global glacier retreat, and the hottest heat waves in documented history.[32] Last year also tallied the largest drought, in terms of area affected, since the 1980s.[33]

In the Arctic, the maximum sea ice extent hit its lowest level ever recorded in February 2015. Other drastic changes are underway in the High North—including melting sea ice, dwindling ice sheets and glaciers, more frequent extreme weather, thawing permafrost, and Arctic Ocean acidification—that could cross dangerous thresholds and set off an avalanche of challenges in the region and the world.

Arctic meltdown

While the dangers of Arctic warming have been well-documented for decades,[34] scientists have recently observed that changes in the High North are occurring more rapidly than previously predicted.[35] Recent data and scientific analysis reveal a new normal of unparalleled warming and melting at the top of the world that is on track to set off an unstoppable chain reaction of warming that will have grave consequences for sea ice, permafrost, the Greenland ice sheet, sea levels, and global weather systems. The implications for people around the planet will be life-changing. Even if world leaders are able to limit global warming to 2 degrees Celsius, that global temperature rise will be amplified in the Arctic to roughly 5 degrees Celsius, accelerating ongoing climate changes in the region.[36]

Sea ice

Sea ice essentially acts as an ocean cooling system and air conditioner: The white surface of the ice reflects some of the sun's heat away from the Arctic Ocean and back into the atmosphere.[37] As sea ice disappears, the ocean absorbs more heat, setting off a domino effect of even more warming and melting.[38] Sea ice loss also affects ecosystems that support healthy fish,[39] walrus,[40] whale,[41] and other marine life populations that Native Alaskans and other Arctic indigenous people rely on for food and for sustaining their economies and culture.[42] As sea ice shrinks, villages such as Shishmaref are losing the protective shield that traditionally has helped deflect extreme storms and waves. These changes, together with rising seas and permafrost thaw, prompted Shishmaref residents to vote in August to relocate.[43]

Recent sea ice data tell a grim tale of Arctic warming. The average Arctic sea ice extent during the winters of 2015 and 2016 dropped 1.12 million square kilometers, or roughly three times the size of California, relative to winter Arctic sea ice coverage between 1981 and 2010.[44]

At a recent gathering of leading Arctic scientists at Columbia University in New York City, sea ice expert Hajo Eicken of the International Arctic Research Center at the University of Alaska Fairbanks said that, "extrapolating from observed trends, by 2030, the 'open water' season between spring ice break-up and fall freeze-up in the North American Arctic is expected to double relative to [open water seasons in] 1979 to 2013, and occur year-round by 2100."[45] Historically, the spring ice breakup and fall ice freeze occur during the three-month period between July and September. Sea ice loss rates currently exceed 10 percent per decade and have followed a long-term trend of decline since the late 1970s.[46] As the area covered by ice shrinks, the remaining ice is rapidly thinning, with sea ice volume dropping more than 60 percent in just 30 years.[47]

Changing local conditions enough to sustain Arctic sea ice would require aggressive steps to curb global warming and cool the region.[48] Without such changes, experts anticipate that sea ice loss will fuel more warming, permafrost thaw, and Greenland melt and provoke "large scale changes to the global climate."[49]

The Greenland ice sheet

Recent observations reveal that the Greenland ice sheet is melting at a stunning rate.[50] Leading ice sheet experts have concluded that 1.6 degrees Celsius is the "best estimate" of the warming threshold that is likely to trigger irreversible melting of the Greenland ice sheet.[51] Scientists estimate that when global average temperatures rise by 1.6 degrees Celsius, surface melting, loss of ice sheet size, and ice calving—when slabs of ice suddenly break off and slide into the sea—will hit a point of no return.[52]

If the Greenland ice sheet were to melt completely, scientists estimate that the global sea level would rise approximately 7 meters, or 23 feet,[53] an event that would have dire consequences for the roughly 40 percent of the world population that lives near coasts.[54] New research by leading experts shows a rise in sea levels could reach 1.8 meters, or roughly 6 feet, by 2100.[55] Zillow, a leading provider of real estate market data and analysis, recently concluded that if such a rise in sea level occurs, "almost 300 U.S. cities would lose at least half their homes, and 36 U.S. cities would be completely lost."[56]

Leading experts also warn that freshwater ice melt flowing from Greenland into the Arctic Ocean is slowing the major current system of the Atlantic Ocean and creating a so-called cool blob of ocean to the south of Iceland that may be the cause of increasingly frequent storms and flooding in Europe.[57]

Permafrost thaw

Permafrost, the perennially frozen ground that covers 24 percent of the Northern Hemisphere,[58] contains two times more carbon, in frozen form, than the atmosphere currently holds. Experts predict that roughly 10 percent of the carbon stored in permafrost, or 130 to 160 billion tons, could be released by the end of this century as frozen soils thaw.[59]

Scientists warn that if this previously locked-away carbon seeps into the atmosphere, it would become a significant and irreversible driver of global climate change, and one that is not currently factored into major climate change models.[60] Kevin Schaefer of the National Snow and Ice Data Center at the University of Colorado Boulder describes permafrost thaw as a "true climactic tipping point … once you [completely] thaw the permafrost, there's no way to refreeze it."[61]

As permafrost comes out of deep freeze, it launches an escalating cycle that is difficult to reverse: Previously frozen carbon leaks into and warms the atmosphere, which thaws more permafrost, which leaks more carbon, and so on.[62] Experts predict that permafrost could thaw completely with as little as 1.5 degrees Celsius of global warming[63]—a level we could reach, since human activities have already warmed the planet by 0.85 degrees Celsius.[64]

Even if global greenhouse gas emissions are scaled back immediately, experts predict that thawing permafrost will become a significant source of carbon by 2100.[65] However, world leaders can avoid between 65 percent and 85 percent of the expected permafrost carbon release by rapidly transitioning to a low-carbon economy. Specifically, world leaders need to adopt policies that ensure global CO2 emissions peak in 2020 and dramatically decline by 2100, and global warming is held below 2 degrees Celsius.[66]

In addition to its potential to exacerbate global climate change, permafrost thaw also puts at risk Arctic infrastructure that is fundamental to commerce and public health and safety in the region. Roads, airports, pipelines, and other infrastructure are beginning to buckle as the once-frozen solid support beneath them softens, threatening access to jobs, schools, food, health care, and global markets.[67] Other ramifications of thawing permafrost are just beginning to be uncovered. For example, in July, three-dozen people were hospitalized in Siberia for suspected anthrax infections that may have come from deer previously frozen in now-thawing permafrost.[68]

More extreme weather

A growing body of research suggests that skyrocketing temperatures in the Arctic will escalate the rate of devastating droughts, heat waves, fires, winter storms, and flooding in the United States and across the Northern Hemisphere.[69] The dramatic decline in Arctic sea ice has intensified warming in the region, as discussed above, and has narrowed the temperature divide between the High North and the midlatitudes. This temperature difference is what drives the jet stream, the strong winds that create and guide weather patterns and sustain the climate as we know it.[70] As Arctic temperatures rise, the jet stream weakens and wavers, causing more extreme weather in the United States, Canada, Europe, and Asia.[71] For example, experts believe that California's current drought, ongoing since 2012; deadly flooding in Pakistan in 2012[72]; and other recent extreme weather events were likely caused by Arctic warming.[73]

Skyrocketing temperatures in the Arctic will escalate the rate of devastating droughts, heat waves, fires, winter storms, and flooding in the United States.

Unless global greenhouse gas emissions are significantly reduced, experts predict a continued trend of Arctic warming, jet stream weakening, and more extreme weather events that bring high costs and threaten the health and safety of people living in the Northern Hemisphere.[74]

Arctic Ocean acidification

A portion of the CO2 emitted from fossil fuel burning and other human activities is absorbed by oceans. While this reduces the accumulation of CO2 in the atmosphere, it elevates the acidity of seawater, with dire consequences for marine ecosystems.[75] This process, known as ocean acidification, has increased the average surface ocean water acidity by 30 percent relative to preindustrial times.[76] According to the Arctic Monitoring and Assessment Programme, "Arctic marine waters are experiencing widespread and rapid ocean acidification."[77]

When combined with sea ice loss, rising temperatures, and other dramatic changes in the Arctic, ocean acidification is expected to significantly alter the diversity and productivity of marine life in the region.[78] These changes will have profound effects on the livelihoods of Arctic indigenous people and others living in the region.[79]

Recommendations

With rapid climate change already afoot, the roughly 25 science ministers from around the world who will meet at the White House Arctic Science Ministerial on September 28 have an opportunity to spotlight Arctic warming's dangerous effects and strategies to curb them. Science ministers must also use the White House gathering to press world leaders to leverage upcoming international forums—including the Marrakech Climate Change Conference; the 28th Meeting of the Parties to the Montreal Protocol on ozone-depleting substances in Kigali, Rwanda; the 38th International Civil Aviation Organization, or ICAO, Assembly in Montreal; and the Arctic Council ministerial meeting next spring—to radically scale up global efforts to cut heat-trapping emissions and combat climate change.

At the White House ministerial meeting, the Obama administration can partner with other countries to ensure that the latest science on dangerous Arctic and global warming thresholds informs future emission reduction goals set by nations implementing the Paris Agreement. The recommended actions are described in detail below.

Avoid dangerous Arctic tipping points

When the White House convenes the September meeting, ministers should launch a high-level international panel of leading scientists and policymakers tasked with helping world leaders avert Arctic and other warming-related tipping points.[80] This panel would lead an urgent initiative to identify the timing, triggers, and consequences of Arctic and global thresholds that the climate cannot cross without having serious implications for people across the planet. The panel would also identify monitoring gaps that must be filled to better understand Arctic-warming thresholds. Lastly, it would strive to recommend to world leaders, the amount of Arctic permafrost, sea ice, glaciers, ice sheets, and other conditions that must be preserved to avoid unstoppable and dire effects.[81]

The Arctic Monitoring and Assessment Programme,[82] or AMAP—a working group of the Arctic Council—could help inform and support the panel's work. AMAP is currently updating its 2011 assessment of Arctic snow, water, ice, and permafrost in the Arctic, or SWIPA. AMAP is also studying the extent to which the Paris Agreement will reduce Arctic warming in order to inform the spring 2017 Arctic Council ministerial meeting.[83]

In addition, science ministers should commit to jointly invest in new research and analysis in order to create an effective early warning system that would, along with AMAP and other analyses,[84] inform the panel and policy leaders on approaching climate thresholds. The early warning system would use an expanded set of observations and models to predict the long-term health of the Greenland ice sheet, permafrost, sea ice, and other critical climate systems—as well as the pace and amount of global sea-level rise—under different warming and policy scenarios.[85]

The high-level panel would, drawing on AMAP's work, present key tipping point findings to policy leaders to help them design future national climate goals that avert catastrophic Arctic warming. For example, the panel could present its analyses to country representatives at or before the 2018 "facilitative dialogue" that world leaders have agreed to hold under the Paris Agreement.[86] The dialogue's purpose is to "take stock of collective efforts of [signing] Parties" to meet the long-term goals of the Paris Agreement, which include peaking global greenhouse gas emissions as soon as possible and keeping global warming "well below" 2 degrees Celsius and ideally to 1.5 degrees Celsius.[87]

With cutting-edge data on dangerous warming thresholds in hand, country leaders would be equipped to put forward by 2020[88] new or updated national climate goals that would help the world avoid crossing perilous warming thresholds. The panel and the early warning system discussed above would also inform the 2018 special report, which parties have asked the Intergovernmental Panel on Climate Change to prepare, on the effects of warming the planet by 1.5 degrees Celsius above preindustrial levels and possible emissions pathways to hold warming at that level.[89]

Lastly, Arctic science ministers should commit to improving global access to critical data by coordinating existing Arctic science databases and creating a centralized access point.[90] Leading Arctic scientists have identified a lack of access to data and observation points as a significant barrier to improving analyses of how Arctic and global systems interact in a warming climate.[91] Centralizing access to existing Arctic databases—including those managed by AMAP, the National Science

Foundation, and the National Aeronautics and Space Administration, among others—would improve the global understanding of long-term Arctic trends, the relationship between regional and global climate systems, and the accuracy of climate change predictive models that policymakers rely on to shape effective national and global responses to climate change.

Implement the Paris Agreement

While creating the Paris Agreement was a landmark victory in the fight against climate change, countries must now join the agreement so that it can take effect. At the time of this report's publication, the World Resources Institute and the U.N. Framework Convention on Climate Change, or UNFCCC, both reported that the agreement had been signed by 180 parties and officialy joined by 27 parties collectively representing roughly 39 percent of global emissions. When combined with countries that have domestically ratified the agreement but have yet to officially join it by submitting their ratification instruments to the United Nations, the numbers improve: 39 countries have joined collectively representing roughly 46 percent of global emissions.[92] For the Paris Agreement to enter into force, 55 parties accounting for at least 55 percent of total global greenhouse gas emissions must join the agreement.[93]

The United States and China formally joined the Paris pact on September 3.[94] Heads of state from Iceland, Norway, Argentina, and India, among others, have committed to join the agreement as soon as possible.[95] At the North American Leaders' Summit in June, President Obama, Canadian Prime Minister Justin Trudeau, and Mexican President Enrique Peña Nieto called on all nations to support the Paris Agreement's entry into force in 2016.[96] When G-20 leaders met in Hangzhou, China, on September 4 and 5, they endorsed these and other efforts to ensure that the Paris Agreement takes effect this year.[97]

At their September meeting, science ministers should build on the momentum of these recent bilateral and multilateral climate statements by urging world leaders to immediately join the Paris Agreement so that it takes effect in 2016. World leaders must answer this urgent call to avoid unmanageable climate change.

World leaders must also direct their climate negotiators to build a strong and transparent accountability system in order to ensure that countries meet their existing climate commitments and raise the ambition of those commitments every

five years. Negotiators will have an opportunity to lay the foundation for a credible accountability system when they meet this November in Marrakech, Morocco for the 22nd Conference of the Parties, or COP 22, under the UNFCCC.[98] According to a recent analysis by the Center for American Progress, country negotiators can begin constructing such a system by specifying in Marrakech the information that developed and developing countries will need to provide on the following: their national emissions; their progress toward meeting their national climate goals; and the international climate financing countries have given or accepted.[99] Negotiators must also agree on a credible process for sharing this information.[100]

Advance additional climate action globally

When they meet in September, science ministers also have an opportunity to urge world leaders to take full advantage of all near-term opportunities beyond the Paris Agreement to curb global climate change. Fortunately, there are a number of immediate openings for taking action this fall, including reaching agreement at the October Montreal Protocol negotiations on an amendment to phase down dangerous and heat-trapping HFCs; creating a strong market-based system to curb global aviation emissions at the ICAO Assembly in September and October; and setting the stage for the Arctic Council to adopt at its ministerial meeting next spring an ambitious regional goal to cut black carbon pollution and a commitment to setting a similar regional goal for methane pollution. When science ministers convene at the White House in September, they can make clear to world leaders that seizing all available opportunities to curb global greenhouse gas emissions is crucial to meeting the Paris Agreement goals and avoiding the worst climate change outcomes.

Phase down super-polluting HFCs

Heat-trapping hydrofluorocarbons have replaced many ozone-depleting substances used for conditioning, refrigeration, foams, and aerosols, but they remain potent greenhouse gases. HFCs are accelerating global warming as their use rapidly rises.[101] According to the U.N. Environment Programme, or UNEP, "An agreement to phase down HFCs under the Montreal Protocol would avoid an estimated 105 gigatonnes of carbon dioxide equivalent by 2050, and up to 0.4°C of global warming by the end of the century, while continuing to protect the ozone layer."[102]

In October, parties to the Montreal Protocol on Substances that Deplete the Ozone Layer—a treaty agreed to in 1987 to reduce the production and consumption of substances that deplete the earth's ozone layer[103]—will meet in Kigali, Rwanda, to discuss the adoption of an amendment that would phase down the use of HFCs.[104] World leaders must urge their country representatives to reach agreement on an ambitious and comprehensive HFC phase-down amendment in order to help meet the Paris Agreement goals and avoid catastrophic Arctic and global warming. In various 2016 bilateral and multilateral climate statements, leaders from the United States, China, India, Canada, Mexico, the Nordic nations, and Argentina have affirmed their commitment to reach agreement on an HFC phase-down amendment this year.[105] Parties to the Montreal Protocol set the stage for such an agreement during their July meeting in Vienna, Austria.[106] In September, China and the United States expanded their commitment to achieving an HFC phase-down amendment by "committing to work together to reach agreement this year on an ambitious and comprehensive HFC amendment with an early freeze date and ambitious phase down schedule, along with increased financial support to assist in implementation.[107]" At their September summit, G-20 leaders stated their support for a successful outcome at the October Montreal Protocol meeting.[108]

Curb the rapid rise in global aviation emissions

Global aviation produces roughly 2 percent of global CO2 emissions today, but emissions from this sector are soaring and are expected to triple globally by 2050.[109] Aviation fuel-efficiency advances have been outpaced by the industry's rapid growth.[110] In the absence of ambitious efforts to reduce aviation emissions, meeting the Paris Agreement goals will become even more challenging.[111]

The 191 member states of the ICAO—the U.N. body charged with working with countries and industry to reach consensus on aviation standards and policies[112]—will gather for their triennial assembly in Montreal, Canada, in late September.[113] When they meet, they must adopt a market-based system to freeze international civil aviation emissions at 2020 levels while supporting carbon-neutral growth within the sector.[114]

ICAO negotiators are currently haggling over the details of a global emissions offsetting scheme.[115] Such a scheme would allow companies to offset their emissions increases by purchasing, via a global market, cost-effective emissions reductions achieved by other firms. The aviation industry supports the creation of a single

global carbon-offsetting scheme, rather than face a patchwork of country- and regional-level systems.[116] Industry advocates also believe carbon offsetting will be a cost-effective complement to other emissions-cutting options, which include new aircraft technology and more efficient air traffic management systems.[117]

President Obama and leaders from Argentina, Canada, India, Mexico, the Nordic countries, and others have called on countries to reach agreement at the ICAO Assembly this fall on a market-based measure in order to halt the rapid rise in international aviation emissions.[118] Doing so is an essential step in combating global climate change.

Reduce black carbon and methane pollution in the Arctic

Diesel cars and trucks; woodstoves; wildfires and agricultural burning; oil and gas production; transportation; and shipping all emit black carbon, or soot—a type of pollution that is often most potent near its emission source.[119] When emitted in or near the Arctic and other icy regions, black carbon pollution warms and blackens the surfaces of snow and ice, which reduces its ability to reflect the sun's heat and warms the atmosphere.[120] Black carbon threatens the health and well-being of communities in the Arctic and other regions, and it is linked to heart attacks, strokes, respiratory illness, and higher rates of infant mortality and premature death.[121]

Methane pollution is the second-most powerful contributor to global warming, which drives Arctic warming. Methane is emitted by venting and flaring at oil and gas fields, coal mining, agricultural burning, wildfires, leaks from natural gas transportation, and other sources.

While emissions of CO2 are the primary driver of global climate change, short-lived climate pollutants such as black carbon and methane threaten public health and accelerate Arctic and global warming.[122] At the spring 2017 Arctic Council ministerial meeting, Arctic leaders should adopt an ambitious regional target to cut black carbon pollution and agree to set a strong regional goal to cut Arctic methane pollution during the Finnish Arctic Council chairmanship. If world leaders take full advantage of the available opportunities to cut black carbon, methane, and ozone pollution globally, they can reduce Arctic warming by roughly 0.5 degrees Celsius by 2050 and help keep global warming below 2 degrees Celsius.[123]

In April 2015, Arctic Council nations—Canada, Denmark, Finland, Iceland, Norway, Sweden, the Russian Federation, and the United States—agreed to take action to cut their black carbon and methane pollution under the Framework for Action on Enhanced Black Carbon and Methane Emission Reductions.[124] As part of the framework, Arctic nations committed to set a regional goal to reduce black carbon pollution at the spring 2017 Arctic Council ministerial meeting,[125] when the Arctic Council chairmanship will transition from the United States to Finland.[126] As it stands, Arctic nations have not yet agreed to set a regional goal to curb Arctic methane pollution.[127]

Conclusion

Arctic warming is already affecting people in the region and around the world in life-altering ways, from accelerating global sea-level rise and flooding coastal communities to more extreme storms, drought, and heat waves that exacerbate poverty and elevate the risk of conflict in vulnerable regions of the world.

Experts have concluded that a small but rapidly closing window of time remains for world leaders to take immediate and significant global action to avoid the worst Arctic and global warming consequences. To prevent that window from closing, science ministers attending the September 28 White House Arctic Science Ministerial should launch a high-level panel to help world leaders fully consider Arctic tipping points in future international and national climate goal setting. Science ministers should also use the latest scientific evidence and analysis to make clear for world leaders the imperative of taking new and bold steps to fight climate change.

For their part, world leaders must immediately ratify or otherwise join the Paris Agreement so that it can take effect this year. They should also direct their climate negotiators to use the fall U.N. climate negotiations to lay a firm foundation for a strong and transparent accountability system that will ensure countries meet their climate commitments and raise the ambition of those commitments every five years.

In addition, world leaders should take advantage of upcoming international forums to secure new international commitments to curb climate change. These include reaching agreement on an amendment to phase down dangerous and heat-trapping HFCs at the fall Montreal Protocol negotiations, creating a strong market-based system to curb aviation pollution through ICAO, setting an ambitious regional target to curb black carbon pollution in the Arctic, and committing to a similar target for methane.

With the safety and well-being of people around the globe at stake, there is not a moment for science ministers and world leaders to lose. They must take these pragmatic and meaningful actions to prevent catastrophic Arctic and global warming.

About the authors

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Acknowledgments

The authors thank Gwynne Taraska, Pete Ogden, Jerusalem Demsas, Meredith Lukow, and Erin Whalen from the Center for their contributions to this report. The authors also thank Philip Duffy, Brenda Ekwurzel, Hajo Eicken, Martin Forsius, Scott Goetz, Max Holmes, Sue Natali, Rafe Pomerance, Brenda Rogers, Adam Rosen, and Margaret Williams.

The Center for American Progress thanks the Nordic Council of Ministers for its support of our education programs and contribution to this report. The views and opinions expressed in this report are those of the authors and the Center for American Progress and do not necessarily reflect the position of the Nordic Council of Ministers. The Center for American Progress produces independent research and policy ideas driven by solutions that we believe will create a more equitable and just world.

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