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## Cutting Non-CO<sub>2</sub> Pollutants Can Delay Abrupt Climate Change, Solve “Fast Half” of Climate Problem

Washington, D.C., October 12, 2009 – Reducing non-CO<sub>2</sub> climate change agents such as black carbon soot, tropospheric ozone, and hydrofluorocarbons (HFCs), as well as expanding bio-sequestration through biochar production, can forestall fast approaching abrupt climate changes, according to Nobel Laureate Dr. Mario Molina and co-authors in a paper published today in the *Proceedings of the National Academy of Sciences (PNAS)*.

The paper’s authors said that pursuing these solutions could change the character of the United Nations climate change conference taking place this December in Copenhagen.



*Black carbon and tropospheric ozone are major pollutants and greenhouse gases*

“Cutting HFCs, black carbon, tropospheric ozone, and methane can buy us about 40 years before we approach the dangerous threshold of 2°C warming,” said co-author Professor Veerabhadran Ramanathan, a Distinguished Professor of Climate and Atmospheric Sciences at Scripps Institution of Oceanography at the University of California, San Diego.

“By targeting these short-term climate forcers, we can make a down payment on climate and provide momentum going into the December negotiations in Copenhagen,” said co-author Durwood Zaelke,

President of the Institute for Governance & Sustainable Development. “The Obama Administration and other key governments need to take up the fast-action climate agenda before it is too late.”

HFCs are powerful greenhouse gases originally developed as substitutes for ozone-depleting chemicals. They are poised to become a larger part of the climate problem over the next few decades. HFCs are used primarily as refrigerants and in making insulating foam, and emissions are expected to grow dramatically due to increased demand for air conditioning in developing countries. By 2050, HFC emissions could equal up to 19 percent of global CO<sub>2</sub> emissions under business-as-usual scenarios. The good news, the paper points out, is that a binding legal agreement exists that can cut HFCs now—the Montreal Protocol ozone



*Durwood Zaelke, IGSD*

treaty—and that many alternatives to HFCs have already been developed and are on the shelf waiting for the right regulatory incentive from the Montreal Protocol to be deployed.



Photo Credit: Donna Cooney/MIT

**Dr. Mario Molina,**  
*UCSD*

“The Montreal Protocol has already delayed climate change by seven to 12 years, and put the ozone layer on the path to recovery later this century,” said Dr. Mario Molina, recipient of the Nobel Prize in chemistry for his path-breaking work in 1974 that sounded the alarm on ozone-depleting CFCs. “The Montreal Protocol is critical for avoiding abrupt climate change. We have to take advantage of the proven ability of this legally binding treaty to quickly phase down HFCs.”

The small island nations of Micronesia and Mauritius submitted a joint proposal in April to phase down production and consumption of HFCs under the Montreal Protocol. North American leaders followed suit with their own joint proposal, which builds on the islands’ submission. The Montreal Protocol is an essential strategy for the island nations to achieve fast mitigation to slow sea-level rise that is already starting to destroy their countries. “We must consider all viable strategies that will help protect vulnerable island nations, in particular, those strategies that have a track record of success, such as the Montreal Protocol,” said Ambassador Masao Nakayama, Permanent Representative of the Federated States of Micronesia to the United Nations. Although the Kyoto Protocol currently addresses emissions of HFCs, it does not address production and consumption.

A neglected fast-action strategy presented in the paper is reducing black carbon soot, an aerosol produced largely from the incomplete combustion of diesel fuels and biofuels, and from biomass burning. It is now considered to be the second or third largest contributor to climate change. Black carbon is responsible for almost 50 percent of the 1.9°C increase in warming of the Arctic since 1890 as well as significant melting of the Himalaya-Tibetan glaciers that feed the major rivers of Asia, providing fresh water to billions of people.

Researchers consider black carbon an ideal target for achieving quick mitigation because it only remains in the atmosphere a few days to a few weeks and can be reduced by expanding the use of diesel particulate filters for vehicles and clean-burning or solar cookstoves to replace those burning dung and wood. With indoor air pollution killing 1.6 million people a year, global action to cut soot emissions would reap major benefits for both public health and climate.



**Dr. Veerabhadran Ramanathan,**  
*UCSD*

“If we reduce black carbon emissions worldwide by 50 percent by fully deploying all available emissions-control technologies, we could delay the warming effects of CO<sub>2</sub> by one to two decades and at the same time greatly improve the health of those living in heavily polluted regions,” said Dr. Ramanathan.

Like black carbon, ground level or tropospheric ozone doubles as a major climate forcer and health hazard. It also lowers crop yields. A recent study reported that ozone’s damage to crop



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yields in 2000 resulted in an economic loss of up to \$26 billion annually. It is formed by “ozone precursor” gases such as carbon monoxide, nitrogen oxides, methane, and other hydrocarbons, many of which can be reduced by improving the efficiency of industrial combustion processes. Reducing tropospheric ozone by 50 percent could buy another decade’s worth of time for countries to start making substantial cuts in CO<sub>2</sub>.

Biochar is one of the few promising “carbon-negative” strategies that can drawdown existing concentrations of CO<sub>2</sub>. The fine-grained charcoal product is a stable form of carbon that can be plowed into soil where it remains for hundreds to thousands of years, also serving as a natural fertilizer. Biochar comes from cooking biomass waste at low temperatures with minimal oxygen—a process called pyrolysis. “The other fast-action strategies can quickly mitigate emissions, but to back away from the cliff of abrupt climate change, we need biochar,” said Zaelke.

“Fast-action strategies are critical for Africa and all other vulnerable States, and are essential for containing the cost of adaptation that all States will face,” said co-author Donald Kaniaru of the National Environment Tribunal of Kenya.



**Donald Kaniaru,** *National  
Environment Tribunal of Kenya*

Although most of the world is focused on CO<sub>2</sub> in the months leading up to Copenhagen, the authors of the paper hope that policymakers will recognize the advantages of implementing these fast-action strategies to complement reductions in CO<sub>2</sub>. “These fast-action strategies will support the long-term CO<sub>2</sub> solution by stopping near-term climate change with non-CO<sub>2</sub> solutions,” said Dr. Stephen Andersen of the Montreal Protocol’s Technology and Economic Assessment Panel. “This will bring momentum to those negotiating the international agreement and the U.S. legislation.”



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The paper is part of a “Tipping elements in Earth systems” special feature to be published in *PNAS* later this year.

“Cutting CO<sub>2</sub> emissions is essential, but it won’t produce cooling fast enough to avoid passing tipping points for abrupt climate change,” said Zaelke. “With the world already committed to more than 2°C of warming, we need these fast-action strategies to put the brakes on climate change, and in the case of

biochar, put us in reverse by reducing existing atmospheric concentrations of CO<sub>2</sub>.”

“We intend our paper as a call to action,” said co-author K. Madhava Sarma of the Montreal Protocol’s Technology and Economic Assessment Panel.

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**Title:** *Reducing abrupt climate change risk using the Montreal Protocol and other regulatory actions to complement cuts in CO<sub>2</sub> emissions*

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**Available online:** <http://www.pnas.org/content/early/2009/10/09/0902568106.full.pdf+html>

**For further information** on the Montreal Protocol and its contribution to climate protection:

IGSD background note on Montreal protocol:

<http://www.igsd.org/documents/OzoneDayPR15Sept1055am.pdf>

IGSD press release on “North American leaders submit joint proposal to phase down HFCs under Montreal Protocol”: [http://www.igsd.org/documents/PR\\_NAHFCproposal1245pm.pdf](http://www.igsd.org/documents/PR_NAHFCproposal1245pm.pdf)