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A large, vibrant image of the Earth from space, showing the curvature of the planet and the sun's rays illuminating the horizon.

At the crossroads

The Montreal Protocol is considered by many to be the world's most successful environmental treaty. It has phased out 97 environmentally damaging chemicals by nearly 100 per cent over its 24-year history, putting the ozone layer on the path to recovering to its pre-1980 level by the middle of the century. It has also mitigated climate change, by preventing the emission of greenhouse gases equivalent to approximately 10 billion tonnes of carbon dioxide per year between 1990 and 2010 - many times what was expected from the Kyoto Protocol during the commitment period ending 2012.

Hydrofluorocarbons (HFCs) were introduced into commercial use as substitutes for other chemicals that damage the ozone layer, including both the original CFCs and the HCFCs used as transitional substitutes for them. But it has long been recognized that many are potent greenhouse gases. They are increasing rapidly and are projected to go on doing so. While radiative forcing from them is now quite small,

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they will contribute significantly to climate change a few decades from now, perhaps up to 20 per cent as much as carbon dioxide in 2050, if the future emissions are the same as the current mix. Such a large HFC increase would require even steeper cuts in carbon dioxide to stabilize climate change. Limiting the production and consumption of HFCs with high Global Warming Potential (GWP) would minimize their contribution to climate forcing and preserve the climate benefits previously achieved by the Montreal Protocol.

It is worth laying out a few important facts and issues:

I. HFCs are exclusively anthropogenic in origin. They were introduced to take the place of CFCs and HCFCs that were or are currently being phased out — and are used in various applications of refrigeration and air-conditioning, foam production, fire suppression, and solvents

2.

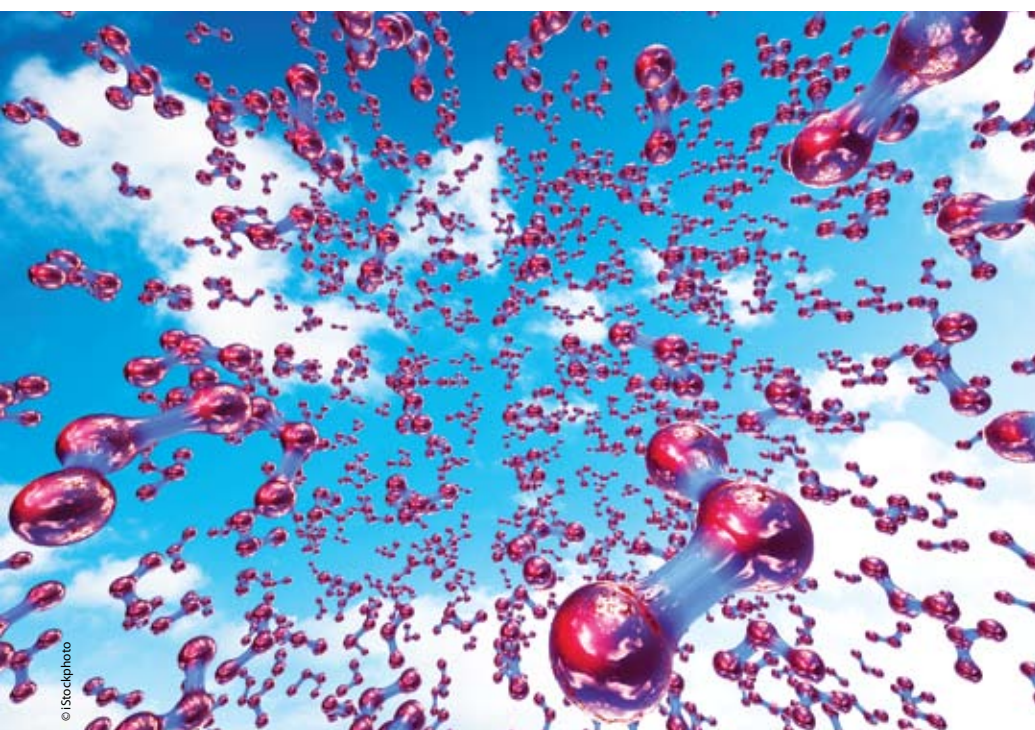
As they contain only Hydrogen, Fluorine, and Carbon atoms (thus HFCs for short) and do not contain chlorine or bromine, they do not deplete the ozone layer. Thus, using them has helped avoid further damage to the ozone layer while allowing a smooth, almost unnoticed, transition from CFCs and HCFCs.

3.

Since they contain carbon-fluorine chemical bonds, HFCs absorb infrared radiation in the atmosphere that would otherwise escape to space. Their ability to absorb it is comparable to those of CFCs and HCFCs — on a molecule-per-molecule basis — and much greater than other greenhouse gases such as CO₂, methane, and nitrous oxide.

4.

Not all HFCs are the same: there are significant dissimilarities in their impact on the climate. These arise mostly from the differences in their atmospheric lifetimes, which determine how much of each accumulates in the atmosphere. Many of the currently used HFCs — even though considered to be Short-Lived Climate Forcing agents (SLCF) compared to carbon dioxide — have lifetimes sufficiently long to make them significant greenhouse gases. For example, the very commonly used HFC-134a has a lifetime of roughly 13 years and a 100-year GWP of roughly 1,400 (i.e. 1,400 times more effective than carbon dioxide on a weight basis). However, some HFCs (olefins, or molecules with carbon-carbon double bonds) are very short-lived, i.e., “living” only days to weeks, rather than years in the atmosphere, and so have negligibly small GWPs. Using Very Short-Lived Climate Forcing HFCs with their low GWPs (or other non-HFC options) in place of the currently used high GWP ones would provide significant climate mitigation.





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Thus choices can be made to use specific HFCs to benefit climate. What are the potential opportunities for this? Clearly the first and foremost is that a significant detrimental climate effect can be avoided by replacing the high GWP HFCs with very low GWP ones or with other environmentally safer alternatives, including not-in-kind technologies. If such replacement were implemented, the legacy of the Montreal Protocol in protecting the ozone layer would be augmented by its continued collateral benefit of ameliorating climate change. The Federated States of Micronesia has made a formal proposal to amend the Montreal Protocol to phase out HFCs with high GWP and the United States, Canada, and Mexico have contributed a similar one. At last year’s Montreal Protocol meeting of parties, 91 countries expressed support for limiting high GWP HFCs.

What are the challenges to passing such an amendment? Clearly, it requires recommitting to the “start and strengthen” approach of the Montreal Protocol, and building on the analysis of the treaty’s Technology and Economic Assessment Panel to understand the range of available alternatives, as well as their costs. It also seems prudent to explore limiting high-GWP HFCs in the context of efforts to limit the broader group of non-CO₂ related climate forcing agents, for example the recently expressed interest in such SLCF agents as black carbon, ground-level ozone and its precursor methane, and HFCs. Reducing SLCFs appears to be a great opportunity to minimize climate change in the near future.

Some countries and regions have implemented — or are considering implementing — constraints on HFCs. Examples include an ongoing review by the European Union of its regulations on HFCs and other fluorinated gases, a recent European Parliament resolution urging cuts in HFCs and other SLCFs, and the call by September’s Ministerial meeting on SLCF in Mexico City for a global initiative to support future action on SLCFs. A coalition of 400 businesses also has pledged to eliminate high GWP HFCs starting in 2015, adding further momentum to the effort to limit the climate damage these chemicals cause.

How HFCs impact climate ultimately depends on the choices made today to constrain their current negligible contribution to climate change so they do not continue the dangerous growth projected under business-as-usual.