our planet

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SUPPORTING SOLUTIONS

POWERING CLIMATE SOLUTIONS

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INTERNATIONAL YEAR OF FORESTS · 2011

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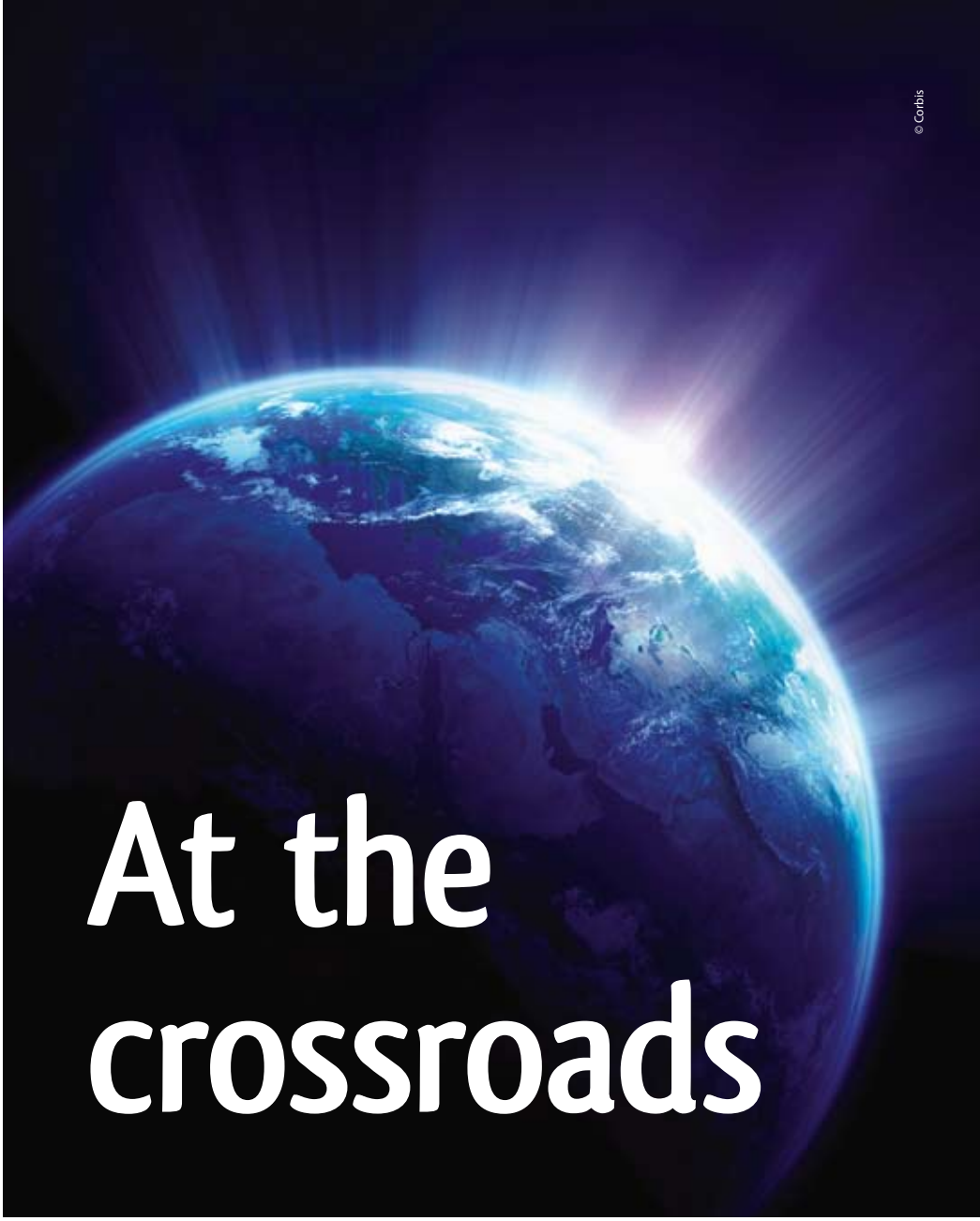

At the crossroads

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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.

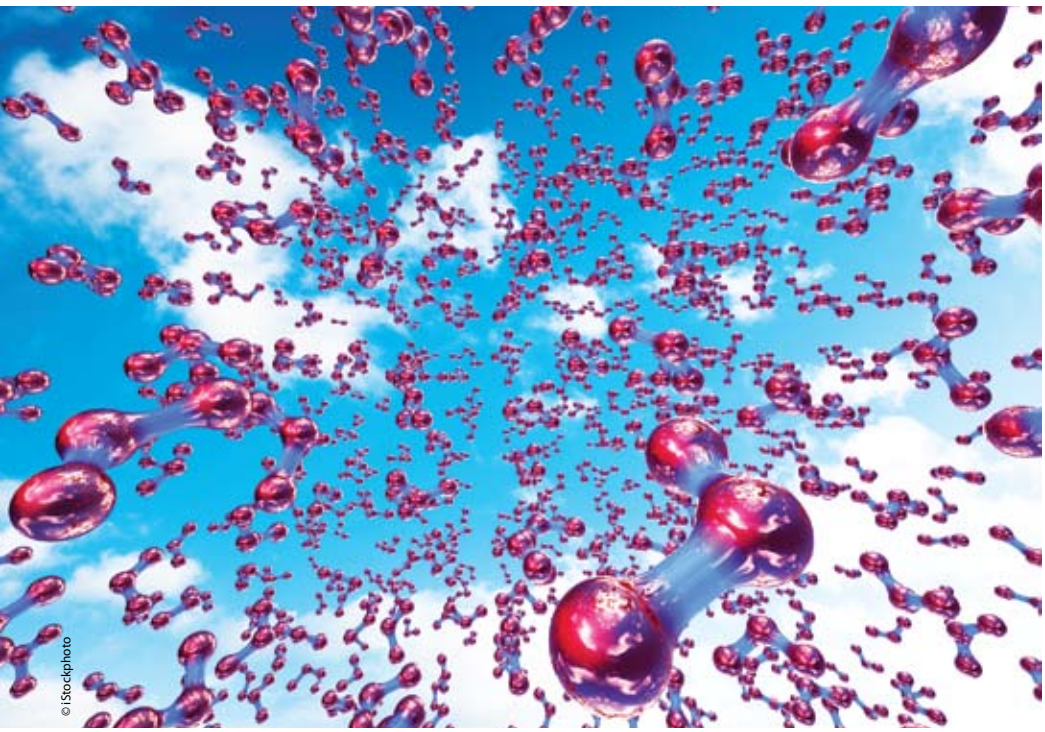
Hydrofluorocarbons (HFCs) were introduced into commercial use as substitutes for other chemicals that damage the ozone layer, including both the original CFCs and the HCFCs used as transitional substitutes for them. But it has long been recognized that many are potent greenhouse gases. They are increasing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

"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."

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:

1.
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



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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 CO_2, 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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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-CO_2 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.

"Reducing SLCFs appears to be a great opportunity to minimize climate change in the near future."

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.

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.

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An equitable arrangement

Equity — as nearly twenty years of hard-won experience demonstrates — is, without doubt, the golden key for climate negotiations. It is epitomized through the principle of "common but differentiated responsibility" between developed and developing nations. This principle is now a point of enormous contention in the climate negotiations. We risk derailing urgently needed solutions to reverse climate change tendencies because we have not yet found a way to guarantee equity under the UNFCCC process.

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"HFCs are in the same family of gases, have similar chemical properties, and are used in the same sectors as chemicals already regulated by the Montreal Protocol – so the structures are already in place in quickly to implement a phase-out."

Finding equity in the distribution of the atmosphere, equity in responsibility to mitigate, and equity in responsibility to the victims of climate impacts has thus far proven elusive to the negotiators. However, the international community has shown that it can provide equity in solving the global environmental challenge, as the story of the Montreal Protocol shows.

Considered the world's most effective environmental treaty, the Protocol is a standard bearer for both global equity and climate mitigation. It applies the principle of common but differentiated responsibilities by requiring that industrialized nations step up to the plate first, while developing nations are given a grace period. And nations have agreed that industrialised countries should pay the incremental costs of compliance for developing ones.

Though the Protocol was originally designed primarily to protect the ozone layer, universal compliance with it has had a whopping positive effect on the climate by reducing climate emissions by the equivalent of 135 billion tons of CO_2 between 1990 and 2010. Considering the difficulties over negotiation of the Kyoto Protocol, the numbers are staggeringly impressive. The Montreal Protocol cut climate emissions to the tune of 11 billion tons per year — four to five times the reductions targeted in the first commitment period of the Kyoto Protocol!

And that's not all. The accelerated phase-out of HCFCs (Hydrochlorofluorocarbons), negotiated and approved in 2007 under the Montreal Protocol, has the potential to eliminate another 15 billion tons of CO_2 equivalent. But there's an important and fundamental catch: the phase-out's climate benefits will only be realized if the transition out of HCFCs leads to substitutes that have zero or low Global Warming Potentials (GWPs). It could be greatly undermined if HFCs (hydrofluorocarbons) are selected as replacements.

HFCs are super greenhouse gases, 2,000 times more potent than carbon dioxide in terms of warming the climate. Although there are numerous low-GWP alternatives, they have become the fastest growing greenhouse gas in many countries through replacing HCFCs. If not controlled, they could be responsible for more than a third of climate forcing by mid-century.

HFCs are one of the six gases in the Kyoto Protocol basket being painstakingly negotiated under the UNFCCC process. A key issue in the talks concerns equity and differentiated responsibilities, and that is where our troubles lie. We face a critical dilemma, advancing by phasing out production and use of HCFCs under one regime (the Montreal Protocol), while being unable to limit the emissions of HFCs under another (the UNFCCC process).

How do we solve this? How do we take advantage of phasing out HCFCs but avoid the growth of HFCs — and, in so doing, guarantee the principle of common and differentiate responsibilities? Thinking of equity in the context of climate change negotiations in practice implies:

a. Effective North-South transfer of technologies;
b. Creating an equitable financial architecture guaranteeing equitable representation and decision-making power from Annex I (industrialised) & Non-Annex I countries;
c. Annex I countries properly fulfilling their mitigation obligations;
d. Annex I countries properly fulfilling their financial obligations on mitigation and adaptation.

All of these already occur and are present in the Montreal Protocol.

So why not then use what has already proven to be a fair, equitable, successful treaty that currently and successfully regulates HCFCs also to control HFCs?

Given the great success of the Montreal Protocol to date, it is a reasonable assumption that it would indeed serve as a constructive forum to address HFC phase-outs. The framework, institutions, and technical experts and negotiators who know each other well, are already in place. But a few more questions may arise:

a. What do we gain in terms of mitigation?
b. At what cost?
c. What would this imply for the UNFCCC negotiations process?
d. Are there other benefits?
e. And — if the answers to all the above are positive, how do we do it?

A workable proposal already exists, first put forward by the Federated States of Micronesia in 2009. It would reduce 85-90 per cent of HFC production and use, achieving a climate mitigation of the equivalent of 100 billion tons of CO_2 by 2050. The United States, Canada, and Mexico followed with a similar proposal in 2010. So the politics are moving in the right direction.

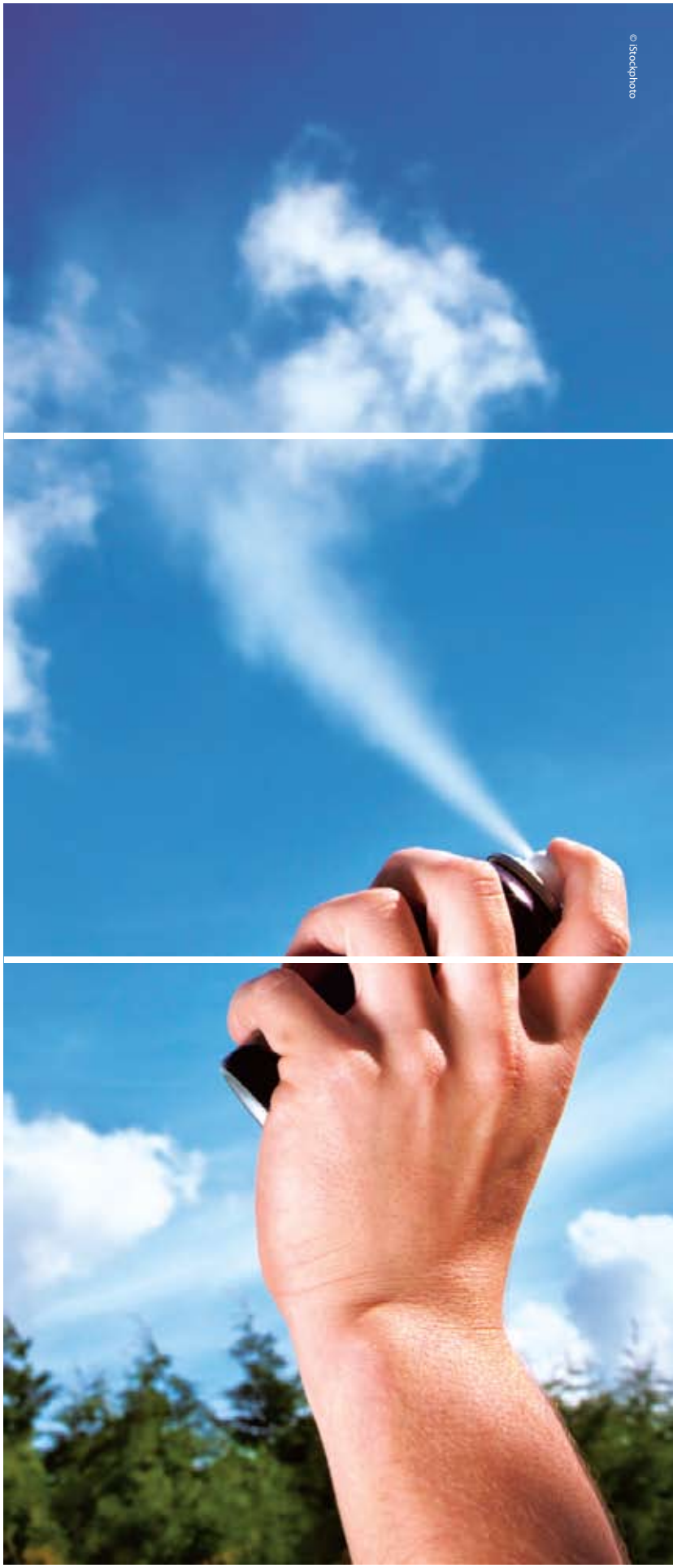
HFCs are in the same family of gases, have similar chemical properties, and are used in the same sectors as chemicals already regulated by the Montreal Protocol — so the structures are already in place to implement a phase-out. The Protocol has already successfully eliminated nearly 100 per cent of 96 other damaging chemicals: an additional HFC phase-out could easily be put in motion.

If we do not address this potential and dangerous shift, the accelerated HCFC phase-out will lead to developing nations transitioning into HFCs in the next five years; in turn guaranteeing an enduring HFC market and a significant increase in emissions. So it is fundamental that we compliment an HCFC phase-out with a parallel phase-down of HFCs.

Developing countries would be comfortable using the Montreal Protocol to regulate production and use of HFCs and accounting to the UNFCCC for the mitigation gained. This would also provide good precedents for its synergy between different environment and agreements and for establishing equity in climate mitigation, since the Protocol has proven to guarantee equity through ensuring the transfer of technology and necessary financing, as well as enshrining the Principle of Equal but Differentiated Responsibilities.

Using the Montreal Protocol for this combined phase-out, will help us to leapfrog high-GWP HFCs entirely — saving billions of dollars to economies around the world.

We cannot but seize this amazing opportunity.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An unprecedented opportunity

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Rapid and meaningful progress on slowing global warming is achievable if world leaders and policy makers are willing to rethink and broaden their strategy, in view of recent findings. It turns out that global warming is caused by two different types of pollutants. The first is the long-lived gases, which we have known about for decades. and which, stay in the atmosphere for a century or longer — most notoriously carbon dioxide (CO_2) released by fossil fuel combustion. Most climate policies have focused on CO_2, but it will take decades and trillions of dollars to reduce emissions significantly. The world cannot afford to lose such decades. The planet has already warmed by more than 0.8°C and the resulting symptoms are being perceived in rising sea levels, melting mountain glaciers, including in the Himalayas and the Alps, large scale retreat of the Arctic sea ice and warming of the ocean waters penetrating to a depth of 1000 meters or more, and such extreme weather as droughts, floods and heat waves. Worse, humans have already dumped enough greenhouse gases (almost 1000 billion tons of CO_2 alone) in the atmosphere to warm the planet by more than 20°C . So, even if we were to replace half of all fossil fuel use with renewables, the warming will continue to increase for decades, because CO_2 molecules live for a century or more once released.

Fortunately, the world can get out of this seemingly hopeless predicament by broadening its focus to the second type of pollutants. Roughly half of total global warming is due to the release of four of these: dark soot particles called black carbon; and the gases methane, lower atmospheric ozone, and the halocarbons (CFCs, HCFCS and HFCs). These pollutants (except CFCs, which are already banned and a few other halocarbons) stay in the atmosphere for only weeks to a few decades and hence are referred to as Short Lived Climate Forcers. Cutting these short-lived climate warming pollutants levels in half, which is feasible with current technologies — as UN Environment Programme (UNEP) report on Black Carbon and Ozone has recently demonstrated — would quickly reduce their warming effect and give the world two to four decades for the effects of CO_2 reductions to take hold. If we were to eliminate black carbon emissions by diesel vehicles today, for example, their warming effect would disappear within weeks to a month. And the cost of such reductions, while not negligible, would not cripple economies; between 1989 and 2007, for example, California reduced its black carbon emissions by as much as 50 per cent.

Black carbon and ozone, two potent short-lived climate forcers, are also great targets for developing nations because they have other known consequences apart from their warming potential. Inhaling indoor smoke (containing black carbon and ozone precursors) from open fires used for cooking and heating around the world — the World Health Organization reports — leads to over 1.5 million deaths each year. Exposure of plants to high levels of ozone leads to damage to millions of tons of crops annually. And black carbon and ozone in the atmosphere have regional climate effects, including melting the Himalayan glaciers and decreasing monsoon rainfall, as recognized in a recent report by the Pontifical Academy of Sciences.

"Roughly half of total global warming is due to the release of four of these: dark soot particles called black carbon; and the gases methane, lower atmospheric ozone, and the halocarbons (CFCs, HCFCS and HFCs)."

The world has an unprecedented opportunity to mitigate some of the disastrous effects of black carbon and ozone on climate, agriculture, water and health with a simple act: replacing traditional cook stoves with energy efficient and pollution-free cooking technologies. This work has already begun with international initiatives like the Global Alliance for Cook Stoves, but challenges remain. The numerous cook stove initiatives that have taken place all over the world have demonstrated time and again that catalyzing widespread adoption of such clean cooking technologies will require innovative and affordable solutions.

This is where Project Surya, an internationally recognized cook stove project sponsored by UNEP, comes in. Its goal is to demonstrate scientifically the environmental and health benefits of introducing clean cooking technologies — and, ultimately, to provide a rigorous evidence base for large-scale action. It aims to deploy improved cooking technologies in a contiguous region with a population of approximately 50,000, thus creating a "black carbon hole" in the otherwise omnipresent pollution cloud which will be measured across space and time to quantify the multi-sector impacts of better cooking technologies. Project Surya will use cell phones, instrument towers, and satellites, and will empower village youth to work with world-class experts in documenting the impacts.

A pilot phase was successfully completed in 2010 in a village in one of the poorest and most polluted regions in the Indo-Gangetic plains. It has already achieved some ambitious and measurable outcomes including: documenting the connection between indoor air pollution from cooking and ambient outdoor pollution levels; identifying improved cooking technologies that reduce pollution significantly; deploying improved cook stoves in all the 500 or so households in the pilot village; and verifying that we will be able to measure the impacts of a larger-scale intervention. Another, parallel pilot test has been started in Nairobi, Kenya.

Our recent data has also shown that the measured black carbon concentrations are three to five times higher than the concentrations simulated by climate models, making it all the more urgent to take action now to target it and other short lived climate forcers. Fortunately, there is a great success story to draw upon. The enormous greenhouse effect of CFC-11 and CFC-12 was discovered only in 1975. CFCs were regulated by the 1987 Montreal Protocol, because of their negative effects on stratospheric ozone, but if this had not happened they would have added enough heat energy to warm the planet by about 1°C or more.

China and India have a common interest in cutting the black carbon and ozone that is melting their shared glaciers, killing millions and destroying millions of tons of crops — and the United States and Europe share common interest in the Arctic where black carbon along and other short-lived pollutants are responsible for almost half of the melting ice. Modest steps that attack these short lived climate forcers, with fast and measurable responses, are the best way to jump-start the stalled climate mitigation actions.