



CLIMATE ALERT

A Publication of the Climate Institute | *Protecting the balance between climate and life on Earth*

Moving Beyond the Status Quo

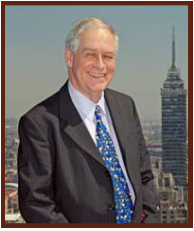
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CLIMATE INSTITUTE



A MESSAGE FROM THE PRESIDENT ON WIN-WIN CLIMATE STRATEGIES *WHAT IS ECONOMICALLY SMART IS POLITICALLY RIGHT*



The past couple of years have been ones of great frustration for many in the climate protection movement in the US. Evidence has mounted that climate change may be moving painfully close to several irreversible tipping points. Methane releases from thawing Arctic tundra may add to growing concentrations of greenhouse gases in the atmosphere, compounding the damage from human industrial and agricultural activity. Changes in albedo, especially in the Arctic and in other glacial regions, have reduced Earth's capacity to reflect incoming solar radiation back to space, adding both to global temperature rise and increase in sea level. Moreover, these harbingers of a potential climate metastasis where change feeds on itself are paralleled by other human induced threats to the life support systems that enable our species and others to thrive.

Despite this mountain of evidence, much of it widely reported in US media, and despite massive spending by US environmental groups to spread a climate protection message, public skepticism has grown both on the human role in climate change and on the urgency of acting. This may be attributable to a variety of factors, among them, a pinched economy in which climate protection seems a more distant concern, a more polarized blogosphere, and freakish weather, e.g. cold or snowy weather in some regions, even in years when global average temperatures are rising. Addressing these societal challenges and the mounting climate crisis will require some fundamental shifts in substantive and messaging strategy by the climate protection movement, in the US and elsewhere. Climate protection strategies that have simultaneous health, economic or political benefits will be the most effective means.

Over the past couple of years, building especially on ideas advanced by two of our Board Members, Tom Casten and Mike MacCracken, the Climate

Institute has argued first for energy recycling to play a much more central role in US energy and climate mitigation strategy, and second for US and global climate mitigation strategies to be revised to focus much more significantly on reducing emissions of black carbon and relatively short-lived greenhouse gases such as methane. Archaic rules, often in state law and utility regulation, frustrate the use of energy recycling or cogeneration by limiting the ability of a facility using recycling to sell excess power to anyone other than utility buyers, by price discrimination that penalizes local generation, and by utility rate practices that discourage least cost approaches. It has been estimated that these barriers to industrial energy recycling and other forms of cogeneration swell US carbon dioxide emissions as much as 20% and cost US industry and consumers tens of billions of dollars annually. The technologies to achieve this have been around for decades (the Netherlands gets nearly 30% of its electricity from energy recycling), but the challenge is to remove perverse economic incentives embedded in state law by utility lobbyists. As Mak Dukan's article indicates, enhanced industrial energy recycling is likely to produce, in addition to averted emissions of carbon dioxide, reductions in black carbon emissions.

The articles by Mak Dukan and Katie McWilliams show great benefits to the environment and the US economy from energy recycling and from methane reductions, even under incentive systems that provide no financial valuation for reductions of black carbon and may well undervalue reductions in methane vis a vis carbon dioxide. One can only imagine a greater pace of investment in both energy recycling and in methane mitigation, and more rapid reductions in radiative forcing, from movement to a more rational greenhouse trading system. There is a glimmer of hope here already - an ingenious collaboration is now underway involving a Philippine jeepney drivers' association, the Australian engineering

firm Rotec, and a voluntary emission reduction credit group, that will facilitate a retrofitting of jeepneys throughout Metro Manila by valuing black carbon reductions, benefiting the climate and health of drivers and passengers alike. This could open the door for changes in the formal trading systems. Meanwhile, as Zahava Essig's article indicates, there is ample authority under the US Clean Air Act to limit black carbon, a subset of a pollutant controlled by this Act.

The fascinating article by Vice Admiral Clyde E. Robbins, recounting his experience as On Scene Coordinator for the Exxon Valdez oil spill, reminds us of the complexities of satisfying our energy needs. A strategy that seeks to blend climate protection with the enhancement of human health and economic well-being has scientific credibility, economic viability and long-term political traction.

Besides lowering barriers to recycling and shifting emission reduction valuations to quickly reduce radiative forcing, there are a host of other win-win reductions available. John-Michael Cross describes an innovative approach to reducing emissions from idling ships that improves public health in port cities. Lynn Kirshbaum shows how energy retrofits can save homeowners money while protecting the climate. Shannon Horst of the Savory Institute discusses the benefits of Holistic Planned Grazing for grasslands. Some approaches like that in Megan Falkenberry's article on algal fuel may require some federal R&D funding, but their potential in minimizing prospects of another Deepwater Horizon blowout may justify this. Lifestyle changes, such as those advocated in Corinne Kisner's article on walkable communities and reduced meat consumption, can have a beneficial effect on carbon footprints as well as waistlines.

These and other promising initiatives, such as a shift to biodegradable motor oils, can alleviate the changing climate even before creation of an optimal institutional framework. Besides their climate benefits, these strategies are economically sound, politically feasible, and can improve human health.

Commentary by John C. Topping, Jr.



HEALTHY PEOPLE, HEALTHY PLANET

Corinne Kiser

Cultural norms and land use patterns in the United States have led to obesity rates at epidemic proportions and a changing climate that threatens catastrophic damage to environments and livelihoods. Sedentary work environments, the rise in vehicle-miles traveled, and meat-heavy diets contribute to the collective decline in health; today, 68% of Americans are overweight or obese. Meanwhile the rate of climate change is increasing, with negative impacts to the environment and society, due in part to carbon dioxide emissions from vehicles, methane emissions from livestock production, and nitrogen emissions from fertilizer use. Encouraging transit-oriented communities and vegetable-rich diets will mitigate climate change and improve human health. Recognizing the significant co-benefits of policy strategies for both health and climate protection is essential to addressing these societal challenges in a coordinated, cost-effective manner.

Restructuring the built environment to promote biking, walking and public transit will decrease the carbon intensity of transportation and improve the fitness of residents. In 2006, transportation contributed about 29% of total U.S. greenhouse gas emissions. Furthermore, the transportation sector accounts for 47% of the net increase in total U.S. greenhouse gas emissions since 1990, making it the most rapidly growing source. Passenger cars, light trucks and motorcycles constitute 62% of the emissions from the transportation sector, so decreasing their prevalence and promoting public transit will result in a net reduction of carbon dioxide emissions from the transportation sector.

Efficient land use and urban design can increase accessibility with less vehicle travel, and make communities more socially attractive by valuing walkability. Communities with pedestrian-oriented infrastructure reap economic benefits, as homeowners are willing to pay 20% more for houses in walkable neighborhoods, tourists are drawn to walkable districts with shops, theaters and restaurants, and retailers benefit from a mobile consumer base.

Communities that are designed with safe and appealing pedestrian corridors will enable residents to access their homes, offices, schools, libraries and stores without relying on fossil-fuel driven vehicles. The health benefits of walking more and driving less are apparent: clinical studies have shown that walking 30 minutes every day can prevent weight gain that would otherwise result from inactivity.

In addition to smart growth development policies, economic tools can achieve a shift in cultural norms away from cars and towards walkability. Economic policies that internalize the societal costs of carbon-intensive transportation can more accurately reflect the price of fossil-fuel driven vehicles. For example, including the external costs of air pollution, traffic congestion and greenhouse gas emissions (which are borne by society rather than the direct consumer) in the financial cost of driving a car can spur a reduction in vehicle miles traveled. The price of a car culture can be further adjusted to include healthcare costs associated with obesity, which were estimated to be \$147 billion in 2008. A combination of economic incentives to drive less, and an urban design that encourages walking more, can result in healthier people and a healthier planet.

Health and climate gains can also be made by reassessing dietary habits. Annual meat consumption in the United States has risen from 89.3 kg per capita in 1962 to 124.8 kg per capita forty years later. Livestock production requires substantial inputs of land, water and fertilizer, and results in high greenhouse gas emissions. According to a 2006 report by the United Nations' Food and Agriculture Organization, livestock production contributes an estimated 18% of total anthropogenic greenhouse gas emissions worldwide. A controversial Worldwatch Institute analysis from December 2009 concludes that direct and indirect greenhouse gas emissions from livestock are in fact much higher, at 51% of total annual emissions.

In either case, meat is an inefficient converter of the energy from fossil fu-

els. The energy required to produce meat (to clear land, to drive tractors, to create fertilizers, to grow grain, to pump water, etc) is much greater than the physical energy gained by eating meat. In other words, one would do better to eat plants that directly convert the sun's energy into calories, rather than eat meat from an animal that has already converted the energy once, inefficiently. According to an analysis by Cornell ecologist David Pimentel, "chicken meat production consumes energy in a 4:1 ratio to protein output, [and] beef cattle production requires an energy input to protein output ratio of 54:1." The amount of fossil-fuel energy required to produce meat is more than eight times that required to grow plants, and this additional energy use creates significantly more greenhouse gas emissions.

Furthermore, the health benefits of a diet lower in meat are plentiful. Protein from beans and nuts lacks the saturated fat found in red meat that contributes to high cholesterol and cardiovascular disease. Fruits and vegetables that are rich in fiber curb hunger and reduce obesity, and fruits and vegetables rich in certain phytochemicals can reduce the risk of cancer. Eating less meat can improve longevity and fight diabetes. For these and other reasons, the growing Meatless Monday movement is encouraging schools, hospitals and individuals to eliminate meat from the menu one day a week for the sake of the climate and human health.

Policy initiatives or consumer choices to reduce car use and meat consumption will have substantial benefits for the climate and for individuals' health. Even better, these gains can be realized without cumbersome international climate negotiations; local governments can serve as testing grounds for sustainability measures. Cities and states can make great strides in climate protection and in encouraging healthy behavior by promoting pedestrian infrastructure and public transit options, and by forgoing meat a few times a week. It's a win-win for the health of people and the planet.

TWENTY YEARS AFTER VALDEZ: THE DEEPWATER HORIZON OIL SPILL

The author is Vice Admiral Clyde E Robbins USCG who was serving as the Coast Guard's Pacific Area Commander in California when he was reassigned to Valdez, Alaska and designated the Federal On Scene Coordinator for the Exxon Valdez spill from April until September, 1989.

What do the 1989 *Exxon Valdez* spill in Alaska and the current BP *Deepwater Horizon* spill in the Gulf of Mexico have in common? Crude Oil! And not much else, except the lawsuits that will prevail over the next couple of decades.

The *Exxon Valdez* ran aground on Bligh Reef in Prince William Sound, spilling some 11 million gallons of crude oil, most of which eventually found its way to the Alaskan shores. Those shores were mostly composed of rocks but a few were marshy areas and some could be called beaches. The water was cold and the weather inhospitable. Far removed from any population center, the logistical and political nightmares were quickly apparent. The press had a heyday. The ambulance chasers were everywhere. The "lower forty-eight" folks believed that Alaskan coastline was covered with oil when in fact, much less than 500 miles had been "oiled" at all and well less than a hundred miles were heavily oiled.

Still, the actual impact in Alaska was not insignificant and thousands of lives were impacted in some way. Exxon spent over \$2 billion that first summer in '89 on the cleanup and is still fighting in courts to limit their losses. Yet, Exxon showed a huge profit for its stockholders in '89 and still continues to make money on its oil business.

It's hard to estimate what the Gulf spill will cost in terms of cleanup, environmental impact and damages to the livelihoods of thousands who depend on the resources gleaned from the Gulf and its shores. At this writing the current level of spillage is estimated at 210,000 gallons per day. If that estimate is accurate (spillers are notorious for under-estimating spills), it will be near the end of June before the spill reaches the numbers associated with

the *Exxon Valdez*. Even if the drillers are successful in stopping the flow before the end of June, the disastrous results of this spill could far exceed the impact of the *Exxon Valdez*.

How so? The shoreline along the Alaskan coast is not densely populated. While there are many subsistence peo-

ple who depend on the shoreline for their food and general livelihood, there are far more that may be impacted by the BP oil spill as it comes ashore in the Gulf States. This impact will be complicated by the continuous flow of the spill and the whims of nature as it spreads the spill around. Alaska's spill was "quick and dirty." While it took several weeks for the oil to go ashore up and down Alaska's coastline, it was relatively easy to forecast where it was going and how bad it would be. While I don't wish to downplay the impact on the Alaskan shoreline, the Gulf spill could (and I emphasize the "could") be much worse. The continuous flow of the spill source and the fickle winds of nature could be an environmental disaster for the entire Gulf Coast.

water; the light ends (the more volatile parts of petroleum) will be gone and it's doubtful if the spill would burn. And of course, even if it would burn, we should be mindful of adding carbon to the environment.

What's the next best choice? We often talk about dispersants, and they can be valuable in breaking up a spill before it reaches the shoreline. It's quite possible that it would be less damaging to break the oil into tiny globules and let Mother Nature help us fix things we've screwed up. So what happens to all those little bits of oil that are spread throughout the water column? I'm not qualified to answer that but certainly the sea creatures could tell you. Considering the huge volume of water in the Gulf however, it may not be significant when compared to the damage the oil can do when it goes ashore.

Dispersants are not a cure-all. Much of the oil in a large spill will eventually find its way to shore, given the right



Vice Admiral Clyde E Robbins USCG walking on an oiled beach

So how to cope with such a spill? I suspect that there are few improvements over the methods we used in the Alaskan spill. There aren't many effective weapons in the oil cleanup arsenal

currents, wind conditions, etc. Floating barriers can help, given the right circumstances, but they are affected by currents and tides and are of limited efficacy along seacoasts. So what do we do once the spill is on shore?

Some scientists believe that in many cases, it would be better to stand aside and let Mother Nature take care of the problem. Oil is part of our environment and the effort we put forth in cleaning up a spill often does more damage than good. They may be right but I can't imagine any responsible politician offering that up as a solution amid the screams of the press and the outcry of irate citizens.

So we do what we can, trying to strike a balance between not making the situation worse and beating the hell out of the shoreline. That balance is hard to reach. The U.S. Coast Guard is responsible for overseeing the cleanups. A Federal On Scene Coordinator (FOSC) is always either pre-assigned to an area or may be specially designated for a particular spill. I, as a Coast Guard Vice Admiral, was specially designated for the first summer cleanup of the *Exxon Valdez* spill. I had not been directly involved in a spill cleanup since my Galveston tour some 15 years before the *Valdez* spill. What I found upon my arrival on scene wasn't very encouraging. I thought I would have a lot to learn about new tactics and equipment that had been developed. Unfortunately, that was not the case. Tactics and equipment hadn't changed -- they were no more effective in '89 than they were in the mid-seventies!

Generally, Exxon used high-pressure hot water to wash the oil off the shoreline, caught it with barriers in the water, and then used skimmers to suck it up. Eventually Exxon would load it on a barge and transport it to Oregon to a hazardous land fill. In some areas it was impossible to use this method. For instance, in marshy areas, removal of oil polluted soil was the preferred method but it's not a very pretty operation. Tearing up a wetland to "save"

the wetland doesn't make a lot of sense unless leaving the oil there will cause so much damage there is no other alternative. Fortunately, soil removal wasn't necessary in most cases. Some times simple removal by using a hand shovel and bucket was pretty effective.

Of course, "bioremediation" was a solution to the cleanup problem that appeared to be beyond our grasp. There were plenty of detergents available but the side effects of using them and getting them into the water column were lethal.

AS LONG AS WE HAVE
THE INSATIABLE
APPETITE FOR OIL AND
ITS BYPRODUCTS, WE'RE
GOING TO HAVE SPILLS

What we needed was something to "break down" the oil that had covered the rocky shores so that it could enter the surrounding environment without damaging it. We found that the French had developed a mixture, called "Inipol," which appeared to be very effective. When applied, it certainly improved the appearance of the shoreline but the long-term impact of its application is controversial. Apparently it was so controversial that it is no longer manufactured.

In the final analysis, cleanup of oil spills is difficult and like any medicine, there are bad side effects no matter what process you employ. The Gulf spill will be no different; there is no "silver bullet." As long as we have the insatiable appetite for oil and its by-products, we're going to have spills, and like it or not, we have to accept the risks associated with that entire enterprise from extraction to final delivery to the customer. The trick is to bring that risk down to a level that we can be more comfortable with. We can mitigate the risk through application of technology, insistence on safe practices and strong government and industry oversight. We can also strive to develop methods to more effectively deal with spills once they occur. And, of course, the best way to reduce the risk of a spill is to aggressively pursue alternative fuels to drive our economy.

VADM Clyde E Robbins, USCG (ret)

CHRISTIANA FIGUERES NAMED TO LEAD CLIMATE SECRETARIAT

On May 17, 2010, United Nations Secretary General Ban Ki-Moon named widely respected Costa Rican diplomat Christiana Figueres as Executive Secretary of the United Nations Framework Convention Secretariat based in Bonn, Germany. Figueres, who serves on the Climate Institute Board of Advisors, has long been a leader in the climate NGO community, and has links to numerous public and private groups in the climate protection field. In 1995 she founded the Center for Sustainable Development for the Americas (CSDA); as Executive Director of CSDA, she transformed the Clean Development Mechanism into an effective tool for combining climate mitigation and development, moving well past a focus on a single large project to encompass efforts that are highly dispersed and directly benefit individual users, such as distributed generation renewable energy and end use energy efficiency. Fluent in Spanish, English and German, and educated at Swarthmore College, London School of Economics and Georgetown University, Figueres comes from a distinguished family that were pioneers in sustainable development long before the term came into



general use. She is recognized as having a deep understanding of the negotiation process and the importance of engaging all countries in dialogue on climate protection, in order to foster trust and achieve an international climate agreement. Christiana Figueres now has lead responsibility for ensuring the success of COP 16 that opens November 29, 2010 in Cancun, Mexico.

MITIGATING METHANE

Katie McWilliams

In long-term scenarios, methane is extraordinarily damaging to the environment. A greenhouse gas with a lifespan of approximately 9-15 years, methane can be 20 times more effective at trapping heat than carbon dioxide over a 100-year period. Because of its potency and relatively short lifespan in the atmosphere, lowering methane emissions is one of the quickest ways to see a measurable impact on reducing greenhouse gases and mitigating climate change.

Methane emissions stem from a variety of both natural and anthropological sources. In the natural environment, methane is commonly released into the atmosphere by wetlands, permafrost soils, wildfires, and large bodies of water. However, more than 60% of global methane emissions are the result of anthropogenic activities. In the United States, the largest contributors include landfills, coal mining, natural gas systems, and livestock management.

To curb the environmental impact from these industries, the United States Environmental Protection Agency has developed a variety of programs designed to reduce emissions. Because methane is a primary component (around 95%) of natural gas, captured methane can be used as a valuable energy source. Capturing emissions and converting them to natural gas not only reduces the environmental impact, but also provides significant energy and economic benefits. Many strategies for capturing methane are cost-effective because the methane can be converted to energy and used as fuel, or can be sold to natural gas pipelines for an external profit. Companies in the U.S. that participate in such programs are not only reducing their environmental impact, but are doing so at very little to no cost.

The government sponsors a methane-capturing program for each of the four industries responsible for the majority of anthropogenic emissions in the U.S. These programs include the AgSTAR program, the Landfill Methane Outreach Program (LMOP), the Gas STAR Program, and the Coal Bed Methane Outreach Program (CMOP).

AgStar Program

The livestock industry contributes to methane emissions in the U.S. mostly through the normal digestive processes of ruminant animals such as cattle, sheep, and goats. Large farms, especially dairy and swine operations, use liquid manure management systems that also produce methane. Combined, ruminant digestion and waste management systems are the single largest source of methane emissions in the country.



The AgSTAR program promotes the use of biogas recovery technology to capture and reuse methane produced by the livestock. A biogas system contains the methane and combusts it to produce electricity or heat. Since 1994, AgSTAR has installed over 150 biogas technology systems throughout the country. These systems have been funded mostly by government programs such as the USDA's Rural Development program, which alone has awarded \$34 million in grants.

The biogas technology systems reduce emissions in two ways: first, methane that ordinarily would be released into the atmosphere is prevented from escaping. Second, if the captured methane is converted into an energy source and used, less fossil fuel is needed to generate energy. This reduces what would have been future emissions from the burning of the avoided fossil fuels. In 2009 alone, biogas systems generated 341,000 MWh of electricity and eliminated the equivalent of almost 1.2 million metric tons of greenhouse gases from the atmosphere.

Landfill Methane Outreach Program

Landfills are the second largest source of methane, and are responsible for 23% of U.S. anthropogenic emissions, or the equivalent of 32 million metric tons per year. As trash and waste decomposes anaerobically, or without the assistance of oxygen, it generates methane gas.

LMOP is a voluntary assistance program that encourages participants to capture and use methane as an energy source. The gas is extracted and contained by a vacuum system, then stored in wells. Once collected, the methane is processed, treated, and converted to natural gas. It can then be used to generate electricity for the landfill or other nearby locations, thus eliminating the need to burn other fossil fuels or pay for energy use. The natural gas can also be sold to pipelines as an additional source of revenue to pay for the capturing/conversion system.

LMOP participants that install energy conversion technology can reduce their methane emissions by 60-90%. The gas captured has been used to fuel power plants, vehicles, manufacturing facilities, and even individual homes. Currently, there are 519 landfills that capture and convert methane to use as fuel. Another 530 landfills have been identified as good candidates for future projects. If the total number of landfills participating reaches 1,000, it is estimated that the energy produced could power 720,000 homes.



Gas STAR Program

The natural gas and petroleum industry is responsible for 18% of all emissions, making it the third largest source of methane in the U.S. Methane is emitted during most natural gas production phases - from processing, to storing, to distribution. Beginning in 1993, the Gas STAR program encouraged participating companies to invest in emission reducing technologies and also document their activities. Today, 60% of all companies within the natural gas in-

(Continued on page 15)



STAR HOMES: RETROFITTING AMERICAN HOUSING

Lynn Kirshbaum

Retrofitting homes and improving weatherization is a strategy that benefits not only the global environment as a whole, but also the local environment and economy, as well as individual households. There are numerous opportunities for retrofitting within most households, and the Home Star Retrofit Rebate Program that passed the House of Representatives in late March further incentivizes home improvements that have multiple benefits.

Choosing appliances with low energy consumption has been a major component of reducing a home's energy usage since the US's Energy Star labeling program began in 1992. Since then, however, many other methods for reducing energy consumption have become popular, and can be achieved at a relatively low cost. Plugging air leaks with weather stripping and caulking improves the efficiency of heating and cooling systems, as do programmable thermostats. Households can also reduce water usage by installing aerators and low-flow showerheads, faucets, and toilets. Installing solar panels, geothermal wells, or wind turbines can also help a household reduce the amount of energy it draws from an electric grid, and can even allow the household to sell unneeded energy back into the power grid.

Reduction in energy use is the most obvious benefit of retrofitting homes. Each of the methods mentioned above reduces the amount of energy required by an individual household, and would therefore reduce the household's energy costs. The environment also benefits from reduced energy usage. The United States relies heavily on the burning of coal at large power plants to meet our electricity needs, which emits methane, CO₂, nitrates, SO₂, and particulate matter. Reducing the amount of energy demanded at the household level can help the United States to further reduce its emissions of such harmful substances.

Another benefit of home retrofitting is improved health. Retrofitted homes are better able to stay warm in winter months and cool in summer months, improving the health and wellbeing of

residents and decreasing the financial burden of health care. Recent studies have provided increasing evidence on the specific health risks and costs of a cold, damp and moldy indoor environment, as well as the health risks associated with low indoor temperatures during winter and high temperatures in summer. While retrofitting provides these benefits immediately, it also has long-term positive externalities for health and wellbeing.

The economic benefits to individual households from retrofitting are significant. A 2006 study of the 1976 national Weatherization Assistance Program found that the total estimate for non-energy benefits in all categories associated with weatherizing a home is \$3,346 in 2001 dollars. While these savings are significant, the cost of implementing changes has caused consumers to be wary of weatherization and retrofitting. The Home Star Retrofit Rebate Program, also known as "Cash for Caulkers," hopes to rectify this gap by further incentivizing home retrofits.

This legislation, passed by the US House of Representatives on March 25, 2010, is proposed "to create jobs in existing industries by providing strong short-term incentives for energy efficiency improvements in residential buildings." This initiative would establish a \$6 million rebate program to encourage immediate investment in energy-efficient appliances, building mechanical systems and insulation, and whole-home energy efficiency retrofits. Home Star provides two types of consumer incentives: the Silver Star prescriptive path, and the Gold Star performance path.

The Silver Star path "provides a near-term incentive for specific energy savings investments that is simple to administer and easily introduced into the existing marketplace." Homeowners would receive between \$1,000 and \$1,500 for each measure installed in their home, or \$250 per appliance, with a benefit not exceeding \$3,000 or at

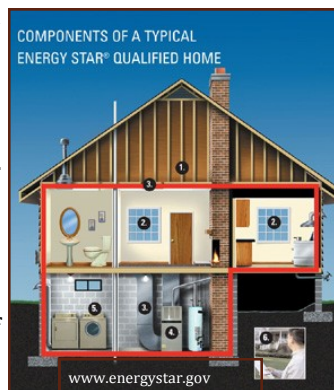
least 50% of total project costs. Covered measures include air sealing, attic wall and crawl space insulation, duct sealing or replacement, and the replacement of existing windows and doors, furnaces, air conditioners, heat pumps, water heaters, and appliances with high-efficiency models. Any appropriately licensed and insured contractor may implement such improvements.

The Gold Star path "offers an incentive to households that choose to conduct a comprehensive energy audit and then implement a variety of measures that are designed together to

provide greater total returns in energy savings." This performance path represents the future of home efficiency: state-of-the-art building science is used to identify problems, present solutions and deliver verifiable energy savings. This is a technology-neutral approach that is based on performance, not products, so that market forces are able to direct funds to those solutions that achieve the best results. Under this path, consumers would receive \$3,000 for modeled savings of 20% plus an additional \$1,000 incentive for each additional 5% of modeled energy savings, with incentives not to exceed 50% of project costs.

These measures will improve the energy efficiency of the United States, reduce the country's demand for oil, and provide skilled jobs for American workers. This program focuses on domestic job growth and, if implemented, would create jobs throughout the country and across various sectors.

Retrofitting homes is an immediate, individual level action that will help to reduce the nation's carbon emissions while providing co-benefits at the local and household level. While the passage of the Home Star bill would further incentivize individuals to retrofit their homes, the economic benefits are such that households need not wait for the bill to pass the Senate to implement such changes.



MITIGATING INDUSTRIAL BLACK CARBON THROUGH ENERGY RECYCLING

Mak Dukan

Alleviating climate change is often viewed as an endeavor that will impose huge costs on our economies. Furthermore, the incongruity between measures and effects means that programs implemented today may not produce noticeable results for a century or more. In order to gain wider public support, climate mitigation strategies must focus on producing tangible results. Reducing black carbon emissions by using energy recycling techniques is a profitable and quick way of alleviating the short term effects of global warming. Adopting these technologies in the US could also have implications for climate negotiations, as the US would show a commitment to lowering its own emissions.

Black carbon

Black carbon is one of the main residues of soot emitted from incomplete combustion of fossil fuels and biomass. A growing body of evidence indicates that black carbon plays a significant role in increasing radiative forcing that drives climate change. In fact, studies suggest that on a per unit basis, black carbon warms the atmosphere hundreds of times as much as CO₂, despite lasting in the atmosphere for only a few weeks. Its effect on the polar regions is even greater, as the dark soot particles settle on ice and snow, forming thin black rugs that absorb sunlight. This reduces the reflection of solar radiation back into space and contributes to warming. Black carbon has direct negative effects on health and agriculture and its short atmospheric life cycle of a few weeks means that its removal would result in an immediate decrease in warming.

The largest sources of black carbon come from open burning of forest and savanna, inefficient combustion of diesel engines and burning fuel for residential heating and cooking. Around 10 percent of global black carbon is emitted from the industrial sector. Although industrial emissions of black

carbon play a relatively small role globally, figure 1 indicates they constitute a major part of emissions in China and to a smaller but still significant degree in India. Each black carbon source has a different warming effect, which depends on the ratio of black carbon particles to other pollutants that exhibit a cooling effect. After diesel emissions, industrial processes are one of the largest annual contributors to the warming effect from black carbon. Within the industrial sector, research indicates that cokemaking is among the largest sources of industrial black carbon emissions.

al. (2004) approximate black carbon emissions from By-product coke production to be smaller by a factor of four than the emissions from Non Recovery Cokemaking plants. Instead of recovering the coke oven gas to produce by-products, these facilities vent it into the atmosphere or in some cases use its heat to produce electricity. This process, called Heat Recovery Cokemaking, has been determined to be the cleanest form of cokemaking. An older version of Non Recovery Cokemaking utilizes “beehive ovens” that are the dirtiest form of coking and can still be found in less developed regions of the world. If

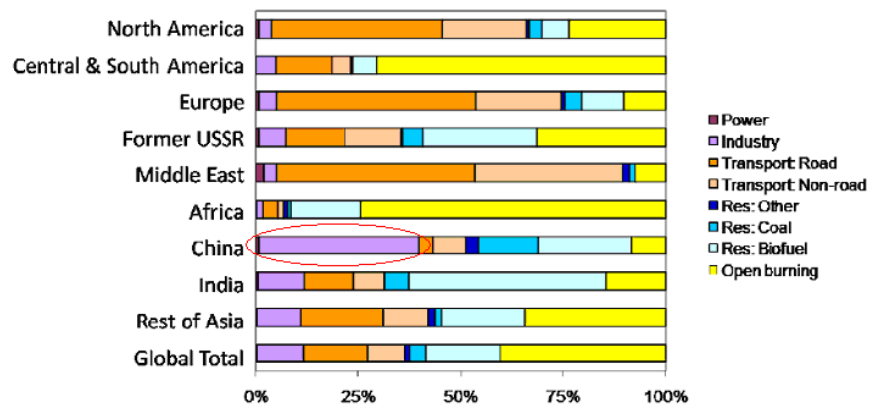


Figure 1: Relative importance of black carbon source categories across regions (after Bond et al., 2004, updated to 2000 inventory), Bachmann J., (2009, p22), *Black Carbon: A Science/Policy Primer*, PEW Center on Global Climate Change

Metallurgical coke is one of the main inputs in steel production and it is used to fuel blast furnaces that reduce iron ore to pig iron. Coke is produced by heating coal in an oxygen-free environment inside a coke oven. This process, called coking, is conducted in order to purify coal from its volatile components. Once this is achieved, the material remaining is a carbon mass called coke. The separated volatile components form coke oven gas, which is either vented in the atmosphere or directed to a separate chemical recovery plant where it is re-fined into by-products.

The latter refers to By-product Cokemaking and is common to developed countries like the US, where environmental regulations are strict. Bond et

the coke oven gas is vented, it is estimated that the production of one ton of coke emits approximately 0.7 to 7.4 kilograms (kg) of particulate matter into the atmosphere. Although it is unknown to what extent this includes black carbon, it likely constitutes a significant part.

The rapid economic development of China and India has increased their demand for steel, which consequently increases demand for coke. China produces about half of the world’s steel and about the same share of the world’s coke. This gives China an essential role in crafting global policies to reduce black carbon. An additional concern arises from the fact that in 2004, China still produced 35 million tons of



coke using beehive ovens, the dirtiest form of cokemaking. Although this is less than a sixth of its 255 millions tons of total production, it amounts to almost the entire coke production of Japan, the world's second largest coke producer after China. Considering the effects that black carbon emissions from coke production have on the environment, targeting the coking industry, and especially beehive ovens, should be of primary concern.

Energy recycling

Energy recycling is a term used to describe a process that utilizes waste energy, such as exhaust heat from the coke oven or a blast furnace, to produce electricity. During the process, the waste heat is converted into high pressure steam and diverted to a steam turbine. Moving high pressure steam through the turbine blades creates rotational energy which is then converted into electricity using a generator. The produced electricity can be used on site by the manufacturing plant or it can be sold to other users. Industries that have the highest energy recovery potential are steel, glass, cement and petrochemicals.

The potential of recovering waste heat in the US is great. It is estimated that recycling industrial energy waste could generate as much as 10 percent of U.S. electricity. In 2005 the combined

electricity output of the Mittal Steel coking plant in Indiana and its nearby rival U.S. Steel that utilizes the same energy recycling technology, was greater than the entire U.S. output of solar photovoltaic (PV) energy that year.

Besides increasing energy efficiency, energy recycling reduces black carbon emissions and mitigates other pollutants. Furthermore, this technology increases business competitiveness as it lowers operational costs. It is estimated that by recycling waste heat, the Mittal Steel plant saves up to \$110 million per year, while the capital costs of building such a plant are estimated at \$165 million. That being said, the initial investment in waste heat recycling technology is repaid in less than two years while substantially reducing the impact on the environment.

Potential for black carbon reductions

As mentioned, Non Recovery Cokemaking plants vent the extremely dirty coke oven gas into the atmosphere. Besides containing various pollutants, this gas is hot. In other words it contains an abundance of heat energy that is being needlessly wasted. The excess heat contained in coke oven gas could be recycled or converted into another form of energy, such as electricity. In the process of recycling waste heat from coke oven gas, mentioned previously as Heat Recovery Cokemaking, fugitive air emissions which result from the long hours of baking coal are incinerated inside the coke ovens, thereby destroying virtually all organic compounds, including black carbon particles.

Although the excess emissions could also be reduced by converting a Non Recovery into a By-product Cokemaking plant, recycling waste heat eradicates more emissions and eliminates the need for a separate

chemical recovery plant. In addition, it is estimated that a one million ton-per-year heat recovery coke facility can generate approximately 100MW of electricity. Given that the average yearly consumption of a US household is around 11,000 kWh, this would be enough to power approximately 77,000 US homes.

Further black carbon emission reductions are achieved by decreasing the use of fossil fuels. A plant that produces an additional 100MW of electricity by recovering its exhaust heat avoids the greenhouse gas and black carbon emissions that would result from mining, transporting and combusting coal or oil to produce the same 100MW.

Conclusion

Cokemaking may be the biggest source of industrial black carbon emissions. Recycling waste heat from coke ovens could lower these emissions. The reductions would range depending on the cokemaking process in use, but the largest reductions would be achieved in China, where beehive coke production is still used on a mass scale.

Additional black carbon reductions in the US would be much lower than China's, because the US utilizes mainly By-product Cokemaking which emits much less black carbon than beehive coking. But this does not mean the US should not take the lead in adopting energy recycling technologies in coke production and on a wider scale. Recovering industrial waste heat would benefit the US economy by increasing the productivity of energy use, lowering dependence on fossil fuel imports and increasing competitiveness. In addition, the US would gain credibility in climate negotiations, especially when urging developing countries to lower their emissions.

If energy recycling becomes as widely commercialized in the US as in some parts of Europe, it could more easily be transferred to countries such as China and India, where the potential to reduce black carbon emissions from cokemaking is greatest. Reductions in black carbon emissions could be enormous, with an immediate reduction in global warming.

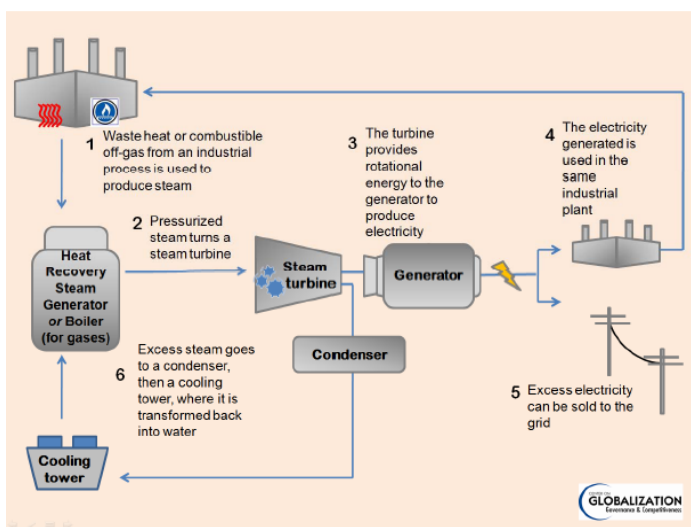


Figure 2: Industrial Waste Energy Recycling Process, Lowe and Gereffi (2009, p4), Manufacturing Climate Solutions, Center on Globalization, Governance & Competitiveness, Duke University

ALGAE AS FUEL

Megan Falkenberry

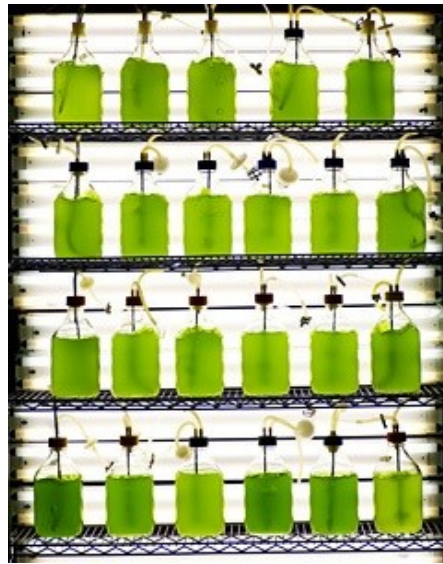
Biofuels have existed almost as long as cars themselves. Henry Ford's first model T was designed to operate on ethanol, and diesel engines were originally intended to run on peanut oil. However, the discovery of extensive petroleum deposits allowed gasoline prices to remain cheaper than biofuels, and gasoline became the dominant liquid fuel source. Recent concerns about rising costs of oil and the fossil fuel related emissions that drive climate change have drawn attention once again to biofuels' capacity as a valuable resource.

In terms of biofuel production, the United States has been left in the wake of the developing world. Brazilian automobiles have been running on biofuel produced by sugarcane for decades, and Europe's diesel engines operate on 7,755 tons of biofuel produced in 2008. However, businesses in the United States have recently begun to work alongside scientists to develop clean, cheap and effective biofuels similar to other countries. Several companies have created environmentally friendly, zero emission, nontoxic fuels from organic matter that reduce dependence on foreign oil and have a smaller climate impact than fossil fuels. One such biofuel is produced with micro-algae.

Algae contain substantial oil, and these fats can produce biocrude, green diesel, biojet, biodiesel and other chemical intermediates. As much as 50% of algae's total weight is composed of oil, dwarfing the current leading producer of biofuel oil in oil-palm trees which contain 20% oil. At its full potential, algae could produce as much as 10,000 gallons of oil per acre per year, compared to only 650 gallons per acre per year produced by palm and a meager 50 gallons per acre per year produced by soy.

In addition, algae carbohydrate content can be fermented into ethanol, another efficient biofuel source. Unlike other biofuel plants, algae grow rapidly, regardless of the weather, and therefore can be harvested for produc-

tion daily. The development of microalgae into biofuel is beneficial for many reasons: it is inexpensive to produce, is scalable in production and distribution, requires little land and water use, consumes fewer resources than soybeans, corn and canola, and does not negatively impact food crop production. This product has the ability to fuel



automobiles, trucks, airplanes and heating systems without emitting harmful pollutants. Not only is this fuel source emission free, the algae actually remove carbon from the atmosphere during growth, through photosynthesis. This ability to capture and store carbon, paired with its capacity as a productive source of energy, make algae biofuel a win-win solution for climate mitigation. Though algae biofuel has only recently made a statement on the renewable energy stage, further research and development will likely improve production and distribution rates and make this a more financially viable fuel source.

Experts stress that finding and producing a biofuel that will seamlessly replace petroleum oil at this point will be difficult, as we have been dependent on the extraction of the latter for over 150 years. Although algae biofuels have proven to be valuable and effective, the industry is not currently without flaw, as is true for all biofuels. In

order to decrease negative environmental impacts, algae farmers need to reduce their use of fertilizer and freshwater. Harmful fertilizer use is devastating to the surrounding environment's flora and fauna, and minimizing freshwater consumption would conserve a valuable resource. Since algae are an extremely efficient means of converting carbon dioxide into biomass, it is most effective to situate algae farms in close proximity to facilities that emit carbon dioxide, such as wastewater treatment plants. Additional carbon dioxide is also required in order to catalyze exponential algae growth, as current atmospheric levels of carbon dioxide are not sufficient for mass production. According to Andres Clarens, who led a study of energy costs and environmental impacts of algae for fuel at the University of Virginia, "algae farms will have a much smaller energy footprint if they use recycled carbon dioxide, nutrients and water rather than virgin products." As there are many methods of collecting and reusing CO₂, nutrients and water, the future for this industry appears promising.

Algae biofuel has yet to achieve widespread use, but as the crop can potentially produce more oil per acre than any other terrestrial oil-producing plant, there is enormous room for growth in the industry. The U.S. Department of Energy announced on January 14th, 2010, that it would invest \$44 million to commercialize algae-based fuels. Commercializing this product would reduce the production and distribution costs and provide incentive for algae farmers to cultivate the product at a larger scale. Currently, this industry still has a long road ahead in terms of technology adjustments and research in order to mass produce the product, but numerous investors have put their faith and funds into the operation. The potential of algae to mitigate greenhouse gas emissions, decrease dependence on foreign oil, and reduce natural resource consumption in fuel production classify it as a plausible strategy worth pursuing.



SHORE-BASED POWER: REDUCING IDLE SHIPS' EMISSIONS *John-Michael Cross*

In two minutes, an average idling car engine consumes an amount of fuel equivalent to the amount required to propel the same car for one mile. Ten seconds of idling uses the same amount of fuel as shutting off and restarting the engine. Millions of tons of greenhouse gases would be saved every year by shutting off vehicles on jammed freeways, loading docks and other altars of idle-worship.

Emissions from idling engines are not limited to cars and trucks. Standard operating procedure for almost every large ship is to keep its diesel engine running the entire time the ship is docked at port. This allows ships to run their auxiliary electrical systems. Ships burn bunker fuel, often without many emissions controls, which releases large amounts of carbon dioxide, black carbon, and other air pollutants. In-port idling to generate electricity is a particularly inefficient use of bunker fuel. In an eight-hour stay in port, a ship can easily emit over 2.5 tons of pollutants. In the United States alone, over 100 ports combine to handle 57,000 dockings each year.

Ports are often hubs of economic activity with large population centers. Idling ships spew diesel fumes into these port areas, resulting in high pollution concentrations that have direct effects on public health. Particulate matter (PM), including black carbon, causes a wide range of cardiopulmonary diseases. One study attributes marine shipping-related PM emissions to cause 60,000 deaths annually, with the majority of deaths concentrated in coastal areas on major trade routes. Non-particulate emissions, such as SO₂, NO_x, carbon monoxide and other toxic chemicals highly concentrated in non-filtered diesel exhaust add to the public health burden in coastal communities.

This problem can largely be alleviated simply by plugging docked ships into the local electrical grid. Known as 'alternative marine power' or 'cold ironing,' this practice allows ships to completely shut down their diesel engines for the entirety of their stay in port. The term 'cold ironing' dates

back to when ships were fueled by coal-fired iron-clad engines; these engines would be deprived of coal at port and slowly go cold. In addition to emissions and fuel savings, ships benefit by reducing wear on their engines that would come from constant operation.

IN AN EIGHT-HOUR STAY
IN PORT, A SHIP CAN
EASILY EMIT OVER 2.5
TONS OF POLLUTANTS.

Cruise ships, container ships and other large vessels can take advantage of shore-based power provided they have been outfitted to do so. Most existing ships are not built with such capability, but retrofit programs are becoming increasingly popular. Oil tankers can also utilize shore-based power, but require specialized on-shore infrastructure that is both more powerful and expensive to provide the energy necessary to pump its cargo in and out of the ship.

Cold ironing requires capital investments from operators of both ships and ports. Retrofitting a container ship with the proper technology will cost between \$200,000 and \$500,000. The corresponding dockside equipment costs \$1.8 million to \$2.5 million per unit. Neither side's investment can pay off without the effort of the other, which has slowed adoption of cold ironing technology. Early adopters have disproportionately been those that own both the ships and the dock, such as the United States Navy and cruise lines. The U.S. Navy has widely utilized cold ironing for decades after recognizing the benefits in fuel saving and reducing wear on ship engines. Princess Cruise Line has installed shore power capacity in much of its fleet and made its ports compatible in Juneau, Seattle and Los Angeles over the past decade.

Operating costs for shore-based power are competitive with idling on bunker fuel, though fluctuations in oil prices and between ports' electricity rates complicates the comparison. One study found that a typical cruise ship would spend \$450-\$550 per hour for shore-based power, compared with

\$425-\$450 per hour by burning bunker fuel. However, if the same ship is required to use higher quality fuel to limit its emissions, the idling cost jumps to nearly \$800 an hour. Wide adoption of such fuel standards would transform operating costs of cold ironing from a near-push to a clear economic advantage over diesel fuel use.

Until recently, the shipping industry was subject to very little environmental regulation. Limited development and adoption of clean technologies reflected that reality. In March, the International Maritime Organization finalized a plan to establish emission control areas off the coasts of the United States in Canada beginning in 2012. The plan will require ships traveling within 200 miles of shore to drastically reduce their emissions of particulate matter, SO₂ and NO_x, achievable partly through consumption of higher quality fuel. The U.S. Environmental Protection Agency announced plans last year for similar emission standards for all U.S.-flagged ships. Higher fuel costs will make cold ironing a more attractive investment, which in turn will facilitate ships' compliance with the new emissions standards.

Benefits of shore-based power are partially curbed by present circumstances. Many ports are supplied with coal-fired electricity, diminishing savings in greenhouse gas emissions from switching off diesel fuel, though particulate matter reductions are maintained. Additionally, there is no current international standard for cold ironing technology. Creating such a standard will allow ships to tap into shore-based power at any port.

By cold ironing, large ships are able to reduce engine wear and avoid higher operating costs that will soon result from new regulations. Greenhouse gas and black carbon emissions are reduced, benefitting the global climate. Local air pollution in port cities is drastically cut, saving thousands of lives. Such benefits strongly suggest that implementation of this strategy should rapidly move forward.



UNITED STATES REGULATORY SOLUTIONS FOR REDUCTION OF BLACK CARBON EMISSIONS

Zahava E. Essig

The Environmental Protection Agency has the regulatory authority under the Clean Air Act to reduce black carbon emissions in the United States. Black carbon, a key particle of the soot emitted from incomplete combustion of fossil fuels and biomass, warms the atmosphere and is harmful to human health. However, there has been debate in United States courts as to whether Congress intended to address the issue of climate change when it enacted the Clean Air Act. When states, local governments, and environmental organizations petitioned the Environmental Protection Agency (EPA) in 1999 to implement regulation of carbon dioxide (CO₂) and other greenhouse gases from new motor vehicles under its authority in the Clean Air Act, the agency denied the petition. EPA maintained that the Act does not give the agency the authority to regulate pollutants to address climate change, and even if they did have such authority, to regulate would be unwise.

Nearly eight years later, the Supreme Court answered in *Massachusetts v. EPA* with a 5-4 decision stating that the Clean Air Act authorizes the EPA to regulate greenhouse gases in the event the EPA Administrator forms a judgment that greenhouse gas emissions contribute to climate change. The only instance where the EPA could have denied petition is if it found that greenhouse gases did not contribute to climate change. However, Appellate Judge Tatel noted the petitioner's affidavit by climate scientist Michael MacCracken, which "adequately supported the conclusion that EPA's failure to curb greenhouse gas emissions contributed to the sea level rise." Since the EPA did not dispute whether greenhouse gases contribute to climate change, Justice Stevens ordered the EPA to make an endangerment finding for the climate-warming pollutants.

In recent years, climate scientists have looked into additional causes of climate change. They found that black carbon degrades regional air quality

and causes regional warming in and around the areas from where it is emitted. Furthermore, scientists also determined that black carbon is warming the Arctic and Himalayan glaciers.

BLACK CARBON IS WARMING THE EARTH, AND EMISSIONS FROM THE UNITED STATES ARE A CONTRIBUTING FACTOR

These findings allowed scientists to determine that black carbon is a leading cause of global warming, second only to carbon dioxide.

As a response to these findings, scientists commented on the omission of black carbon as a global warming pollutant in the EPA's proposed endangerment finding for greenhouse gas emissions. The EPA responded to comments posed in 2009 indicating that due to a difference in the nature and composition of black carbon when compared to greenhouse gas emissions, the uncertainty in the radiative forcing data, and the projections of global distribution of black carbon versus that of greenhouse gas emissions, black carbon deserves a separate evaluation from findings related to greenhouse gases.

Although the EPA's characterization of black carbon is correct, existing scientific data demonstrate that black carbon is warming the earth, and emissions from the United States are a contributing factor. In a post-*Mass. v. EPA* United States, the EPA can utilize their authority under the Clean Air Act to propose a similar endangerment finding and enact regulations to reduce black carbon emissions enough to curb its effects on climate change. The EPA can accomplish this in a number of ways:

PM_{2.5} Standards: Although the EPA and state environmental agencies currently regulate black carbon through the PM_{2.5} standard, black carbon is not specifically targeted. PM_{2.5} targets all particulate matter at 2.5 micrometers and less, which includes black carbon as well as other particulates that have

varying effects on the environment.

Currently, EPA regulates PM_{2.5} at a level to reduce the direct negative health impacts, such as respiratory and cardiovascular diseases, caused by particle pollution. However, the EPA does not regulate PM at a level to protect human health, safety and welfare from any known or anticipated adverse effects of climate change. The EPA should target black carbon as a global warming pollutant and regulate it at a level that reduces its effects on regional warming, as well as on snow and ice melt.

New and Existing Diesel Vehicles:

In January 2001 and in June 2004, EPA issued final regulations requiring the use of ultralow sulfur diesel fuels to be used in newer on- and off-road diesel vehicles. The new low sulfur standards allow for effective use of particulate filters in diesel vehicles. Implementation of the regulations for off-road diesel vehicles began in 2007 and slowly phased in from 2008 to 2015. Particulate matter limits for on-road diesel vehicles went into effect by the 2007 model year.

THE CLEAN AIR ACT ALREADY PROVIDES THE EPA WITH SUFFICIENT REGULATORY AUTHORITY TO REDUCE BLACK CARBON EMISSIONS

While the new regulations are estimated to reduce particle pollution by up to 95%, diesel emissions (both on- and off-road) remain the United States' number one contributor of black carbon, due to continued reliance on older, high emitting diesel vehicles. In-use diesel vehicles are usually the highest emitters and could remain in use for another 20-30 years before being decommissioned. To fill this gap, the EPA has the authority to implement mandatory retrofit regulations requiring the installation of diesel particulate filters for existing diesel vehicles. A National Research Council study dem-

(Continued on page 15)

GRASSLANDS, RANCHERS AND PASTORALISTS PROVIDE SIGNIFICANT WIN-WIN TO ADDRESS GLOBAL CLIMATE CHANGE

Shannon A. Horst

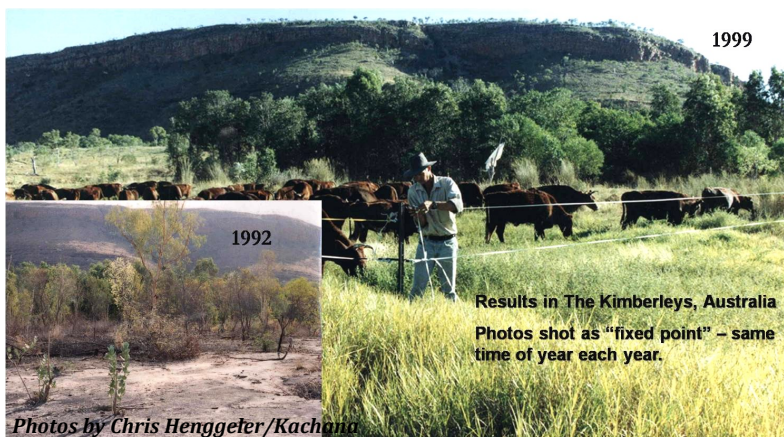
Amid the numerous solutions to sinking more carbon while providing real benefits to humans, few are as significant as the potential of the world's grasslands and the people who live on and manage them.

Grasslands, including rangelands, pasture, arid, semi-arid and tropical, represent 70 percent of the earth's surface (11 billion acres) and its agricultural lands. The soils under these lands represent, conservatively, 20% of the world's soil carbon stocks. An estimated 1 billion of the world's rural poor live on these lands and are livestock keepers. These lands also provide wildlife habitat and water storage (in aquifers) and are the watershed catchments of many of the world's major and minor rivers.

Over thousands of years, these grassland environments have lost significant biological diversity, resulting in desertification and soil carbon loss – thus, releasing billions of tons of carbon into the atmosphere. This has been almost entirely a result of human disruption/management of these landscapes. But this deterioration can be reversed. The key is to change the way humans manage their domestic animals.

If grasslands were successfully managed and the deterioration were reversed on a significant scale, the world would see the following results:

- Significant carbon stocks sequestered in soils under the grasslands;
- Increased food and income security for pastoralists and agropastoralists;
- Reduced drought and flooding (as soils become healthy again);
- Reduced conflict over resources (think Horn of Africa);
- Improved rural economies in grassland regions;
- Restoration of freshwater river systems;
- Aquifers being replenished; and
- Improved wildlife habitat.



To achieve these results does not require huge sums of money spent on speculative research (like other solutions currently touted for reversing climate change). It requires only two things:

- Policymakers and climate change leaders taking grasslands seriously and supporting grazing management that uses livestock as a tool to reverse desertification; and
- Teaching ranchers, pastoralists and agro-pastoralists a better way to manage their animals.

For more than 30 years, Holistic Planned Grazing (developed by Zimbabwean Allan Savory) has helped families and pastoral communities reverse the loss of biological diversity and soil organic matter. It has also increased their productivity, resulting in stocking rates double the average while producing increased forage for wildlife as well. On June 2nd, the Buckminster Fuller foundation recognized Savory for his 50 years of work in developing this approach to improved grazing management as “a solution to some of the world's most pressing problems.” It is the most effective approach to improved grazing and has been used and taught in both commercial and pastoral settings.

Holistic Planned Grazing is based on the fundamental principle that grasslands, their soils, grazing animals and the pack-hunting predator co-evolved.

Thus, it is designed to simulate, with livestock, the symbiotic relationship between soils, plants and animals. Overgrazing is not caused by **too many animals**, but by the **time** that plants are exposed to the animals or re-exposed after an initial grazing. Holistic Planned

Grazing ensures that grasses (and other plants) have adequate time for recovery (to put up leaf and build root) and it works to create animal impact, which is crucial to the health of the soils, preparing the land for seeds, setting the seeds (under the hooves) and water infiltration. It is not a rotational grazing system but rather a planning, implementing, monitoring and replanning procedure that is used today by sophisticated commercial ranchers as well as by native herders in Zimbabwe.

According to the IPCC, improving grazing management and reversing grassland deterioration offer the most important technical mitigation solutions in agriculture.

Improved grazing management can lead to an increase, conservatively, in soil carbon stocks by an average of 0.35 t C ha⁻¹ yr⁻¹, but under good climate and soil conditions improved pasture and silvopastoral systems can sequester 1-3 t C ha⁻¹ yr⁻¹. Some scientists working on this and measuring soils in pastures already under Holistic Planned Grazing have indicated it can produce more. Sources indicate that it is estimated that 5-10 percent of global grazing lands could be placed under carbon sequestration management by 2020. But, with sufficient political will and funding support, far more could be placed under improved grazing management by today. This is a faster, less costly and more effective approach to reducing the legacy load than any other approach currently being explored or promoted. And, it is a win-win.

Climate Institute Events, Awards and Recognition in Mexico

From February 10 to 13, 2010, a team of Climate Institute Board, staff and strategic partners participated in a series of events to launch the Sir Crispin Tickell Interactive Network. These events included: the inauguration of the Tickell Climate Theatre at the Mexico City Museum of Natural History and the Environment, performed by Marcelo Ebrard, Chief of Government of Mexico City; a panel at the Miguel Aleman Foundation on climate protection prospects; and the Miguel Aleman Lecture by Dr. Alexander (Sandy) MacDonald, Director of NOAA's Earth System Research Laboratory and inventor of Science On a Sphere (SOS), which is used in 46 climate theatres around the world. In his lecture, Dr. MacDonald discussed the importance of the data gathered at the Tickell High Altitude Climate Observatory throughout 2009. The Climate Institute team, led by Sir Crispin Tickell, Chairman Emeritus, left the next day for Cuernavaca where they visited the soon-to-open Climate Theatre in Parque Ecologica San Miguel Acapantzingo, the third Tickell Network Theatre. On February 12, Francisco Castillo Montemayor, Secretary of Environment and Natural Resources of the State of Puebla, had his team of climate experts present the draft state plan for evaluation by an international review panel that included Sir Crispin, Dr. MacDonald, Institute President John Topping, and Luis Roberto Acosta, director of Climate Institute Programs in Mexico and Latin America. The draft Puebla State Plan drew high marks from all reviewers.

Dr. MacDonald gave a tour de force presentation of the capabilities of the SOS climate education system within the Tickell Theatre of Flor del Bosque for a large and eager crowd that included British Ambassador Judith Macgregor, her husband retired Ambassador John Macgregor, and Secretary Castillo Montemayor. The Climate Institute concluded the four days of events with an awards and recognition lunch-

eon in a sylvan outdoor setting in the park. Climate Institute President John Topping recognized Dra. Aurora Elena Ramos, Senior Advisor to the Climate Institute, who received a 2008 Climate Institute award as "the Patron Saint of the environmental and climate protection movement in Mexico." Luis Roberto Acosta received the Roger Revelle Memorial Award for Scientific Achievement for spearheading the creation of both the Sir Crispin Tickell Climate Observatory and the Tickell Interactive Network on Climate Awareness and Response. William A. (Bill) Nitze, Institute Chairman from Nov 2002 to February 2009, was awarded the John Chafee Memorial Award for Climate Leadership, for his work in the 1980s as Chief US Climate Negotiator for the State Department in catalyzing the creation of the Intergovernmental Panel on Climate Change (IPCC), and his work later as US EPA International Office Chief in promoting US-Mexico environmental cooperation. Barbara Hernandez, President of the Pedro y Elena Hernandez Foundation, a member of the Climate Institute Board was cited for her generosity and vision that made possible both the construction of the Tickell Observatory and the creation of the Tickell Network. Secretary Francisco Castillo Montemayor was recognized for moving Puebla to the forefront among states of the world in climate protection. Fernando Menendez Roa was recognized for his work in taking measurements atop Sierra Negra.

Carlos Diaz Leal, International Liaison of the Climate Institute and a driving force behind the creation of all the Tickell Network Theatres, organized the four days of events. Climate Institute participants from Mexico included Luis Roberto Acosta; Dra. Aurora Elena Ramos; Carlos Diaz Leal; Fernando Menendez Roa and Pablo Alfaro Zecerro, and from the Board, Barbara Hernandez; Margie Simon de Ortiz, Director General of CICEANA; and Luis Manuel Guerra, now an Honorary Member of the Board, who organized the 1991 Presidential Briefing carried out at Los Piños by the Climate Institute on behalf

of IPCC and UNEP. Attending from the US were John Topping; Bill Nitze; Corinne Kisner, Director of Operations and Editor-in Chief of *Climate Alert*; Irene Soler, Senior Fellow; Nasir Khattak, Director of Global Environmental Programs; and Jack Werner, Senior Fellow. Honorary Members of the team, all participating actively in the Network launch, included Sandy MacDonald; Sandy's wife, Susan MacDonald; Sir Crispin's daughter, Oriana Tickell de Castello, a resident of Mexico City; and John Topping III, son of the Institute's President.

GSEII 10th Anniversary Marked at UN Luncheon; Melinda Kimble and Noel Brown Honored

Together with Friends of the United Nations and the Alliance of Small Island States (AOSIS), the Climate Institute organized a luncheon on May 12, 2010 in the United Nations Delegates Dining Facility to celebrate the 10th anniversary of the Global Sustainable Energy Islands Initiative (GSEII). Ambassador Dessima Williams, Permanent Representative to the United Nations of Grenada and Chair of AOSIS; Former Ambassador Angus Friday, Ambassador Williams' predecessor in both posts and now the point person on clean energy for small island states at the World Bank; Ambassador Abdul Ghafoor Mohamed, Permanent Representative of the Republic of the Maldives; and 20 other invitees, including senior officials of UN organizations, OAS and the United Nations Foundation, engaged in a lively two hour discussion. There emerged a strong consensus that GSEII should be expanded in resources and reach, that COP16 would provide an opportunity to build such support, and that the luncheon discussion format with varying topics would be valuable to AOSIS member nations and AOSIS would welcome such an ongoing program. Climate Institute and Friends of the United Nations are seeking support for such an effort.

At the luncheon's conclusion, Climate Institute President John Topping announced two awards. Melinda Kimble received the Barbara Ward Memorial



Award for her work both as a senior official of the US State Department and then of the United Nations Foundation in “inspiring and nurturing the Global Sustainable Energy Islands Initiative.” Clearly touched by this award, Melinda Kimble, now Senior Vice President of the United Nations Foundation, noted that the English writer and environmental visionary Barbara Ward, had greatly influenced her thinking. Although he was chairing this luncheon as President of the Friends of the United Nations, Dr. Noel J. Brown, a member of the Climate Institute Board for two decades, was surprised to receive the Dr. Bert Bolin Memorial Award for Environmental Leadership and Vision “for inspiring the creation of the Alliance of Small Island States, the Cities for Climate Protection Movement and the IPCC-UNEP Climate Change Briefings.” In making the award, named for the Swedish scientist who first chaired the IPCC, John Topping noted some of Dr. Brown’s other accomplishments, which include inspiring the entertainment community to focus on the environment and showing that indigenous art can be a powerful means of delivering an environmental message. The luncheon ended on a high note with participants determined to make AOSIS a force by COP16 in showing that clean energy transformation can facilitate development.

(Continued from page 6)

dustry are program members.

In the 17 years since the program began, emissions have been reduced by 822 billion cubic feet, which has the same atmospheric effect as eliminating carbon dioxide emissions from six million homes. The figure is also comparable to eliminating greenhouse gas emissions from 8.5 million vehicles, and it would require 10.5 million acres of pine forests to sequester that amount of carbon. Also, methane captured, converted to natural gas, and subsequently sold has earned the involved companies a combined \$802 million dollars in revenue.

Coal bed Methane Outreach Program

The fourth largest source of emissions in the U.S. is methane released through mining operations. Methane is generally captured and removed from the mine by a ventilation system, since it is explosive and hazardous to miners working in a confined space. As a result, the capture and conversion of coalmine methane is beneficial not only to the environment, but also to the mine (as a valuable source of energy and revenue) and the miners. With lower concentrations of methane left in the mines, the chance of a methane-induced explosion is smaller.

By 2006, 86% of all coalmine methane was being captured. This equaled a 16% reduction in emissions since

1994, when the CMOP program began. In those 12 years, the volume of methane gas captured was the equivalent of eliminating 216 million metric tons of carbon dioxide from the atmosphere. Methane reductions from CMOP had the same effect as eliminating 39 million vehicles from the roads for one year, or shutting down 46 coal-fired power plants. Also, enough methane was captured to power 28 million homes for one year.

Another benefit of capturing coalmine methane is that the cost of the technology to capture and convert it to natural gas is equal, if not less than, the potential revenue. By either selling the natural gas or using it as an internal energy source, the coal mining industry gains roughly \$600 million in profits each year.

Conclusion

Together, companies participating in these four government-sponsored programs have lowered U.S. anthropogenic methane emissions by 11% since 1990. While this may not seem to be an overwhelming reduction, the decreases have occurred in spite of overall economic growth within the industries. If the number of participants in methane mitigation programs continues to increase, the overall benefits to the United States (both environmental and economical) could be substantial.

(Continued from page 12)

onstrates that diesel retrofits are more cost effective at reducing particulate pollution than any other transportation pollution reduction strategy.

Vehicles released before the 1994 model year emit more black carbon than a diesel particulate filter can handle, overloading the filter’s carrying capacity and limiting proper filter performance. In this instance, while the EPA cannot force retirement of these vehicles, the agency can provide tax incentives to companies and individuals who trade in their older, high emitting vehicle(s) for a newer, low emitting one(s).

Agricultural burning: In the United States, agricultural burning contributes

only a small fraction of global black carbon. However, agricultural burning is considerably more harmful since the emissions carry into the Arctic during the springtime when the glaciers are most vulnerable to melting. Moreover, in the United States, agricultural burning laws vary from state to state. Some states require permits to burn while other states have no permitting process at all. The EPA can utilize their authority within the Clean Air Act to create regulations requiring states to eliminate springtime burning or eliminate agricultural burning altogether. This can be achieved by requiring states to utilize technologies that reduce crop waste, such as crop-straw gasification and biochar.

Although EPA is wary of uncertainties in the global forcing data for black carbon, scientists have nonetheless demonstrated that black carbon has a significant warming effect, especially in regions predominated by snow and ice. Additionally, scientists provide that reductions in black carbon emissions will produce near-term climate benefits to complement the longer-term benefits of reducing greenhouse gases. Citizens of the United States should not have to wait for lengthy governmental studies and congressional amendments to existing laws. The Clean Air Act already provides the EPA with sufficient regulatory authority to reduce black carbon emissions, bringing nearly immediate relief from the harmful effects of climate change.

CLIMATE INSTITUTE



Founded in 1986, the Climate Institute was the first non-profit organization established primarily to address climate change issues. Working with an extensive network of experts, the Institute has served as a bridge between the scientific community and policy-makers and has become a respected facilitator of dialogue to move the world toward more effective cooperation on climate change responses.


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The Climate Institute's mission is to ...

CATALYZE innovative and practical policy solutions toward climate stabilization and educate the general public of the gravity of climate change impacts.

ENHANCE the resilience of humanity and natural systems to respond to global climate change impacts especially among vulnerable groups (e.g. Native American tribes and Small Islands).

WORK internationally as a bridge between policy-makers, scientists and environmental institutions.



**The Climate Institute is a non-profit,
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GULF of MEXICO - Gas from the damaged Deepwater Horizon wellhead is burned by the drillship Discoverer Enterprise on May 16, 2010, in a process known as flaring. U.S. Coast Guard photo.

Front cover image: Dark clouds of smoke and fire emerge as oil burns during a controlled fire in the Gulf of Mexico, May 6, 2010. U.S. Navy photo.

Editor's note: For all citations and references, see the electronic version of this newsletter at www.climate.org