The other side of global warming

by Peter Donovan

ALMOST all of our proposals and policies for global warming are aimed at reducing fossil fuel use. Yet even if we stopped burning fossil fuels tomorrow, global warming will continue for decades. Why is our approach so one-sided?

The dominant view of global warming is that it's a technical problem. The burning of fossil fuels—often regarded as the lifeblood of modern economies—puts greenhouse gases into the air, mainly carbon dioxide. These trap more solar energy, which makes things hotter and alters weather patterns.

We used to have three greenhouse blankets, and now we have four or five. The solution is defined as reducing greenhouse gas emissions (pollution). The political, social, and moral campaign is directed at technological change, and at using our technology less. Stopping at five or six blankets is better than going to seven or eight, but it won't restore our climate.

Our technology cannot economically remove carbon or other excess greenhouse gases from the atmosphere. Limiting ourselves to technology-focused solutions doesn't give us the leverage we need to actually fix the problem. The best we can do is wreck the world slower.

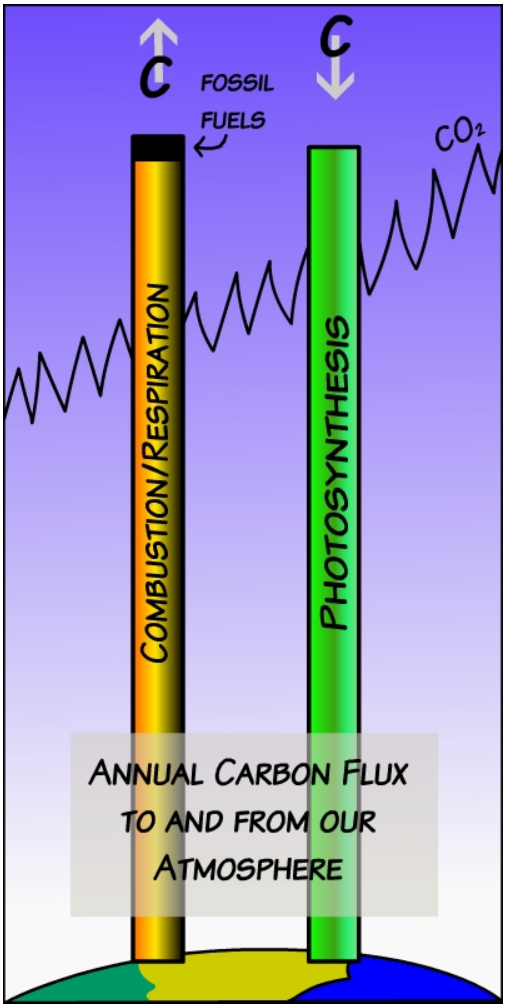
There is another side to global warming, one that existing scientific panels are ill-equipped to recognize, and that existing political institutions are ill-equipped to act on. Global warming is not just an atmospheric pollution problem caused by fossil fuel burning. Like the ancient problem of desertification, it is also a **systemic problem—the result of changes in basic biospheric processes**. Let's look at some examples.

Carbon

Carbon emissions from fossil fuel burning represent less than 3% of the net annual flow of carbon into the atmosphere. The other 97% also results from combustion

reactions—respiration, decay of organic compounds, and burning of biomass. These reactions emit carbon and yield energy.

The right hand bar below represents the flow out of the atmosphere. This is driven by the photosynthesis of green plants (including ocean phytoplankton). Photosynthesis is the reverse reaction: consuming solar energy, plants take in carbon, and store both carbon and energy in complex organic compounds.



The difference between the two flows is less than 3%. This makes the fossil-fuel contribution loom large in the ongoing accumulation of atmospheric carbon.

There is also a guilt factor. Fossil carbon is a human add-on to the natural cycle of carbon from plants to atmosphere and back again.

But as a wealth of new findings are showing, **the rest of the carbon cycle is also controlled or influenced by human decisions.** Our circle of influence is a good deal larger than our concerns over fossil fuels and deforestation. Because humans exercise such dominion over the growth, decay, and combustion of plants, most of these carbon flows represent our human desire to survive, and to prosper. They are our habits, and may be difficult to change. But they are also our decisions.

For thousands of years, long before we discovered fossil fuels, people have been burning and oxidizing carbon compounds that were formed by photosynthesis. Cutting down and burning trees, or burning grass, brush, or crop residue are obvious examples, and still hugely popular.

Less obvious but more significant is the release of stable soil carbon to the atmosphere through plowing and other forms of soil exposure, whereby aerobic microbes rapidly oxidize or “burn” the carbon compounds. Today our soils still contain twice the carbon that the atmosphere does, and these historic and prehistoric losses of soil carbon to the atmosphere can only be guessed at. And it’s ongoing. Tillage continues worldwide, productive grassland turns to dusty desert, and millions of tons of soil carbon are oxidized into the atmosphere.

But it doesn’t have to be this way. Around the world, progressive farmers and

graziers have accomplished some spectacular and rapid reversals of this soil carbon loss, at little additional cost. That's right, *reversals*. In some cases this is a byproduct of their search for sustainability, for maintaining or increasing production while decreasing their dependence on fossil-fuel inputs such as fertilizers, chemicals, and tillage. Unlike vegetation (even trees), the carbon in soil organic matter is fairly stable, lasting more than a generation on average.

These approaches increase photosynthesis while slowing decay or respiration. No, this isn't a secret technology. It's *management*, enhancing and working with biospheric processes instead of going to war against them. It's not abandoning all technology and modern knowledge, going back to some mythical past. It's new knowledge, based on mimicking natural patterns.

Let me repeat that—with good land management, it's possible to take carbon out of the air, rapidly and cheaply. But documentation is scarce, because in our technology-focused society these achievements, and the tremendous opportunities they represent, are seldom recognized. Instead, we regard land use—cattle, corn, houses, or trees—as a fixed category, with determined environmental effects. We don't pay attention to how it is managed. Researchers familiar with conventional and industrial agriculture tend to underestimate the soil carbon opportunity.

Pasture cropping

Colin Seis, an innovative grain and sheep farmer near Gulgong in Australia, has **doubled the organic carbon in his soil in little more than a decade.** He didn't set out to do this. In order to make his operation profitable, and to regenerate the fertility lost by a century of misguided farming practices, he began sowing cereal crops directly into perennial pasture, thus combining farming and intensive grazing while reducing herbicides and tillage. Profits increased because inputs decreased. Another thousand Australian farmers are following his lead, and the system is spreading to North America and Europe.

"The hardest thing to change is your head. Once you've done that, the rest is easy," he says. "Don't spend a cent," he advises farmers. "Throw away your disc plow. Put your animals into large mobs and start moving them around."

Many are hoping for some kind of technology to capture carbon out of flue gases or out of the air. So far, it's not practical or economical. Reversing combustion requires energy, and any recovered carbon or carbon dioxide becomes a disposal problem. But with good land management, photosynthesis can turn atmospheric carbon into valuable soil organic matter, using free solar energy.

Energy

As you might guess from the diagram, **photosynthesis captures far more energy than all the world's mechanical power.** Even in the industrialized U.S., with all our spinning shafts and gas flames, and with all our plowing, paving, burning, and

herbicide spraying, those ridiculously inefficient green plants capture more energy.

The Farm Bill is likely the biggest energy policy the U.S. has. It pays farmers to refuse the free gift of solar energy by subsidizing short-season annual row crops such as corn and soybeans, and a style of agriculture that keeps mostly bare ground between plants and between crops. Nebraska and Iowa look impressively green in July and August, but much of the rest of the year they are brown, with few perennial plants growing. Soil is America's biggest export, far surpassing even empty shipping containers. Much of our agricultural "production" is really consumption.

The Farm Bill encourages the heavy use of fossil energy in agriculture by favoring high-yielding monocultures dependent on nitrogen extracted from the atmosphere by fossil fuels, plus herbicides and pesticides. This nitrogen (usually anhydrous ammonia) contributes to the "burning" of soil organic matter, compounding the debt.

It doesn't have to be this way. People have figured out how to raise excellent food using mostly solar energy while building soil—but this isn't at all popular with fossil carbon lobbyists, or with their many influential friends.

Carrying capacity?

On his small grassland farm in Virginia, Joel Salatin produces more pounds of beef, chicken, eggs, pork, lamb, and rabbit than most conventional farms or extension agents would consider possible. He does this with few outside inputs, and builds soil, organic matter and carbon, and increases fertility in the process.

Salatin's methods are described in Michael Pollan's book *The Omnivore's Dilemma*. Salatin produces such quantity and quality by working with and enhancing the biospheric processes such as water cycling, nutrient cycling, solar energy flow, and synergy among species (rather than separation and confinement). By selling his products directly to his loyal customers, he makes a white-collar income from his 100+ acres of grass.

Water

Among greenhouse gases, water vapor is the gorilla. While carbon dioxide may be the primary driver of global warming, there's more water vapor than other greenhouse gases, and it traps lots more heat. Yet the world's soils, even in their currently dried-out state, hold five times as much water as the atmosphere.

With the loss of sponge-like organic matter, soils lose much of their ability to absorb and retain water. At the soil particle level, it's like the difference between a brick and a balloon. You can wet a brick, but you can put a liter in a balloon. For the difference over an acre, add lots and lots of zeroes.

Large-scale land clearing and tillage, along with the continued desertification of rangeland soils, lets an invisible Columbia River's worth of water evaporate skyward from the soils of the American Southwest.

Legal protections prohibiting human use won't fix this situation, at least not on a timescale that matters to us or our descendants. What has proven to get more water in the soil in these environments is intensive grazing, carefully managed.

The Rafter F

After taking a course in the Holistic Management decision framework, Roger Bowe made big changes on his ranch in eastern New Mexico by transforming his grazing management. Instead of continuously grazing his herd over a wide area, he bunched them so as to intensify grazing and then give the plants an adequate recovery period. Careful monitoring of the soil surface conditions enabled him to adjust his grazing for best results. Over ten years, plant cover doubled, undesirable snakeweed declined by 90%, and pounds of beef produced per acre more than doubled. His costs decreased significantly, giving him more profit.

"The words water cycle, mineral cycle, energy flow, and succession became the words we used to describe the landscape," Roger says. "This is like a foreign language to most ranchers and it is sure not what I was taught in school."

With less bare soil, rain infiltrates better, less of it evaporates, and more is available to grow plants and recharge groundwater. A well on the property that ran dry in the 1950s came back with 10 feet of water in it. Roger says that during a heavy rain from a thunderstorm, his rangeland soils can absorb two inches of rainfall before it begins to flow across the surface. On similar land, managed in a more conventional way, rain began running off after only half an inch.

The opportunities

We've got to reduce fossil fuels. In their new book *Breakthrough: From the Death of Environmentalism to the Politics of Possibility* Michael Shellenberger and Ted Nordhaus have pointed out how transforming both our energy systems and efficiency is a huge opportunity to create millions of good jobs and revitalize our industrial base, and to move *toward* a positive future rather than merely try and avoid a negative one.

But to really address the problem, we will need to look beyond technology to the way we manage land. We do not have, nor will we be able to afford, technological replacements for photosynthesis, for water cycling, or for the majority of carbon cycling—all of which support and sustain our life.

Transforming human land management is also a tremendous opportunity. It promises multiple, simultaneous benefits: more and better water for all, revitalization of rural economies, a more sustainable food system, and enhanced human and environmental health. Taking full advantage of this opportunity will involve new paradigms and a new politics.

If we regard nature as a kingdom or category separate from humanity, the human is often seen as a habitual criminal who can be counted on to vandalize nature for personal gain. Many prosperous developed countries have adopted a policing role intended to protect nature from the human criminal.

Though it may be a necessary stage of development or a process of maturity, this cops and robbers game offers little opportunity for creating the kind of land management we need on our working landscapes. For this we need to move in the opposite direction—*toward* the results we need rather than just punishing what we don't want. This means incentives and opportunity for the farmer, the villager, the grazier, the peasant to enhance these basic biospheric processes. By tying incentives to results, rather than practices, we could empower people to come up with their own creative, locally adapted, low-cost methods.

Zoetvlei

Near Vryburg, South Africa, rancher Sandy Speedy has been keeping records of rainfall and kilograms of beef produced since 1972. Using the Holistic Management framework, Speedy and his family have tripled the amount of beef they produce from an inch of rainfall—by managing grazing to increase soil cover, water infiltration, and soil moisture.

"The limiting factor is not rainfall, as we have been told, but management," Sandy Speedy says.

The South African government has done away with agricultural subsidies, which Sandy says will be "better for the soil, for the water cycle in a country short of water, and for the agricultural community. It is an opportunity for sound agricultural management."

The land management we need, and that provides such an opportunity for addressing both desertification and global warming, brings with it a new paradigm, a new understanding of the foundation or center of gravity of what we regard as nature. This new understanding is totally at odds with the scarcity-based, zero-sum beliefs and behaviors of both industrial agriculture and protectionist environmentalism, and with their associated academic traditions.

The next chapter will explain this new understanding through solar energy flow, water cycling, nutrient cycling, and community dynamics and succession. Then we'll practice with issues: biofuel crops, the Farm Bill, urban sprawl, invasive species, and more.

The final chapter will outline the new politics that we need to take advantage of these opportunities, and how to practice it.

This paper (version 11/5/07) is a draft of the first chapter of a forthcoming short book about the opportunities inherent in global warming. See http://soilcarboncoalition.org for updates and links to related projects and materials.