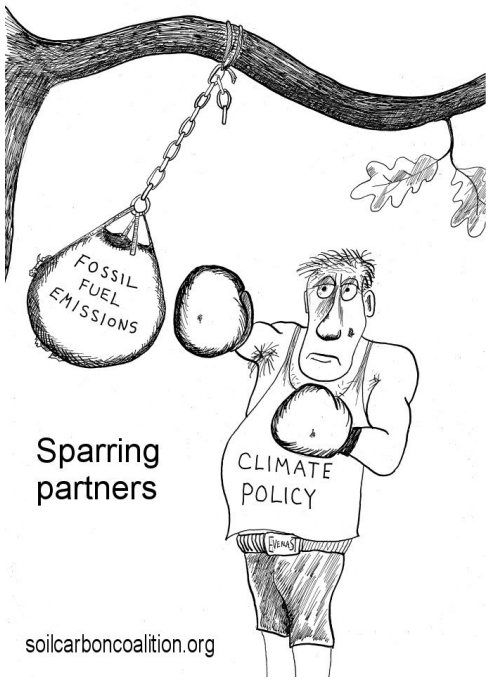
Can policy build soil carbon?

The problem with carbon is that it's **not** a problem. It's a cycle, encompassing the fields and pastures where your breakfast came from, your every breath and thought. It's a network, linking together the metabolisms, life histories, and deaths of all the biosphere's organisms—which are autonomous, mostly single-celled, and made largely of carbon.

There is too much carbon in the atmosphere, and humans are responsible. The cues are all there to see this as a problem, and an environmental problem at that. Such a recognition can be unconscious and instantaneous. The self-evident solution is to reduce fossil fuel emissions.

Within its frame of reference, the diagnosis is true—fossil fuel burning is bad, it's pollution, and ought to be slowed or stopped. But the diagnosis is useless. It will keep the problem unsolved.

It sets up a power struggle over who owns the issue, who frames it. There is widespread and stubborn resistance to the environmental framing and its embedded solution. This resistance is not about peer-reviewed science or data. It's about fear—of scarcity, of loss of choices, of being controlled by liberal do-gooders and dysfunctional international agreements.



Ridiculing, belittling, or ignoring such fears doesn't make them disappear. It nourishes them. Likewise, the fears of climate change—sea level rise, drought, famine, booms and busts of plants and animals, economic collapse, refugees—will gain urgency and strength under denial or lack of action.

These are not the dynamics of change. They are the dynamics of a pendulum, where motion in one direction guarantees motion in the other, and which can only be stable when it is hanging straight down, after all energy is dissipated.

(As a kind of scientific footnote, emissions reductions also appear to lack near-term leverage on climate forcing. Atmospheric carbon dioxide is chemically stable, its concentration buffered by the enormous carbon pool in the ocean. With complete elimination of fossil fuel burning, it will take a century or so for atmospheric carbon dioxide to subside to 350 parts per million, according to the IPCC.[1] We'd lose much of the cooling aerosol effects immediately.)

So what should we do about climate change, about the extra carbon in the atmosphere?

If we want a useful answer, this is the wrong question. It presupposes too much—that the problem or issue can be cleanly formulated, that there is just one best answer (or a short list), that decision makers can arrive at and accept the answer without paralyzing conflict, and that it can be implemented effectively.

But we answer the question anyway. In addition to strategies for reducing fossil fuel emissions, there's planting and protecting trees, carbon capture and sequestration using technology, sulfate particles, iron fertilization of the oceans, space reflectors, ocean mixing, no-till farming, organic farming, biochar. Each of these proposed solutions seems to raise resistance in proportion to its popularity or strength of advocacy. Such conflict increases the difficulty of actually trying them, deciding what to measure, evaluating the results in an evenhanded manner, and disseminating the resulting "information" to decision makers and potential adopters.

E. F. Schumacher observed that problems are of two general types.[2] For some, the best solutions converge, such as the bicycle for a human-powered wheeled vehicle. But for others, such as the best way to educate children, the solutions diverge and multiply, though they may contain common elements. Divergence is characteristic of living systems.

Climate science comes mostly from the sciences of nonliving systems. Svante Arrhenius and Arvid Hogbom, the Swedish chemists who in the 1890s laid the foundation for our modern scientific understanding of climate forcing from increasing atmospheric carbon dioxide, discounted the role of the biosphere in the composition of atmospheric gases.[3] (The Russian geochemist Vladimir Vernadsky recognized in the 1920s that the composition of the atmosphere was a product of biosphere processes, and that life was the most powerful geological force, but there was little demand for this understanding.) In the last several decades the biosphere's role has increasingly been recognized by climate science, but mainly as disturbance or feedback to a nonliving system.

Far from the centers of institutional power and big science, some alternative farmers and graziers on several continents have been putting a developing understanding of living systems at the center of their search for sustainability, lower input costs, and a better quality of life. As a kind of side effect, these practical, independent-minded people have figured out how to turn large quantities of atmospheric carbon into stable, water-holding, fertility-enhancing soil organic matter, using free solar energy captured by plants. (This description does not do justice to the multiplicity of local variations and methods, or to the inner

complexity of these pathways and processes.) Though documentation continues to be scarce, these efforts supplied answers to questions hardly anyone was asking: How does the biological carbon cycle function here? What have we been doing to it? What are the possibilities?

For those acquainted with these discoveries of possibility, it is tempting to see the building of soil organic matter as a single, broad, high-leverage strategy for taking responsibility for the biosphere's carbon cycle, and addressing climate change along with other problems. Soils, depleted as many of them are, contain far more carbon than the atmosphere and forests combined. The flow of carbon in and out of soils is about 8 times as large as what are usually considered anthropogenic emissions (fossil fuel burning and deforestation). A wide variety of human activities—agriculture, grazing, biomass burning, forestry, or protection from other uses—greatly influence these flows, often in surprising directions. Atmospheric carbon can be turned into carbon-rich soil organic matter using solar energy (self-reproducing plants), without the need for expensive collection and concentration systems. Even the poorest people can do it. And organic matter greatly increases the fertility and water-holding capacity of soils, thus addressing the root of most of the major issues or problems facing humans now.

But it's hard to imagine current policy systems implementing a broad-scale enhancement of soil organic matter. No large organized political or economic power bloc stands to benefit directly from it, or makes these underground benefits recognizable to the larger public. It doesn't visibly align with the flagship issues of the environmental movement such as species conservation, wilderness protection, or pollution. Within the framing of climate change as pollution, soil carbon is suspect because it is viewed as an offset or excuse for fossil fuel emissions, which brings concerns about permanence, additionality, and verifiability. Increasing soil organic matter is crosswise to the agendas of agricultural modernization, whose defenders regularly dismiss it as insignificant, unpredictable, and too hard to measure.

In science and policy, we expect problems to be convergent, to have either a best solution, or a small number of good solutions from which a compromise, or suite of best practices, can be assembled. This worked fairly well for reducing chlorofluorocarbons and acid rain. It seems to be working less well for reducing fossil fuel emissions, which are only about 3.4% of the annual flux of carbon dioxide to the atmosphere. For the much broader issue of climate change and the carbon cycle, which involves the biosphere's network of autonomous living organisms, the expectation of convergence becomes a faith in extinction, a hope for a dead universe.

Our institutions and agencies are trained for convergence, and research helps us reduce the solutions under consideration to a manageable number. But building soil organic matter deals with living systems in a variety of environments. It is a divergent strategy, or opportunity, with some common elements such as keeping soils covered with plants or litter. Pushing opportunities into convergent problem-solving systems is like running a stump through a rock crusher, or a boulder through a sawmill. It may work somewhat, but mainly you make a mess and alienate people.

Such attempts are necessary disturbances for change, and may lead to adaptations that aren't purely defensive. But indirect methods, going around the convergent policy systems, may also be necessary.

To summarize: the lack of organic matter in our soils isn't a problem, to be fixed with a solution. It's an opportunity, with divergent solutions. Yet our policy systems tend to select for convergent and standardized solutions, which are difficult to implement because of power struggles and escalating fears, or are too compromised by a "best practices" format to be most effective in a variety of situations. Approved, implementable, and effective strategies and actions get scarcer and scarcer as the need for them gets more and more urgent. In the face of grave threats, the sense of freedom and possibility shrinks to a point. Is this what we want? It is a situation we have contributed to.

Challenging these dynamics, important as it is, won't be enough. Giving the "right" answers to the wrong questions is a steady job, but it gets boring. A different selection system, with different selective forces, is needed. One that asks not what to do about global warming pollution, for example, but asks how the carbon cycle functions in this or that place, and what are the possibilities for enhancing it. For example, what are the possibilities, in a variety of situations, for turning atmospheric carbon into soil organic matter?

Prize competitions are a proven strategy for exploring, pushing the boundaries, and telling the story of what is possible. They can help change the questions, which can help shift leadership from top-level experts to successful local practitioners.

If we want to find out how fast a human can run 100 meters, should we convene a panel of experts to make predictions? Should we do a literature search on how fast six-year-olds can run? Should we build a computer model? Last but not least, can we interest and engage people in running, or teach or encourage them to run faster, by televising these activities?

A prize competition substitutes progress for the pendulum. We can offload the job of picking winners to the stopwatch, and to a multiplication of regional

and local subcompetitions. The focus can be on results rather than on methods, practices, or politics.

Instead of a blueprint for power struggles, a prize competition can offer a platform for possibility, a kind of participatory public space that could enroll people and groups who are not now included in formulating responses to climate change, land degradation, floods and droughts, or any of the other issues over ecosystem services for which soil organic matter is the keystone.

The core idea could be to see how fast land managers could turn atmospheric carbon into soil organic matter over a decade or so, with results measured in tons per hectare per year. But those who bear the costs of loss of organic matter, such as local road and water districts, conservation districts, local governments, emergency management agencies, and more broadly, local economies—could add policy or research trials of their own onto the soil carbon monitoring platform. For example, the city of Wichita, Kansas has done a great deal to encourage the formation of soil organic matter and soil cover to safeguard their municipal water supply. Elsewhere, soil and water questions often remain disconnected.

The strategy of a prize competition is that of positive deviance.[4] We identify people who are outstanding achievers, recognize them, seek to learn from them and emulate them. It's about asking who, before asking what. Instead of a narrow panel of experts drawing up a blueprint for best practices, it's about crowdsourcing and local leadership.

Help us create a platform for possibility to replace the downward spiral. The Soil Carbon Coalition is looking for people and organizations who would be willing to help design, promote, fund, and carry out The Soil Carbon Challenge, or World Carbon Cup.

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Notes

[1]Section 10.3 of the FAQ to the IPCC 2007 Fourth Assessment: "Complete elimination of CO_2 emissions is estimated to lead to a slow decrease of atmospheric CO_2 of about 40 ppm in the next century." (http://www.ipcc.ch/pdf/assessment-report/ar4/wg1/ar4-wg1-faqs.pdf)

[2]Schumacher's *A Guide for the Perplexed*, chapter 10.

[3]Svante Arrhenius, "On the Influence of Carbonic Acid in the Air upon the Temperature of the Ground," *Philosophical Magazine and Journal of Science* Series 5, Volume 41, April 1896, pages 237–276.

[4]David Dorsey has a trenchant summary of the positive deviance strategy here: http://www.fastcompany.com/node/42075/print