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Why Are We Still Unable to Fully Resolve Environmental Problems?

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Pollution Threatens Life as We Know It

Humanity has failed to deal with environmental crises because we are in thrall to a narrative which says that to have prosperity and a high quality of life, we must sacrifice the environment. That narrative is wrong. Our job is to craft a new narrative: an economy in service to life.

Pollution is both an inner and outer challenge. It is, at once, an intimately personal issue and a societal problem.

My choice to fly here to be with you emitted almost five tons of CO_2,[1] more carbon than the annual per capita emissions of an average person in France.[2] I often remark that my job is burning carbon to save the climate. I could have done this talk by video. But then we would not have shared meals or gotten to know each other. So, you tell me if it is worth it.

At the same time, my emissions are almost irrelevant: almost 70 percent of all carbon emitted has been done by 90 entities: the oil majors and the sovereigns like Saudi Arabia.[3]

It is these larger emissions we must eliminate. Korea now suffers more and stronger typhoons. These threaten Asia's mega-cities, which could lose as much as $35 trillion in assets by 2070. This is up from the estimated $3 trillion value in 2005.[4] Mangkhut, the strongest storm ever measured, killed 70 people in the Philippines. Typhoon Jebi, the strongest ever to hit Japan, killed 11 a few weeks before. Kong Rey, which killed several in Korea, was the twenty-fifth tropical storm in 2018 and the fifth category five storm. Typhoons hitting East and Southeast Asia have intensified by 12 to 15%.[5] The proportion of category four and five storms has doubled—tripled in some regions—bringing a 50% increase in destructive power.

When it is not raining, Korea is subject to droughts. 2017 saw the worst drought in 15 years. This, too, is the result of my flying, and of all of us using fossil fuels. It is climate change's signature.

"But I have no choice," you say. To some extent that is true. It is also not true. There are also many things we each can do to drop our carbon footprint and clean the air. My ranch is solar powered. I drive a Leaf, an electric vehicle (EV). You could, too. The Kia Niro is impressive. CT&T grabbed 35% of the domestic market here as soon as it released its EV.

In Colorado, our governor just issued an Executive Order to mandate more EVs to clean the air. Korea should do this. You have some of the worst air pollution in the world, which is literally killing people. It is also making your economy less

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competitive, costing $9 billion each year.[6]

Where does this come from? "China," say most Koreans. Recent NASA studies show that only 30% of the "fine dust" (PM 2.5 pollutants) here come from China. The rest come from your coal-fired power plants and petrol cars.

Your health, your economy, your security, and the future of the planet all require us to frame a new narrative: what kind of a future do you want to live in?

It'll Do 'til the Mess Arrives

The woes of the world are not an accident. Nelson Mandela said, "Like slavery and apartheid, poverty is not natural. It is manmade, and it can be overcome and eradicated by actions of human beings."[8]

Pollution is not natural either. And, as Mandela said, if we created this mess, we can un-create it.

The threats facing humanity are symptoms of an economy that is extractive and degenerative: we liquidate human and natural capital to generate more money and stuff.

That economy is the result of a story, created by 36 men in 1947.[9] Called neoliberalism, it was built to defend individual creativity from the evils of fascism and communism. The narrative says that humans are greedy bastards but that's OK, because, in a perfect free market, me against you will somehow aggregate to the greater good.

No, it won't. It hasn't. It's impoverishing the planet and most of humanity, driving us over a cliff.

To neoliberals, all that matters is that each of us is free to express our individual liberty in an unfettered market. Money is the only measure of success. Being wealthy is a sign of being blessed. Government should be as small as possible, protecting private property and access to the market.

This story is baked into mental models of most everyone in business, academia, and policy.[10] This narrative governs global economic policy in almost all of the world.

A New Narrative: The Principles of Natural Capitalism[11]

To craft a finer future[12] institutions around the world must enable all people to enjoy shared prosperity on a healthy planet.

The route to a regenerative economy is to implement the three principles of Natural Capitalism. First, we should use all resources dramatically more productively. This is profitable, but more importantly, it buys time by pushing back crises like climate change. That time should then be used to redesign how we make and deliver all goods and services, using such approaches as the circular economy[13] and biomimicry. This includes closing loops in material flows[14] to eliminate waste and using renewable energy.[15] For any system to be truly sustainable, however, it must be managed to be regenerative of all forms of capital, especially human and natural capital.[16]

This new narrative rests on two key transformations: the decarbonization of the economy and the shift to regenerative agriculture.

In November 2018, President Moon announced the creation of the "world's largest solar park": an $8.8 billion solar and wind complex. Under Moon's plan, renewables would account for 34% of the country's installed capacity by 2030, up from 9.7% in 2017. Natural gas would generate 19%. Nuclear and coal would fall from 51% of the current energy mix to a third by 2030.

Good start, but insufficient. And likely to be overtaken by economic events. Tony Seba, a Stanford professor, says inevitably, for fundamental economic reasons, the entire world will be powered by renewables by 2030.[17]

Is this possible? In 2009, Stanford scientist Dr. Mark Jacobson[18] showed that renewable energy could power the world by 2030. His Solutions Project[19] calculated how to do this. More recently, scholars like Christian Breyer[20] have shown how to do it with photovoltaics alone.

Seba[21] describes how the convergence of four disruptive technologies and business models will drive it: reduced cost of solar energy, reduced cost of storage (batteries), the electric vehicle, and the driverless car. Renewably powered electric vehicles offering Transit-as-a-Service would be ten times cheaper than current private ownership of internal combustion cars.

In late 2017, the coal-dependent Xcel Energy of Colorado released its request for bids to supply energy for its customers; 57 gigawatts of wind, solar, battery storage was offered at 3¢ per kilowatt-hour.[22] When you combine renewables with battery storage, you get fixed, firm, 24-hour power—just like a coal plant, but without the pollution. The cheapest fossil bid, natural gas turbines, was 4¢/kWh. In October, Saudi Arabia announced the new world record low price: 1.7¢/kWh.[23] The goal for Korea and everywhere else should be 100% renewable by 2030.

China has already eclipsed its 2020 goal in solar installations. It now adds 45 gigawatts of solar every year (more than the entire installed solar capacity of Germany).[24]

California predicted it will hit its declared 2030 target of getting 50% of its power from renewable energy by 2020[25] and has committed to 100% carbon-free power by

2045. Korean car makers, responsible for 12% of the country's added value,[26] are locked in a death struggle with German, Japanese, American, and most of all Chinese car makers to win the EV race. This could serve you well, as the batteries LG Chem is making become the basis of your future economy.

If all this is true, it has profound implications for, well, everything. Failure to manage this transition carefully will mean the dissolution in value of the oil, gas, coal, uranium, nuclear, utility, and auto industries; the banks that hold the loan paper for all of these companies; and the pension funds and insurance companies investing in them. It will mean, within about 10 years, an economic collapse on a scale never before seen. Consider oil. John Fullerton of the Capital Institute predicted that keeping fossil energy on the balance sheets of some of the world's wealthiest companies and sovereign wealth funds of many nations implied a write-off of at least $20 trillion.[27] In contrast, Fullerton warned, the 2008 financial collapse resulted from the stranding of only $2.7 trillion in mortgage assets. If Tony Seba is right, we are looking at the mother of all disruptions. We will construct an entirely new economy, like it or not.

The second half of solving the climate crisis profitably is the shift to regenerative agriculture. This will ensure abundant and healthy food from prosperous rural communities. Energy and chemical intensive, industrial agricultural production is responsible for pollution in Korea and everywhere. It also decarbonizes the soil. Over-application of nitrogen fertilizers denitrifies the soil and causes emissions of nitrogen oxides, another potent greenhouse gas (GHG). Confined animal feeding operations release enormous amounts of methane, a far worse GHG than carbon dioxide. Such agriculture emits about a quarter of greenhouse gasses, and is vulnerable to climate change. It is also degenerative of rural economic integrity and human health.

There is increasing interest in what Robert Rodale called regenerative agriculture. Regenerative systems, he said, enhance the resources that they use, leaving them more abundant instead of depleted or destroyed. Such systems are holistic, enhancing innovation and delivering environmental, social, economic, and spiritual well-being.[28]

Regenerative agriculture uses nature's wisdom and healthy soils, not human brute force, to sequester carbon. This approach has been taught for decades by a man named Allan Savory. His Savory Institute (SI)[29] is now the leading proponent of Holistic Management and Holistic Decision Making to use agriculture to solve the climate crisis. It enables practitioners to turn deserts into thriving grasslands; restore biodiversity; bring streams, rivers, and water sources back to life; combat poverty and hunger, all while reversing global climate change.[30]

In nature, carbon is not the greatest poison: it is the building block of life. Savory's approach mimics how vast herds of grazing animals co-evolved with making the world's grasslands the world's second largest store of carbon: The herds were dense-packed because of predators, moving together, eating everything, fertilizing the land, tilling the manure and seeds into the soil with their hooves, and then moving on, not returning until the grass was lush again.

This interaction creates healthy communities of soil microorganisms. They, in turn, recarbonize the soil and restore natural nitrogen cycles. Savory[31] argues that even achieving zero emissions from fossil fuels would not avert major catastrophe from climate change. Grassland and savanna burning would continue and desertification would accelerate, as soils become increasingly unable to store carbon or water.[32] Averting disaster, he says, will require a global strategy to cut carbon emissions, substitute benign energy sources for fossil fuels, and implement effective livestock management practices to put the excess carbon in the atmosphere back into the soils. Profitable Holistic Management is the only way, he argues, to reduce biodiversity loss and biomass burning and reverse the desertification that is not caused by atmospheric carbon buildup.[33] The 2010 Buckminster Fuller Challenge Prize recognized Savory's decades of work, his Africa Centre for Holistic Management in Zimbabwe, and SI for deployment of whole-systems solutions to climate change and sustainable development.

Meet Gabe Brown.[34] A failing commodity corn and soybean farmer, he converted his 2,000 acres near Bismarck, North Dakota, to regenerative agriculture to cut costs. When he began in 1993, his soil quality was poor, requiring fertilizer, pesticides, and herbicides to produce a crop. By 1995, Brown had stopped plowing his land. In 1997, he added multi-species cover crops. In 2006, he introduced Savory-style grazing practices, adding cows, sheep, broiler hens, bees, corn, and soybeans. Not needing chemical inputs or fossil energy cut his costs and increased his profitability. In 2014, it cost him $1.35 to produce a bushel of corn, which he sold for more than $3.50. He cannot keep up with demand for his grass-finished beef and lamb, and his fields have never been healthier. The capacity of his acreage to cycle nutrients,[35] including carbon, and to hold water, exceeds that of his neighbors who farm organically—but without animal impact. It also exceeds two no-till operations that use varying amounts of synthetic fertilizers. Soil samples from Brown's ranch compared to his neighbors' operations shows how much animal impact increases concentrations of nitrogen (N), phosphorus (P), and potassium (K) (Table 1).[36]

The water-extractable organic carbon (WEOC) is

Management	N lbs.	P lbs. (ppm)	K lbs. (ppm)	WEOC
Organic	2	156 (9)	95 (14)	233
No-till, low diversity	27	244 (14)	136 (19)	239
No-till, MD, high syn.	37	217 (12)	199 (28)	262
No-till, HD, NS, livestock	281	1,006 (56)	1,749 (250)	1,095

Tested by Dr. Rick Haney, ARS, Temple, TX

Note: Gabe Brown, whose ranch is shown in the bottom row of numbers, provided a 2007 soil test from his ranch showing these results: N - 10 lbs. in the top 24 inches; P (Olsen test) - 6 ppm; K - 303 ppm. Gabe says he has not used any fertilizers on his home ranch since 2007. The ppm numbers are a *Graze* conversion (with help from Gene Schriefer, University of Wisconsin-Extension) from the original lbs. listed in this soil test.

the most amazing outcome. When Brown bought his farm in 1993, it had shallow soils with 1.3% soil organic matter (carbon). By 2013, he had plots with more than 11% soil organic matter.

Brown is rolling climate change backwards, recarbonizing his soils at a profit. As he puts it, if your soil is healthy you will have clean water, clean air, healthy plants, healthy animals, and healthy people. You will have a healthy ecosystem. And essentially no pollution.

Such practices improve more than the soil. Will Harris converted White Oak Pastures,[37] his family's commodity farm in south Georgia, to a successful regenerative operation by raising, slaughtering, and selling five kinds of poultry, five kinds of red meat (all pasture raised), eggs, and vegetables. The products are sold online, to high-end restaurants and to Whole Foods markets across the Eastern United States. Harris employs 137 residents of the once-decaying town of Bluffton. His commodity farmer neighbor, with the same acreage, employs 4.[38] White Oak Pastures features agri-tourism, a restaurant, a general store, and is the Georgia Savory Hub.

How much carbon can be sequestered in properly managed grasslands and how fast? In some experiments in California, manure from dairy and beef operations is blended with green waste that would otherwise go to landfills, impose costs, rot, and release methane. The mix is composted and spread on pastures. Scientists from the University of California, Berkeley, take annual soil cores a meter deep and test whether that soil carbon has increased. One application of compost to rangeland, they found, doubled grass growth and increased carbon sequestration by up to 70%.[39] The stored carbon increases annually. This can achieve total greenhouse gas (GHG) mitigation rates over a 30-year time frame of more than 18 tons of CO_2-equivalents per acre of land treated with the organic amendments.[40]

Dr. David Johnson,[41] director of the Institute for Sustainable Agricultural Research at New Mexico State University, developed a similar approach. His research showed "...promoting beneficial interactions between plants and soil microbes increases farm and rangeland's efficiency for capturing carbon and storing it in soil. These same interactions increase soil microbial carbon-use efficiencies, reducing the rate at which soil carbon, as CO_2, is respired from the soil. When this biotechnology is promoted in agro-ecosystems, it is feasible to capture and sequester an average of more than 11 metric tons of CO_2 per hectare per year in rangeland soils[42] and more than 36.7 metric tons of CO_2 per hectare per year in transitioning farmland soils,[43] all for less than one-tenth the cost of EPA's recommended Carbon Capture Utilization and Storage (CCUS) technologies."

The world's permanent pasture and fodder lands amount to roughly 3.4 billion hectares. Calculations by Seth Itzkan of Soil4Climate show that if Holistic Management were practiced on all of the world pastureland, 10.2 gigatons of carbon per year could be captured. Over 30 years' time that would return the world to the preindustrial level of 280 parts per million CO_2 in the atmosphere.[44]

Coupled with other forms of regenerative agriculture and the reductions in carbon emissions possible and profitable through good energy policy, it is clear that we can solve the climate crisis and do it in ways that are profitable.

One of those ways may be Korean Natural Farming,[45] a blend of Korean and Japanese techniques developed by Cho Han Kyu. It blends traditional Korean farming and fermentation, used in food such as kimchi, to create Indigenous Micro Organisms (IMOs)— colonies of bacteria, fungi, protozoa, and other organisms—that enhance productivity of crops and livestock, cut odor in pig production, and decrease reliance on external inputs and fossil fuel to improve profitability of farms.

These approaches would go a long way to eliminate the water pollution that has increased in Korea as the

country developed. Since the 1988 Olympics, quality has improved, but a study from Portland State University[46] found that "there are still higher-than-acceptable levels of pollutants in some of the more urbanized regions in and around the capital Seoul." It recommended increasing forest cover and vegetation along streams and rivers, but noted "there needs to be more stringent regulations, implementing best management practices and creating natural buffers." Regenerative agriculture would certainly help.

Creating a Finer Future

We have created an economy designed to maximize possession of financial and built capital. But doing this is destroying our life-support systems. Money and stuff are useful, but sacrificing human and natural capital to get more of it is daft.

Further, it is just bad capitalism. Intact community and ecosystems are far more valuable forms of capital, because without them there is no social stability and no life and thus no economy. We need to create a well-being economy, one that delivers shared prosperity on a healthy planet. The great scientist and lead author of Limits to Growth, Dana Meadows, believed that we can do it. We can avoid collapse. She observed:[47]

> People don't need enormous cars; they need respect. They don't need closetsful of clothes; they need to feel attractive and they need excitement, variety, and beauty. People need identity, community, challenge, acknowledgement, love, joy. To try to fill these needs with material things is to set up an unquenchable appetite for false solutions to real and never-satisfied problems. The resulting psychological emptiness is one of the major forces behind the desire for material growth. A society that can admit and articulate its nonmaterial needs and find nonmaterial ways to satisfy them would require much lower material and energy throughputs and would provide much higher levels of human fulfillment.[48]

Meadows believed in human potential and the power of telling optimistic stories. She believed that a sustainable world is possible.

Last fall OECD convened the Sixth World Forum on Statistics, Knowledge and Policy: The Future of Well-being in Korea. It called for shifting how we keep national systems of account from GDP to well-being. Korea could become a world leader in this approach.

In 2007, German parliamentarian Hans Josef Fell offered the Koreas a peace plan based on substituting renewables for nuclear and fossil energy. It was rejected then, but President Moon's approach could offer a return to that. Fell writes: Renewables are the most cost-effective energy. The position of South Korea as a market leader in renewable energy technologies, battery storage, and e-mobility could help North Korea create jobs. A switch to 100% renewables would position the Korean peninsula as a global leader of sustainable, nuclear-free green economy.[49]

Korea and the world have a choice: they can cling to the neoliberal myth that has brought us to the edge of a cliff. Or we can craft a new narrative to deliver Buckminster Fuller's vision of a world that works for 100% of humanity.[50] Let's create that finer future.

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